FINAL REPORT

CITY OF LA HABRA HEIGHTS REASONABLE ASSURANCE ANALYSIS

Prepared for

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Acronyms

BMP	Best Management Practice
cfs	cubic feet per second
City	City of La Habra Heights
EPA	United States Environmental Protection Agency
EWMP	Enhanced Watershed Management Plan
HRU	Hydrologic Response Unit
IOQC	Interflow Concentrations
LACDPW	Los Angeles County Department of Public Works
LARWQCB	Los Angeles Regional Water Quality Control Board
LSPC	Loading Simulation Program in C++
NLCD	National Land Cover Dataset
MS4	Municipal Separate Stormwater Sewer System
NHD	National Hydrography Dataset
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
POTFS	Scour Potency Factor
POTFW	Wash-off Potency Factor
RAA	Reasonable Assurance Analysis
RWL	Receiving Water Limitation
SCCWRP	Southern California Coastal Water Research Project
SOQC	Surface Outflow Concentrations
TLR	Target Load Reductions
TMDL	Total Maximum Daily Load
USGS	United States Geological Survey
WMMS	Watershed Modeling Management System
WQBEL	Water Quality Based Effluent Limitation
WQO	Water Quality Objective
WMP	Watershed Management Plan
WQO	Water Quality Objective

The City of La Habra Heights (City) as Co-Permittee to Order R4-2012-0175 has conducted a Reasonable Assurance Analysis (RAA) as part of the implementation of their Watershed Management Plan (WMP) to demonstrate compliance with appropriate water quality standards as developed through applicable total maximum daily loads (TMDLs) and other Permit limitations including water quality based effluent limitations (WQBELs), receiving water limitations (RWLs), and water quality objectives (WQOs).

The Regional Board has developed a guidance document for conducting a RAA titled, Guidelines for Conducting Reasonable Assurance Analysis in a Watershed Management Program (LARWQCB 2014a). Although the guidance document presents guidelines and not necessarily requirements, the results of the RAA presented in this Technical Memorandum have been developed to conform to the Regional Board guidance document where appropriate.

The Watershed Management Modeling System (WMMS) developed for Los Angeles County was utilized to perform the City's RAA. Baseline critical wet conditions and critical dry conditions were simulated using the WMMS for both Coyote and San Jose Creek for the time period ranging from January 1, 2000 through March 31, 2012.

Based on the results of the RAA, additional control measures will be necessary in order for the City to obtain compliance with water quality objectives (WQOs) for fecal indicator bacteria. The City of La Habra Heights is committed to environmental stewardship and continues to investigate ways to reduce its impact on storm water pollution. Source control measures that will be implemented by the City include requiring septic systems to meet all AB885 compliance factor requirements concerning large animal waste management and resource production compliance requirements. These BMPs are described in detail in the City's WMP.

The City of La Habra Heights (City) as Co-Permittee to Los Angeles Regional Water Quality Control Board (LARWQCB) Order R4-2012-0175 (NPDES Permit No. CAS004001) is required to perform a Reasonable Assurance Analysis (RAA) as part of developing its Watershed Management Plan (WMP). A RAA involves using publicly available modeling software to demonstrate that applicable water quality based effluent limitations and receiving water limitations will be achieved through implementation of the watershed control measures proposed in the WMP. This technical memorandum provides the methodology, assumptions, and limitations used in developing the City's RAA as well as the results of the analysis.

1.1 PHYSIOGRAPHIC SETTING

The City of La Habra Heights is located in the eastern portion of Los Angeles County within the geographic center of the greater Los Angeles metropolitan area. While being located within the second largest urban population center in the United States, the setting of the city is best classified as rural.[1]

Located in the Puente Hills, the City's natural terrain is characterized by canyons and steep hillsides. Elevations in the City range from 350 feet to 1400 feet (City of La Habra Heights, 2004). Among these canyon areas is the Puente Hills Wildlife Corridor which is dominated by native plant communities such as grass lands, inland coastal sage scrub, mixed chaparral, and riparian woodlands. This corridor connects directly to the Cleveland National Forest. Because of the City's small population and natural canyon terrain, native habitats blend with man-made settings. This is enabled by City policies which encourage rural character, animal husbandry, and open space.

The City consists of 6.2 square miles in total land area with an abundance of open space lands including trees, shrubs, grasslands and wildlife, creating a sharp contrast to the dense suburban development found within neighboring cities. The City is committed to protecting its natural and rural environment. Over 20 percent of the City's land area is devoted to permanent, natural open space. Open space refers to unimproved land or water devoted to the preservation of natural resources, for outdoor recreation, or for public health and safety concerns. This includes wildlife habitats, rivers, groundwater recharge areas, and areas with mineral deposits. Trails, parks, outdoor recreation areas, private open space, commercial open space, utility easements, scenic roadways, and areas requiring the regulation of hazardous conditions such as earthquake fault zones, unstable soils, flood plains, and watersheds are also considered open space (City of La Habra Heights, 2004).

1.2 CLIMATE

Like most of Southern California, La Habra Heights has a Mediterranean climate characterized by hot, dry summers, and cool, somewhat rainy winters. Average summer temperatures range from highs in the high 80's to lows in the mid 60's (degrees Fahrenheit). Average winter temperatures range from highs in the low 70's to lows in the high 40's. From November to

[1] Rural has been defined by the City as natural terrain and dense vegetation; houses which blend in with the setting; privacy and large distances between homes; no "city" improvements such as curbs, gutters, sidewalks and streetlights (La Habra Heights, 2004).

March, monthly precipitation averages range from approximately 1 to 3 inches (City of La Habra Heights, 2013).

1.3 WATERSHEDS

The City of La Habra Heights is within the San Gabriel River watershed. Surface water runoff from the City drains towards La Mirada Creek and San Jose Creek. La Mirada Creek is a tributary of La Canada Verde Creek which drains to Coyote Creek. Both San Jose Creek and Coyote Creek are tributaries to the San Gabriel River (Figures 1.1 and 1.2). These areas are within the jurisdiction of the Los Angeles Regional Water Quality Control Board (LARWQCB).

The City is within the United States Geological Survey's (USGS) San Gabriel River Hydrologic Unit and the Lower San Gabriel Hydrologic Area. The San Gabriel River Hydrologic Unit has a drainage area of 1,608 square miles. The Lower San Gabriel Hydrologic Area is approximately 165 square miles.

1.3.1 San Gabriel River

The San Gabriel River receives drainage from a 682 square mile area of eastern Los Angeles County and has a main channel length of approximately 58 miles. Its headwaters originate in the San Gabriel Mountains with the East, West, and North Forks. The river flows through a heavily developed commercial and industrial area before emptying into the Pacific Ocean in Long Beach (Figure 1.1). The main tributaries of the river are Walnut Creek, San Jose Creek, and Coyote Creek. At 6.2 square miles, the City comprises less than 1 percent of this overall drainage area.

1.3.2 Coyote Creek Subwatershed

The Coyote Creek subwatershed drains approximately 185 square miles of densely urbanized residential, commercial, and industrial development, along with some areas of open space and natural lands (Table 1.1). Coyote Creek's channel is concrete-lined in the urban areas near the Los Angeles/Orange County border. Coyote Creek joins the San Gabriel River above the tidal prism in Long Beach south of Willow Street. At the northern end of the subwatershed, La Mirada Creek is a tributary La Canada Verde Creek. La Mirada drains the upper region of the Coyote Creek subwatershed. La Mirada Creek is located within zoned areas of open space.

Table 1.1. Proportion of La Habra Heights within the Coyote Creek Subwatershed

Coyote Creek Subwatershed	
Coyote Creek Watershed	185.0 square miles[1]
City of La Habra Heights	5.1 square miles
City Percent of Watershed	2.8%

Source: LACDPW 2014a

1.3.3 San Jose Creek Subwatershed

San Jose Creek drains approximately 83 square miles of urbanized residential, commercial, and industrial development and open space and natural lands (Table 1.2). The creek is concrete lined in its eastern portion and soft bottomed just before it joins the San Gabriel River.

Table 1.2. Proportion of La Habra Heights within the San Jose Creek Subwatershed

San Jose Creek Subwatershed	
San Jose Creek Watershed	83.4 square miles[1]
City of La Habra Heights	1.1 square miles
City Percent of Watershed	1.3%

Source: LACDPW 2014b

Figures 1.1 and 1.2 present the City's jurisdictional boundaries within both the Coyote Creek and San Jose Creek subwatersheds.

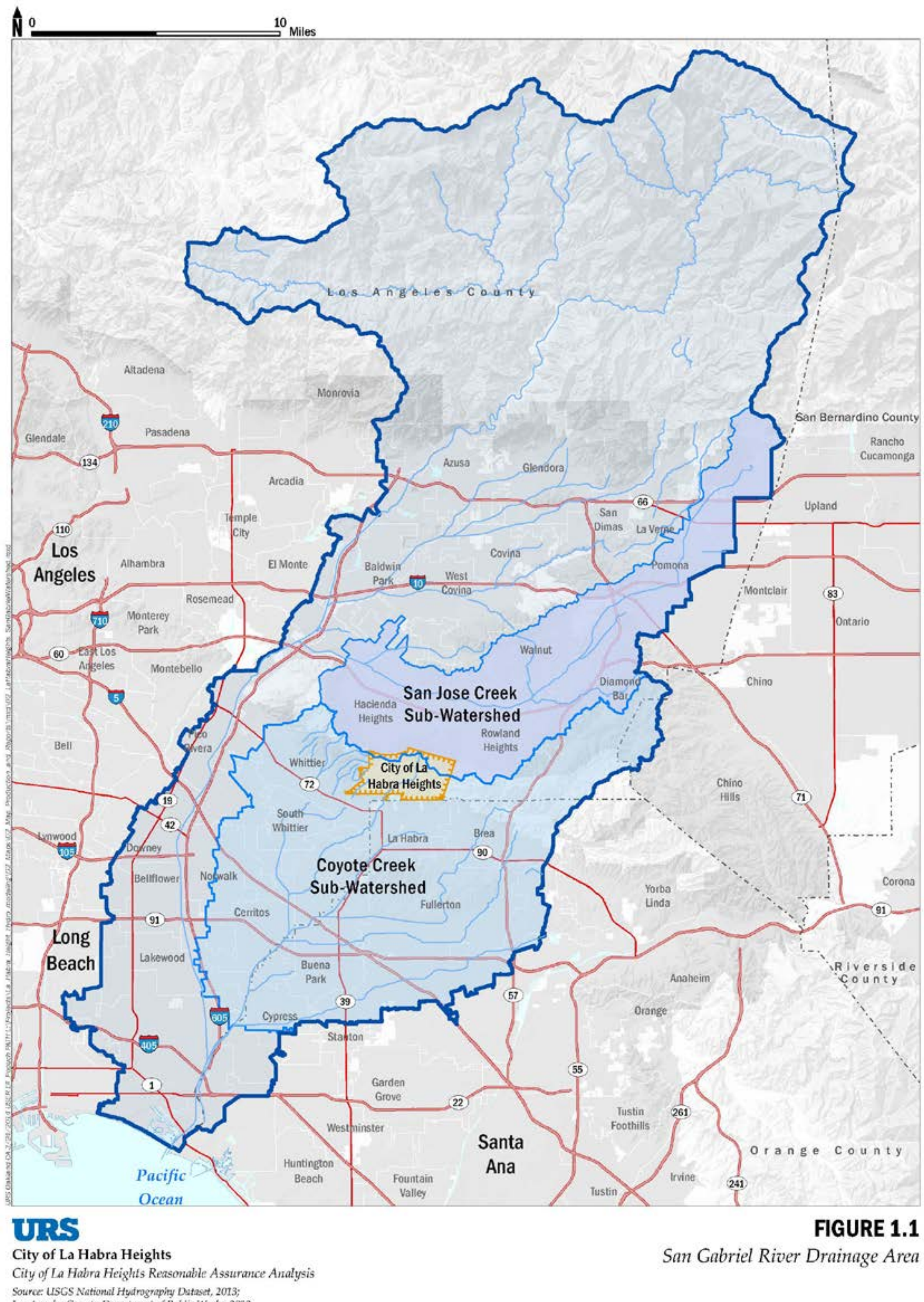

Figure 1.1. Regional Map: Coyote Creek and San Jose Creek Subwatershed Areas within the San Gabriel River Watershed

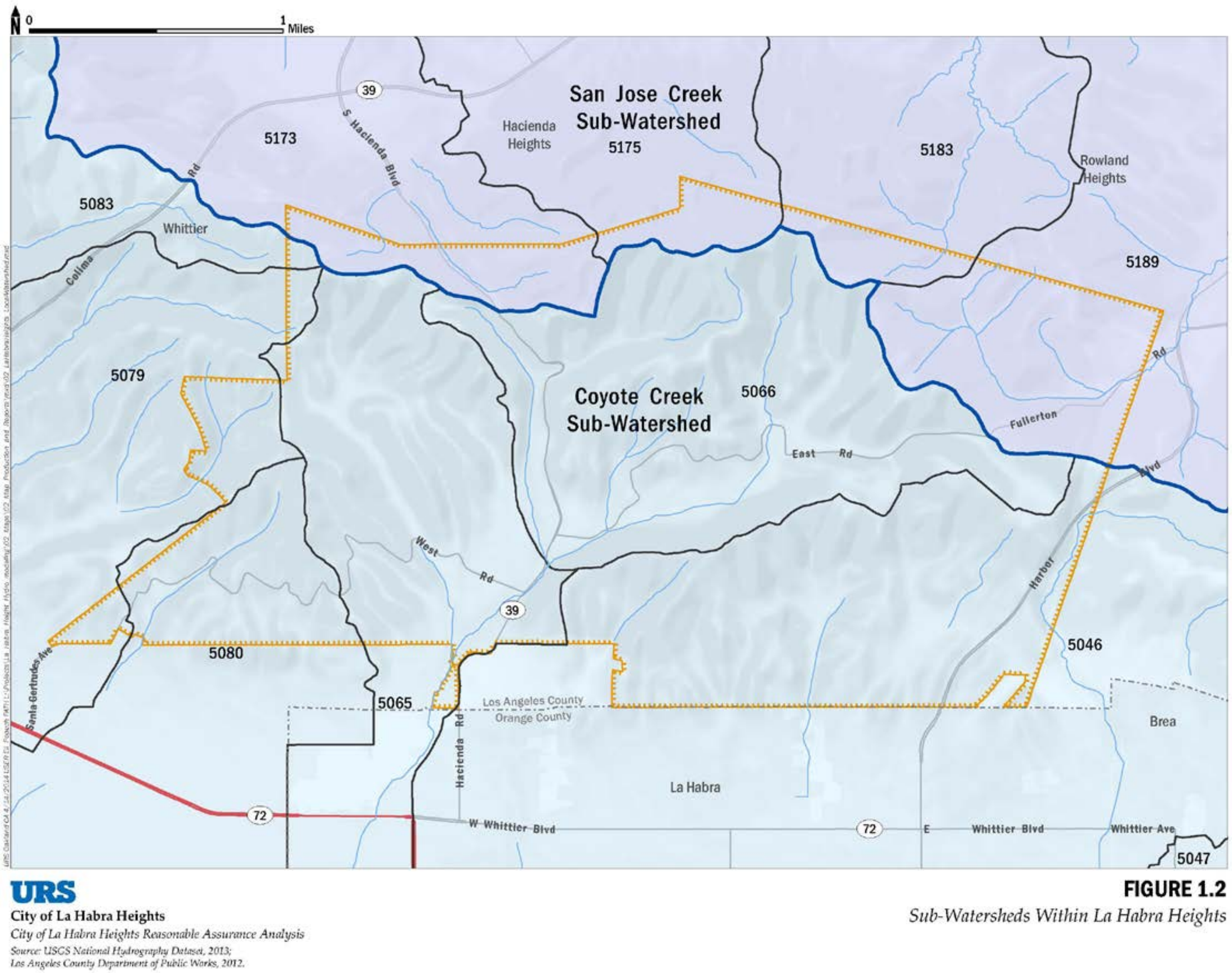

Figure 1.2. Coyote Creek and San Jose Creek Subwatershed Areas within La Habra Heights Jurisdictional Area

A RAA involves providing an initial assessment of current baseline pollutant loading for water body pollutants using relevant subwatershed data and the best available representative land use and pollutant loading data collected within the last 10 years. Baseline loading estimates include modeling critical conditions that are used in each respective TMDL.

Pollutant combinations assessed by a RAA fall into one of three categories:

- Category 1 (Highest Priority): Water body-pollutant combinations for which water quality-based effluent limitations and/or receiving water limitations are established in Part VI.E, TMDL Provisions, and Attachments L through R of the Municipal Separate Stormwater Sewer System (MS4) Permit.
- Category 2 (High Priority): Pollutants for which data indicate water quality impairment in the receiving water according to the State Water Resources Control Board's Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (State's Listing Policy) and for which MS4 discharges may be causing or contributing to the impairment.
- Category 3 (Medium Priority): Pollutants for which there is insufficient data to indicate water quality impairment in the receiving water according to the State's Listing Policy, but which exceed applicable water limitations contained in Order R4-2012-0175 and for which MS4 discharges may be causing or contributing to the exceedance.

The City of La Habra Heights is subject to the following Category 1 (Highest Priority) pollutants as established in Part VI.E TMDL Provisions and Attachment P of the MS4 Permit. Attachment P lists San Gabriel River Reach 2, Coyote Creek, and San Jose Creek as impaired with waste load allocations for a combination of wet weather and dry weather critical conditions as outlined in Table 2.1 below.

Table 2.1. TMDLs in San Gabriel River Watershed Management Area

Name	Pollutant	Waste Load Allocations		Source
		Wet	Dry[4]	
San Gabriel River Reach 2[1]	Lead	81.34 ug/L x daily storm volume (L)	N/A	Automobile operation, industry, legacy pollutant
Coyote Creek[2]	Copper	24.71 µg/L x daily storm volume (L)	0.941 kg/day	Vehicle brake pads, atmospheric deposition, soil erosion
	Lead	96.99 µg/L x daily storm volume (L)	N/A	Automobile operation, industry, legacy pollutant
	Zinc	144.57 µg/L x daily storm volume (L)	N/A	Vehicle tires, galvanized metal, atmospheric deposition
San Jose Creek (Reach 1 and 2)[3]	Selenium	N/A	0.232 kg/day 5 µg/L[2]	Soil erosion

Notes:

[1]As per the San Gabriel River and Impaired Tributaries Metals and Selenium TMDL, a wasteload allocation for lead is included to address the lead water quality impairment in Reach 2 of the San Gabriel River. Wet-weather allocations are assigned to all upstream reaches and tributaries of San Gabriel River Reach 2 and Coyote Creek because they potentially drain to these impaired reaches during wet weather. In San Gabriel River Reach 2, wet-weather TMDLs apply when the maximum daily flow in the river is equal to or greater than 260 cfs as measured at USGS station 11085000, located at the bottom of Reach 3 just above the Whittier Narrows Dam. (USEPA 2007).

[2]In Coyote Creek, wet weather Total Maximum Daily Loads apply when the maximum daily flow in the creek is equal to or greater than 156 cubic feet per second (as measured at Los Angeles County Department of Public Works flow gage station F354-R; Dry weather waste load allocations apply when flow at F354-R are below 156 cfs (USEPA 2007).

[3]Dry weather Total Maximum Daily Load for Selenium in San Jose Creek is based on the median flow at Los Angeles County Department of Public Works flow gage station F312B is below or equal to the median flow of 19 cubic feet per second (USEPA 2007).

[4]The mass-based dry-weather MS4 allocations are shared by all of the MS4 permittees and Caltrans within the drainage area. The City is 2.8% of the entire Coyote Creek subwatershed, thus its share of the dry weather copper MS4 allocation is approximately 0.026 kg/day.

Acronyms:
µg/L = micrograms per liter
kg/day = kilograms per day
L = liters
N/A = not applicable

Coyote Creek and San Jose Creek are also 303(d) listed for indicator bacteria. These waterbodies are also listed for other pollutants including: cyanide, ammonia, Diazinon, pH, total dissolved solids, and toxicity, however these pollutants are either not modelable given currently available datasets or are not typically associated with MS4 discharges. Table 2.2 below summarizes the Category 2 and Category 3 pollutant waterbody combinations considered by the City's RAA.

Table 2.2. 303(d) Modeled Listed Pollutants and Other Pollutants of Concern

Receiving Water Body	303(d) List (Category 2 Pollutants)	WQO/WQBEL	Other Pollutants of Concern (Category 3)**
Coyote Creek	Indicator Bacteria (W, D)	235 *E. coli* / 100mL*	N/A
	Selenium (W,D)	5.0 µg/l	
San Jose Creek Reach	Coliform Bacteria (W,D)	235 *E. coli* / 100mL*	Lead (W) Zinc (W,D) Copper (W,D)

Notes:

* WQBEL based on potential REC-1 beneficial use.

** WQBEL will be based on the San Gabriel Metals TMDL

W = Wet hydrologic condition impairment

D= Dry hydrologic condition impairment

2.1 POTENTIAL SOURCES OF CONSIDERED POLLUTANTS OF CONCERN

2.1.1 Copper

Coyote Creek is designated as impaired for dissolved copper and included on the Clean Water Act Section 303(d) list of impaired waterbodies for this pollutant. The source of the dissolved copper in this watershed is unknown (SWRCB 2011). Possible urban sources of metal loading include runoff from light industrial, transportation, and retail/commercial land uses with critical sources from auto repair, motor freight transportation, and auto dealerships. Other potential urban sources of metals to the watershed include wet and dry atmospheric deposition and natural background loading.

Urban sources of copper include industrial sources and vehicle brake pads. Motor vehicles are a major source of copper, a metal that originates from brake pad wear. Copper and other pollutants are deposited on roads and other impervious surfaces and then transported to aquatic habitats via stormwater runoff.

Pollutant loads of copper from urban land uses is expected to decrease due to Senate Bill (SB) 346 which was signed into law on September 25, 2010. This legislation phases out copper in vehicle brake pads over a period of years; milestones include the following dates:

- January 1, 2021: Limits the use of copper in motor vehicle brake pads to no more than five percent by weight.
- January 1, 2025: Limits the use of copper in motor vehicle brake pads to no more than 0.5 percent by weight.

Full implementation of the legislation is expected to remove approximately 61 percent of the copper from urban runoff in metropolitan Los Angeles area watershed. Although vehicle brake pad wear is not expected to contribute as much copper in rural La Habra Heights as in the more urbanized metropolitan Los Angeles area, a decrease in copper loading is expected from vehicles due to the law's implementation.

2.1.2 Lead

Coyote Creek and Reach 2 of the San Gabriel River downstream of San Jose Creek are designated as impaired for lead. The source of lead is associated with wet weather discharges from major municipal point sources (SWRCB 2011). Sources of lead in the urban environment also include automobile operation and industries with practices that may expose metals to stormwater. Lead was formerly used as an additive in gasoline. This has caused widespread contamination of soils near highways and streets and in drainageways in urban areas. Exhaust particulates, fluid losses, drips, spills and mechanical wear products continue to contribute lead to street dust.

2.1.3 Zinc

Coyote Creek has previously been listed as impaired for zinc, but more recently LARWQCB has found that water quality standards are being met in the creek (SWRCB 2011). Dissolved zinc loading can occur during wet weather storm events. Road dust, contaminated by tire wear, and erosion of zinc plated material (i.e. galvanized chain link fences) are major contributors of zinc to urban runoff.

2.1.4 Selenium

San Jose Creek and Coyote Creek have previously been listed as impaired for selenium, but more recently LARWQCB has found that water quality standards are being met (SWRCB 2011). Selenium is not typically associated with urban runoff. However, selenium is present in local marine sedimentary rocks (Orange County 2006). Sources of selenium include irrigation of soils that are naturally high in selenium, activities that mobilize groundwater to the surface (e.g., dewatering activities), petroleum refinery effluents, and runoff or discharges from certain mining activities (USEPA 2007). While many of these sources are not relevant to La Habra Heights (i.e. refinery effluents and mining activities), the City is founded on the La Vida Shale member of the Monterey Formation which can contain natural sources of selenium (Dibblee and Ehrenspeck 2001).

It is believed that much of the selenium in San Jose Creek results from natural soils in the watershed because many of the impairments in San Jose Creek occur after the channel becomes soft-bottomed. Special studies will allow further assessment of sources of selenium in San Jose Creek (USEPA 2007).

2.1.5 Fecal Indicator Bacteria

Both San Jose Creek and Coyote Creek are listed as impaired for indicator bacteria. Fecal coliform is an indicator of the possible presence of pathogenic organisms (e.g., enterococcal bacteria, viruses, and protozoa), which can cause human illness. The direct monitoring of those pathogens is difficult and therefore fecal coliform is used as an indicator of potential fecal contamination. Storm drain system discharges can have elevated levels of bacterial indicators because of sanitary sewer leaks and spills, improperly maintained septic systems, illicit connections of sanitary lines to the storm drain system; runoff from homeless encampments; pet waste; organic debris from gardens, landscaping and parks; food waste; and illegal discharges from recreational vehicle holding tanks, among others (LARWQCB 2006; USEPA 2003a).

The bacteria indicators used to assess water quality are not specific to human sewage; therefore, fecal matter from wildlife can also be a source of elevated levels of bacteria, and vegetation and food waste can be a source of elevated levels of total coliform bacteria (LARWQCB 2006).

3.1 MODEL SELECTION

The Watershed Management Modeling System (WMMS) was selected to address the modeling needs for the City's RAA. The WMMS is one of the models specified in the MS4 permit for use in conducting a RAA.

WMMS is a regionally calibrated open source model developed for Los Angeles County that utilizes the Loading Simulation Program in C++ (LSPC). LSPC is a comprehensive data management and long-term dynamic rainfall-runoff simulation model system used for continuous simulation of runoff quantity and quality from pervious and impervious lands. The runoff component of the model operates on a collection of subwatershed areas that receive precipitation and generate runoff.

The water quality component of the WMMS utilizes Hydrologic Response Units (HRUs) that represents variability in non-point source pollutant loadings based on land use, soil hydrologic group, slope, and pervious and impervious lands. Specifically, water quality is simulated by the removal of sediment-associated water quality constituents by washoff; this is accomplished in the model by multiplying the washoff detached sediment by a washoff potency factor (the amount of a water quality constituent that is associated with an amount of sediment for a land segment). The WMMS system uses a Microsoft Access database that manages model data and weather text files, which are used to simulate the watersheds.

As per the LSPC manual (Tetra Tech 2009), the subwatersheds found within the jurisdiction of La Habra Heights were truncated to be within the City's boundaries in order to determine its specific loading, only these areas were simulated in the model. HRUs were assigned in each subwatershed based on site specific characteristics of areas within the City. These characteristics include, slope, hydrologic soils group, land use, and degree of imperviousness.

3.2 DATA SOURCES & PARAMETERS

Baseline loading from the City was modeled using metrics derived from long-term historical data (daily rainfall, modeled flow/runoff volume, and modeled pollutant loading) using the WMMS for each subwatershed area within the City's jurisdictional area. Baseline loading estimates were generated for wet and dry critical conditions for the time period of January 1, 2000 through March 31, 2012. Critical conditions for baseline estimates were originally based on the following:

- In San Gabriel River Reach 2, wet-weather TMDLs apply when the maximum daily flow is equal to or greater than 260 cfs as measured at USGS station 11085000, located at the bottom of Reach 3 just above the Whittier Narrows Dam
- Dry weather critical conditions in Coyote Creek exist when the maximum daily flow at Los Angeles County Department of Public Works (LACDPW) flow gage station F354-R is below 156 cubic feet per second (cfs).
- Wet weather critical conditions exist in Coyote Creek when the maximum daily flow at LACDPW flow gage station F354-R is equal to or above 156 cfs.

Dry weather critical conditions for Selenium apply in San Jose Creek when is based on the median flow at Los Angeles County Department of Public Works flow gage station F312B is below or equal to the median flow of 19 cubic feet per second (USEPA 2007).However, due to a large data gap in gage F354-R for the period of October 1, 2002 through September 30, 2003, the LARWQCB has recommended that the City's RAA Critical conditions should be based on 0.25 inches or greater of rainfall in one day for wet critical conditions and less than 0.25 inches for dry conditions (LARWQCB 2014b). The 0.25 inch per day rainfall value was also applied to determining wet and dry hydrologic conditions for the San Jose Creek subwatersheds. The critical conditions were determined using the most representative Los Angeles County Flood Control District precipitation gauge, La Habra Heights Mutual Water Company Station (D1088) for the period of January 1, 1986 – March 31, 2012.

Baseline pollutant loading from land use within the City's jurisdictional area was based on the 90th percentile of "wet days" (i.e., days with 0.25 inches of rain or greater) and "dry days" (i.e., days with less than 0.25 inches of rain).

Due to the rural nature of the City of La Habra Heights, the initial assumptions made by the WMMS were refined to use more site-specific loading factors based on each of the City's respective land uses. Specific parameters changed from the baseline WMMS are summarized in Table 3.1, and specifically detailed in as well as the data sources used to refine the WMMS model (see Sections 3.2.1 to 3.2.11). None of the regionally calibrated parameters associated with pollutant loading for specific HRU types were modified for the subwatersheds within the City. A complete list of all the modeling parameter values used in the RAA can be found in Appendix C.

Table 3.1. Summary of WMMS Parameters Refined in La Habra Heights RAA

Parameter	Baseline Value	Refined Value
Land-based Sediment Contributions (COVER)	0.00 for all pervious HRU	0.27 for all pervious HRU (See Section 3.2.9)
Land Use Attributes (AREA AC)	HRU acreages based on County data and encompass entire subwatershed	HRU acreages based on La Habra Heights General Plan and parcel information. Encompass only the City's jurisdictional area (See Section 3.2.10)
Water Quality Constituents (GQUAL) - Constant Loading Parameters	No SOQC or IOQC values for selenium	SOQC & IOQC values for selenium obtained from Ackerman and Schiff, 2003. (See Section 3.2.11)

Acronyms:
COVER = fraction of land surface which is shielded from rainfall erosion
GQUAL = general water quality
HRU = hydrologic response unit
IOQC = interflow concentrations
SOQC = surface outflow concentrations

3.2.1 Topography Data

Topography data was acquired from the National Elevation Dataset. The highest resolution files available (0.3 arc seconds; approximately 10 meters) were utilized in the City's RAA model. Slope was calculated from the NED in ArcGIS and the slope was averaged over the City's jurisdictional area. Average slope in the City is over 10 percent, this data was used as a parameter in assigning the appropriate HRUs in the analysis.

3.2.2 Stream Network

Each delineated subwatershed in the WMMS within the City's jurisdiction was represented with a single stream assumed to be a completely mixed, one-dimensional segment with a trapezoidal cross-section. USGS National Hydrography Dataset (NHD) was the original source for stream reach data in the WMMS.

3.2.3 Drainage Area

Drainage area data was determined from utilizing the delineated subwatershed shapefile within the WMMS with consideration of the City's jurisdictional border. The watershed boundaries in the WMMS are HUC-12 equivalent boundaries relative to the national HUC-12 boundaries. The areas obtained for each subwatershed draining the City is summarized in Table 3.2.

Table 3.2. Drainage Area By Subwatershed

Watershed	WMMS Subwatershed	Area of Subwatershed within the City (acres)	Total Subwatershed Area (acres)	Percent of Subwatershed within the City (%)
Coyote Creek	5046	901.3	4,873.7	18.5
	5065	751.5	1,140.5	65.9
	5066	1,170.0	1,170.0	100.0
	5079	140.4	1,477.6	9.5
	5080	270.3	1,501.1	18.0
	5083	8.5	1,028.5	0.8
San Jose Creek	5173	156.9	2,409.3	6.5
	5175	81.1	1,603.8	5.1
	5183	78.1	1,318.3	5.9
	5189	383.6	2,274.8	16.9

Sources: LACDPW 2012 and Wilhelm 2014

3.2.4 Meteorological Data

Meteorological data is a critical component of the watershed model. LSPC requires appropriate representation of precipitation and potential evapotranspiration. Hourly precipitation (or finer resolution) data was used in the model. Rainfall-runoff processes for each subwatershed were driven by precipitation data from the most representative station. Two precipitation and evapotranspiration meteorological stations were utilized by the WMMS model in the LHH RAA and are listed below in Tables 3.3 and 3.4 with their locations illustrated in Figure 3.1.

Table 3.3. Precipitation Station Data used in the La Habra Heights RAA

Station #	Description	Latitude (deg°min'sec'')	Longitude (deg°min'sec'')	Elevation (ft)	Percent Complete	Start Date	End Date
1088B	La Habra Heights - Mutual Water Co.	33°56'52''	117°57'55''	445	100%	01/04/1986	04/26/2012
106F	Whittier City Hall	33°58'57''	118°02'50''	300	100%	01/02/1986	04/26/2012

Acronyms:
ft = feet
deg= degree
min=minute
sec=second

Table 3.4. Evapotranspiration Station Data used in the La Habra Heights RAA

Station #	Description	Latitude (deg°min'sec'')	Longitude (deg°min'sec'')	Elevation (ft)	Percent Complete	Start Date	End Date
23129	Long Beach Daugherty Airport	33°49'60''	118 °10'00''	10	100%	12/31/1985	04/30/2012
96	Puddingstone Dam	34 °05'31''	117 °48'24''	1030	100%	12/31/1985	04/30/2012

Acronyms:
ft = feet
deg= degree
min=minute
sec=second

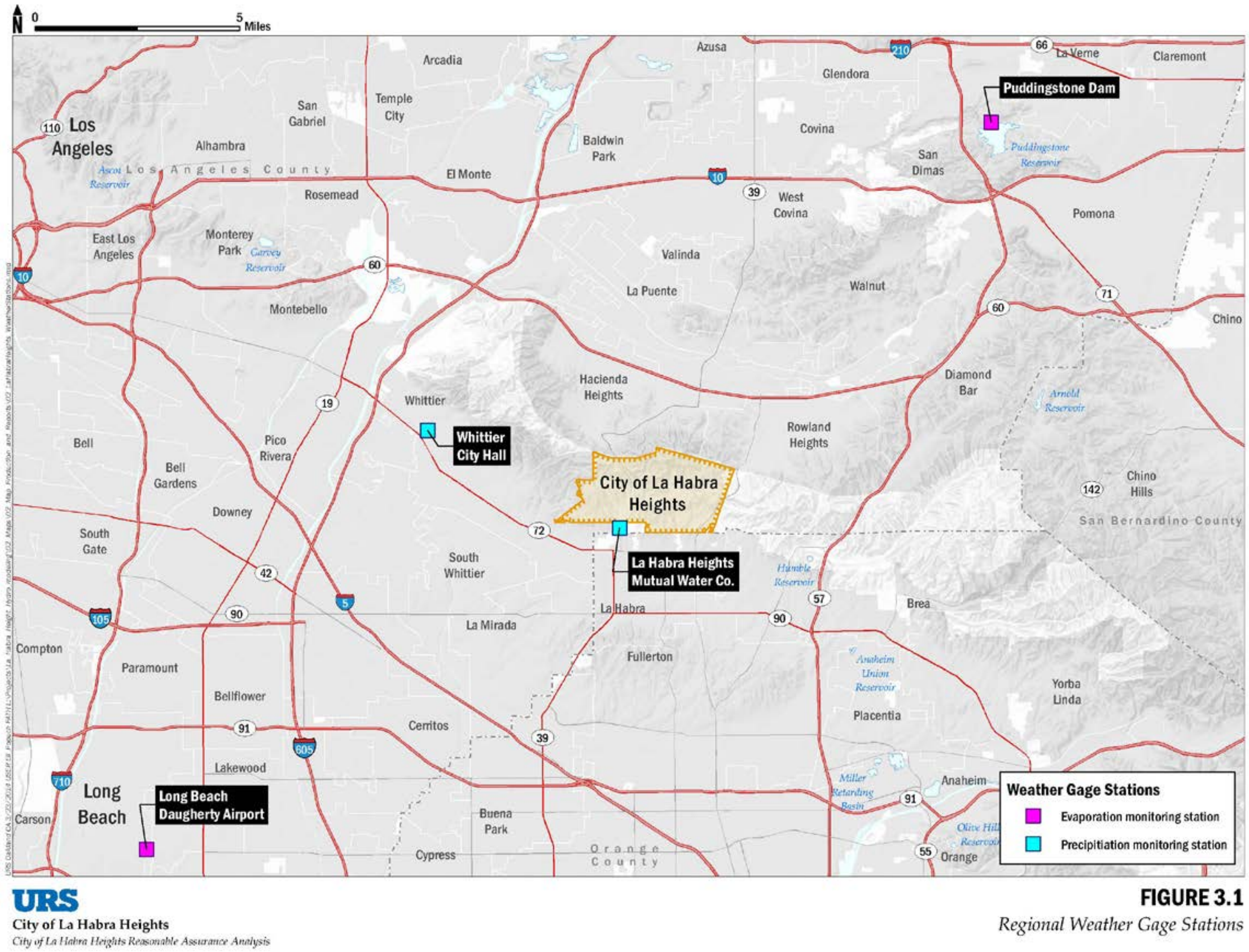

Figure 3.1. Location of Meteorological Stations

3.2.5 Soils

Soil data for the watersheds were obtained from the State Soil Geographic Database (STATSGO2) provided by the Natural Resources Conservation Service (NRCS 2006). The STATSGO2 data was used to determine the total area that each hydrologic soil group covered within each sub-watershed. The sub-watersheds were represented by the hydrologic soil group that had the highest percentage of coverage within the boundaries of the sub-watershed and are summarized in Table 3.5.

There are four main hydrologic soil groups (Groups A, B, C, and D). These groups, which are described below, range from soils with low runoff potential to soils with high runoff potential (USDA 1997).

- **Group A Soils:** Have high infiltration rates and consist of soils that are deep and well drained to excessively drained and are often sandy with coarse textures.
- **Group B Soils:** Have moderate infiltration rates when wet and consist chiefly of soils that are moderately deep to deep, moderately well to well drained, and moderately fine to moderately course textures.
- **Group C Soils:** Have slow infiltration rates and are soils with layers impeding downward movement of water, or soils that have moderately fine or fine textures.
- **Group D Soils:** Have very slow infiltration rates and have soils that are clayey and impede downward movement of water, or can be shallow soils over an impervious layer. Soils have a high water table.

The predominant soils identified within the City consist mainly of Soper-Fontana-Calleguas-Balcom-Anaheim and Zamora-Urban Land-Ramona soil types which belong to hydrologic soil group C or D respectively. A small outcropping of the Urban Land-Sorrento-Hanford soil type is located within subwatershed 5080 which belong to hydrologic soil group B.

Table 3.5. Hydrologic Soils Group By Subwatershed

Watershed	Subwatershed	Soil Map Unit Key	Percent of Subwatershed	Hydrologic Soils Group
Coyote Creek	5046	660477	55%	C
		660480	45%	
	5065	660477	73%	C
		660480	27%	
	5066	660477	100%	C
	5079	660477	77%	C
		660480	23%	
	5080	660477	10%	D
		660480	90%	
	5083	660477	100%	C

Table 3.5. Hydrologic Soils Group By Subwatershed

Watershed	Subwatershed	Soil Map Unit Key	Percent of Subwatershed	Hydrologic Soils Group
San Jose Creek	5173	660477	100%	C
	5175	660473	12%	C
		660477	88%	
	5183	660477	100%	C
	5189	660477	100%	C

Source: NRCS 2006

660473: Urban Land-Sorrento-Hanford

660477: Soper-Fontana-Calleguas-Balcom-Anaheim

660480: Zamora-Urban Land-Ramona

3.2.6 Reach Characteristics

Reach characteristics in WMMS were pre-populated during the initial model development and were not altered in the City's RAA analysis. The original source of reach characteristics were obtained from the USGS NHD.

3.2.7 Point Sources

There are no point source discharges (other than MS4 discharges) within the City's boundaries. This was confirmed through querying the following databases:

- United States Environmental Protection Agency's (EPA) Storage and Retrieval Data Warehouse
- State Water Resources Control Board's California Integrated Water Quality System
- State Water Resources Control Board's Storm Water Multiple Application and Report Tracking System

3.2.8 Land Use

Parcel and zoning data was acquired from the City of La Habra Heights (Wilhelm 2014). Post-processing of the data included delineating city roadways into a city roads land use category and determining percent impervious and pervious cover.

Land use within the City falls into seven categories as described by La Habra Heights General Plan (La Habra Heights 2004) (Figure 3.2) plus an additional category developed for the purpose of distinguishing between active and inactive resource production land uses. The City's land use types and corresponding WMMS HRUs are described below to provide support for the percent impervious assumptions.

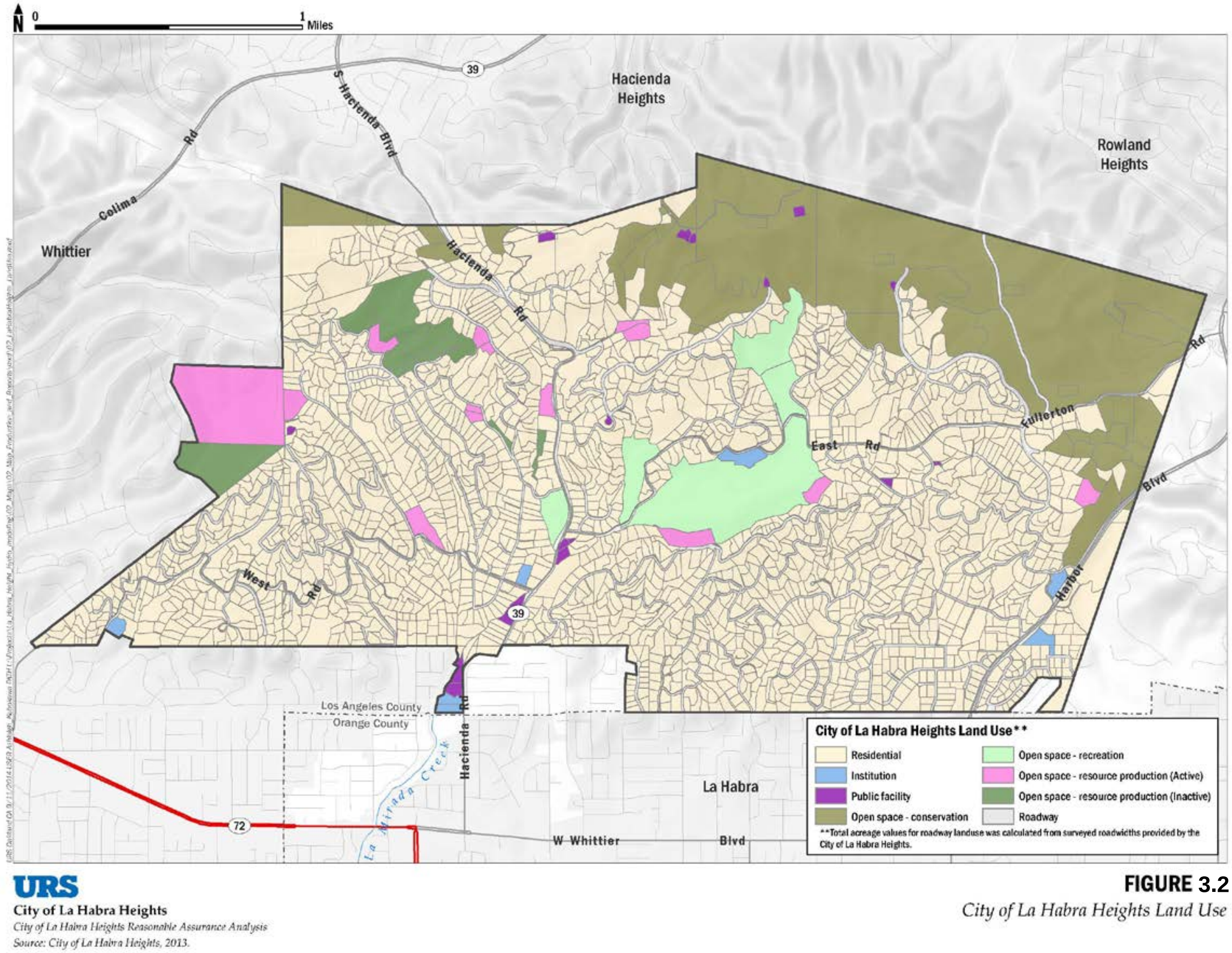

Figure 3.2. Land Use in the City of La Habra Heights

3.2.8.1 Residential

Residential land use is the most common land use within the City of La Habra Heights. Most residential dwelling units within the City are single-family detached units. A typical residential parcel within the City is one- acre in size with the total hardscape limited by hardscape area standards. For the purposes of the RAA model, a residential parcel is assumed to be 21 percent impervious due to hardscape of the residence's footprint and associated private roads. This assumption is based on information acquired from the 2006 National Land Cover Dataset (NLCD) Land Use Land Cover Data Set (Fry et. al 2011) and supported with information from the Los Angeles County Hydrology Manual (LACDPW 2006).

3.2.8.2 Public Facilities

There are two categories of public facilities in La Habra Heights. One category includes facilities that are directly under the control of the City: the City Hall, the Community Center, and the Fire Department. The other category is composed of public facilities answerable to non-local mandates; these include the water district facilities, portions of the communications antenna farm and the power transmission sites throughout the City. The 2006 NLCD Land Use Land Cover Data Set was not used to determine percent impervious cover for public facilities due to the relatively large cell size used in the dataset (30 meter) compared with the relatively small total land use of public facilities in the City. Percent impervious for public facilities are assumed to be 80 percent in the RAA based on average institutional values from the Los Angeles County Hydrology Manual (LACDPW 2006).

3.2.8.3 Institutions

Institutional land uses include those uses that are neither residential nor public facilities. They are private or quasi-public facilities. These uses provide services to individuals that can include educational, health, religious, and cultural activities. In many cases, more than one of these services are offered at the same location. Institutional uses do not include commercial or industrial activities, which are not allowed or zoned for in the City of La Habra Heights. These private and quasi-private institutions are permitted only in areas served by the single arterial highway (Hacienda Road) within the City. Like in public facilities, the 2006 NLCD Land Use Land Cover Data Set was not used to determine percent impervious cover and was assumed to be 80 percent in the RAA based on average Institutional values from the Los Angeles County Hydrology Manual (LACDPW 2006).

3.2.8.4 Open Space – Conservation

Approximately 20 percent of the City's land area is land owned by the Puente Hills Land Fill Native Habitat Preservation Authority. The Authority's property in La Habra Heights is part of a wildlife corridor that extends from the San Gabriel River to the Cleveland National Forest. This corridor will persist if dedicated links of regional open space can continue to be acquired for natural conservation purposes. The Open Space – Conservation land use is assumed to be completely pervious for the purpose of the RAA due to the WMMS model not including a HRU that considers natural areas of imperviousness (i.e. rock formations).

3.2.8.5 Open Space – Recreation

The category of open space for recreation includes the Hacienda Golf Club and the Las Palomas Riding Ring, which are member-supported recreational facilities, as well as Powder Canyon, and the City Park. Open Space is assumed to be zero percent impervious due to minimal amounts of hardscape in these areas.

3.2.8.6 Open Space – Resource Production (Active)

A number of sites throughout the City are identified as open space that have historically been used for, or can potentially be used for, production of natural gas and oil. Property owners may request a change of land use designation and its implementing zoning. As it now exists, such land may not be suitable for residential uses and must be cleaned or remediated before it is safe for human habitation. State law mandates the necessary procedures to convert the natural gas and oil well sites to other uses. Parcels included within this land use category currently support an active well or formerly supported a well and have yet to be remediated for rezoning. Open Space – Resource Production (Active) land use is assumed to be 10 percent impervious (LACDPW 2006).

3.2.8.7 Open Space – Resource Production (Inactive)

Parcels included under the Open Space – Resource Production (Inactive) land use either once supported natural gas and oil production and have been remediated or have never been in active production. A majority of the parcels with this land use designation are zoned such in order to create a buffer between the public and areas that are in active production. Open Space – Resource Production (Inactive) is assumed to be zero percent impervious due to minimal amounts of hardscape in these areas.

3.2.8.8 City Roads

Roadways in the city of La Habra Heights consist of mainly residential, lane, country roads, and traffic corridors (specifically Hacienda Blvd). Local streets are lightly traveled and narrow. Spatial information regarding roads under the jurisdiction of the City was obtained from La Habra Heights Geographic Information System circulation layer (Wilhelm 2014). The area of city roads was combined with the land use layer to provide spatial information for each HRU. City roads are considered to be rural with an imperviousness of 45 percent (CalEPA 2010).

Geographic Information System data was not available for private roads; as such, the RAA includes private roads as part of the Residential HRU with respect to loading.

3.2.9 Assigning Hydrologic Response Groups

The narrative descriptions in combination with a subwatershed’s average slope, hydrologic soil group, and proportion of imperviousness were used to assign acreages to different HRUs that the WMMS model utilizes in determining the loading of pollutants. The proportion of each land use assigned to a specific HRU is summarized in Table 3.6. Residential parcels required further assessment as multiple HRUs are applicable. In order to accomplish this 20 random residential parcels were chosen and the land use visually assessed to determine the appropriate acreages to assign in the model. Descriptions of HRUs utilized by the La Habra Heights RAA are described below.

Table 3.6. Land Use and Hydrologic Response Group Comparison

La Habra Heights Parcel Zoning	WMMS HRU[1]	Proportion of Land Use	Impervious / Pervious
Residential	Low Density Single Family Steep	0.21	Impervious
	Vacant Steep	0.70	Pervious
	Agriculture Moderate Slope	0.02	Pervious
	Urban Grass Irrigated	0.07	Pervious
Public Facilities	Institutional	0.80	Impervious
	Urban Grass Non-Irrigated	0.20	Pervious
Institutions	Institutional	0.80	Impervious
	Urban Grass Non-Irrigated	0.20	Pervious
Open Space- Conservation	Vacant Steep	1.00	Pervious
Open Space- Recreation	Urban Grass Irrigated	1.00	Pervious
Open Space- Resource Production (Active)	Industrial	0.10	Impervious
	Vacant Steep	0.90	Pervious
Open Space- Resource Production (Inactive)	Vacant Steep	1.00	Pervious
City Roads	Secondary Roads	0.45	Impervious
	Urban-Grass Non-Irrigated	0.55	Pervious

Notes:

[1] The Vacant Steep and Agricultural HRU assigned is dependent on the hydrologic soil group assigned in each subwatershed (Tetra Tech 2010a and 2010b).

3.2.9.1 Institutional

Institutional land is impervious, urban land managed by institutions (e.g. schools, government buildings, etc.).

3.2.9.2 Urban Grass Non Irrigated

Urban Grass Non Irrigated is pervious urban land with natural cover such as trees, shrubs, or bare ground.

3.2.9.3 Urban Grass Irrigated

Urban Grass Irrigated is pervious urban land with managed vegetation. This includes irrigated lawns, landscaped areas, and other urban grass.

3.2.9.4 Vacant Steep (C and D)

Vacant Steep is pervious land that has no designated use (i.e. vacant), has a slope of 10 percent or greater, and moderately high to high runoff potential when thoroughly wet.

3.2.9.5 Low Density Single Family Steep

Low Density Single Family is urban, impervious land used for single family homes with a slope of 10 percent or greater. In the City's RAA, private roads are also included within this HRU.

3.2.9.6 Agriculture Moderate Slope (B and D)

Agriculture Moderate Slope is pervious land used for agriculture with a slope of less than 10 percent. While the average slope in the City is typically greater than 10 percent, no corresponding HRU for a steep classification exists within the WMMS and the moderate slope HRU was deemed most appropriate for use. Additionally, there is no Agricultural HRU that corresponds with a C hydrologic soil group; therefore the D grouping was used in order to assume a worst case scenario.

3.2.9.7 Industrial

Industrial is impervious land used for industrial facilities and their associated infrastructure (i.e. active resource production facilities).

3.2.9.8 Secondary Roads

Secondary Roads is impervious land used as roadways. This includes residential streets, but not major motor transportation arteries such as freeways.

3.2.10 Canopy Cover

Percent tree canopy cover was determined over the City's jurisdictional area using Percent Tree Canopy (Version 1.0) data from the 2001 National Land Cover Database (Homer et. al 2007). The percent tree canopy cover was averaged over the City's jurisdictional area and an average value of 27 percent was obtained. This value was then applied to all pervious land use HRU's within the RAA.

3.2.11 Pollutant Loading

The WMMS includes estimates of continuous and variable water quality concentrations for each modeled subwatershed that are consistent with event mean concentrations by calibrating to in-stream monitoring data throughout the region. This calibration was fully documented, and is consistent with methods used in LSPC modeling efforts previously performed by EPA to support TMDL development (Tetra Tech 201a and 2010b). A review of regional data show that pollutant delivery varies spatially and temporally with storm size. Because the WMMS-LSPC calibration uses continuous simulation (rather than only using event mean concentrations that are static), it predicts long term, continuous, hourly water quality concentrations in a robust and representative way.

Calibration of selenium was not accomplished in the WMMS as it was not a pollutant considered during the models design. Pollutant loading data for selenium (Table 3.7) was obtained from a study performed by Ackerman and Schiff of Southern California Coastal Water Research Project (SCCWRP) in 2003. Information provided from the study (the arithmetic mean) was used to populate selenium concentrations in surface outflow and interflow (SOQC and IOQC) parameters for HRUs. Due to a lack of monitoring data for selenium, the wash-off potency factor (POTFW) and scour potency factor (POTFS) were unable to be calculated for HRUs.

Table 3.7. Pollutant Loading Factors for Selenium assigned to Hydrologic Response Units

SCCWRP Land Use	**Corresponding HRU**	**Selenium**	
		SOQC (µg/L)	IOQC (µg/L)
Agriculture	Agriculture Moderate Slope (D)	1.86	1.86
Commercial	Institutional	0.35	0.35
Open	Vacant Steep (C/D)	0.35	0.35
	Open Space		
	Urban Grass Irrigated		
	Urban Grass Non-Irrigated		
Residential	Low Density Single Family Steep	0.47	0.47
Industrial	Industrial	0.59	0.59

Source: Ackerman and Schiff 2003

Acronyms:
µg/L
HRU = hydrologic response unit
IOQC = concentrations in interflow
SOQC = concentrations in surface outflow

4.1 ASSUMPTIONS

Assumptions are inherent to the modeling process when attempting to represent a natural system as accurately as possible. Assumptions in the City's RAA are consistent with assumptions used in developing the WMMS (Tetra Tech 2010a and 2010b). The assumptions associated with the LSPC model and its algorithms are described in the Hydrological Simulation Program - Fortran User's Manual (Bicknell et al. 2001). There were several additional modeling assumptions used in the La Habra Heights model which deviate from the initial WMMS model, which are summarized below.

- The average percent of canopy cover for all pervious HRU designations within the City's jurisdictional area is assumed to be 27 percent based upon Percent Tree Canopy (Version 1.0) data from the 2001 National Land Cover Database (Homer et. al 2007).
- Loading contributions from North Harbor Blvd were excluded from the analysis as it is under the jurisdiction of Los Angeles County.
- Private roads in La Habra Heights contain little vehicle traffic and therefore are assumed to function more closely to the low density single family HRU than the secondary roads HRU.
- Open Space areas are assumed to be 100 percent permeable due to the lack of availability of an HRU that considers natural areas of imperviousness (i.e. rock formations).

4.2 LIMITATIONS

- The WMMS model is not intended to accurately represent all non-storm-related base flow hydrologic conditions.
- While the WMMS was calibrated regionally, local calibration of the model could not be accomplished due to the absence of flow gage stations and appropriate water quality data within the modeled subwatersheds. Flow data and water quality data will be collected as per the City's Integrated Monitoring Program to locally calibrate and validate the WMMS model used in the RAA during future implementation of adaptive management process. Methodology for how the WMMS model is regionally calibrated can be found in the Los Angeles County Watershed Model Configuration and Calibration Reports (Tetra Tech 2010a and 2010b)
- Wash-off potency factors and scour potency factor for selenium were not developed during the WMMS model creation. Pollutant loading for selenium in WMMS was instead accomplished by using modeled runoff and event mean concentrations determined by a study performed by Ackerman and Schiff (2003) of SCCWRP.

5.1 SUMMARY OF MODEL OUTPUT

5.1.1 Baseline Loading

As discussed in Section 3.2, baseline loading of pollutants in the RAA is based upon the 90th percentile wet day and dry day for the period of January 1, 1986 through March 31, 2012

The 90th percentile wet day and dry day loading for applicable pollutants was determined for each subwatershed. The results were then compared against the applicable WQBELs, RWLs, and WQOs discussed in section 2.1. Baseline flow conditions and loading results from the RAA for the 90th percentile day wet and dry weather critical conditions are summarized for Coyote Creek and San Jose Creek in Tables 5.1 through 5.6 below.

Table 5.1. 90th Percentile of Flow in Coyote Creek Subwatersheds

Subwatershed	90th Percentile of wet flow (cfs)	90th Percentile of wet Volume (L/day)	90th Percentile of dry flows (cfs)	90th Percentile of dry Volume (L/day)
5046	15.80	3.86E+07	0.34	8.29E+05
5065	29.80	7.29E+07	0.83	2.03E+06
5066	17.35	4.25E+07	0.56	1.37E+06
5079	1.66	4.07E+06	0.04	9.87E+04
5080	4.83	1.18E+07	0.10	2.50E+05
5083	0.11	2.60E+05	0.002	5.09E+03

Table 5.2. 90th Percentile of Flow in Coyote Creek Subwatersheds

Subwatershed	90th Percentile of wet flows (cfs)	90th Percentile of wet Volume (L/day)	90th Percentile of dry flows (cfs)	90th Percentile of dry Volume (L/day)
5173	2.32	5.68E+06	0.06	1.40E+05
5175	0.41	1.01E+06	0.03	6.15E+04
5183	0.14	3.46E+05	0.02	5.33E+04
5189	1.76	4.31E+06	0.12	2.88E+05

Table 5.3. Baseline Wet Loading for 90th Percentile Day in Coyote Creek Subwatersheds

Subwatershed	Category 1 Pollutants			Category 2 Pollutants	
	Total Copper (lbs)	Lead (lbs)	Zinc (lbs)	Selenium (lbs)	Fecal Indicator Bacteria (MPN/100 mL)[1]
5046	1.68	0.69	5.26	0.036	17,248
5065	1.35	0.57	5.09	0.028	16,293
5066	1.55	0.66	5.51	0.036	16,317
5079	0.15	0.06	1.00	0.003	11,095
5080	0.52	0.21	1.59	0.011	17,430
5083	0.01	0	0.03	0	18,784
Total	**5.25**	**2.19**	**18.48**	**0.11**	**N/A**

[1] 90th percentile loading under wet conditions for fecal indicator bacteria only encompass the days in which a High flow suspension of REC-1 beneficial uses are not in effect. High flow suspensions occur when greater than or equal to ½ inch of rainfall occurs and the 24 hours following the precipitation event.

Table 5.4. Baseline Dry Loading for 90th Percentile Day in Coyote Creek Subwatersheds

Subwatershed	Category 1 Pollutants		Category 2 Pollutants
	Copper (lbs)	Selenium (lbs)	Fecal Indicator Bacteria (MPN/100mL)
5046	8.4E-12	1.1E-05	318
5065	6.5E-12	9.0E-06	226
5066	7.9E-12	1.8E-05	185
5079	4.4E-13	1.1E-06	176
5080	2.6E-12	3.4E-06	329
5083	3.6E-14	2.7E-08	142
Total	**2.6E-11**	**4.3E-05**	**N/A**

Table 5.5. Baseline Wet Loading for 90th Percentile Day in San Jose Creek Subwatersheds

Subwatershed	Category 1 Pollutants	Category 2 Pollutants	Category 3 Pollutants	
	Lead (lbs)	Fecal Indicator Bacteria (MPN/100mL)1	Copper (lbs)	Zinc (lbs)
5173	0.12	16,300	0.25	0.96
5175	0.01	16,876	0.03	0.12
5183	0	2,080	0	0
5189	0.07	16,725	0.15	0.56
Total	**0.20**	**N/A**	**0.44**	**1.64**

[1] 90th percentile loading under wet conditions for fecal indicator bacteria only encompass the days in which a High flow suspension of REC-1 beneficial uses are not in effect. High flow suspensions occur when greater than or equal to ½ inch of rainfall occurs and the 24 hours following the precipitation event.

Table 5.6. Baseline Dry Loading for 90th Percentile Day San Jose Creek Subwatersheds

Subwatershed	Category 1 Pollutants	Category 2 Pollutants	Category 3 Pollutants	
	Selenium (lbs)	Fecal Indicator Bacteria ($MPN*10^{12}$)	Copper (lbs)	Zinc (lbs)
5173	1.7E-06	279	1.2E-12	9.5E-12
5175	3.5E-07	118	1.7E-13	1.4E-12
5183	7.3E-09	0	0	0
5189	1.5E-06	105	7.1E-13	5.9E-12
Total	**3.5E-06**	**N/A**	**2.0E-12**	**1.7E-11**

5.1.2 Allowable Loads

The allowable loads for Category 1 pollutants were determined by multiplying the concentration based WQBELs (see Table 2.1) by the runoff from the 90th percentile day (Tables 5.1 and 5.2). Allowable loads for copper in Coyote Creek during dry periods was determined based on multiplying the proportion of the watershed in which the City occupies (approximately) 2.8 percent by the WLA.

Since there is no bacteria TMDL for the San Gabriel River watershed, the bacteria allowable load is based on the WQO for REC-1 beneficial use for which Coyote Creek and San Jose Creek potentially support. Both waterbodies have REC-1 beneficial uses suspended during periods when there is rainfall greater than or equal to 0.5 inches and remains in effect during the 24 hours following the rain event (USEPA 2006). Allowable loads of copper, lead, and zinc in San Jose Creek were assumed to be in-line with the Coyote Creek TMDL due to the TMDL's conformance with the California Toxics Rule. Allowable loads for selenium in Coyote Creek was based on the freshwater chronic toxicity of 5µg/L which is in line with the San Jose Creek selenium TMDL (see Table 2.1). Allowable loads for wet and dry conditions are summarized below in tables 5.7 through 5.11.

Table 5.7. Allowable Wet Loading for 90th Percentile Day in Coyote Creek Subwatersheds

Subwatershed	Category 1 Pollutants			Category 2 Pollutants
	Total Copper (lbs)	Lead (lbs)	Zinc (lbs)	Selenium (lbs)
5046	2.11	8.26	12.32	0.43
5065	3.97	15.59	23.24	0.80
5066	2.31	9.08	13.53	0.47
5079	0.22	0.87	1.30	0.04
5080	0.64	2.53	3.77	0.13
5083	0.01	0.06	0.08	0
Total	**9.27**	**36.39**	**54.23**	**1.88**

Table 5.8. Allowable Dry Loading for 90th Percentile Day in Coyote Creek Subwatersheds

Subwatershed	Category 1 Pollutants	Category 2 Pollutants
	Copper (lbs)[1]	Selenium (lbs)[2]
5046	0.016	0.009
5065	0.013	0.022
5066	0.021	0.015
5079	0.002	0.001
5080	0.005	0.003
5083	0.0001	0.0001
Total	**0.057**	**0.051**

Notes:

[1] Allowable dry Copper pollutant loads calculated from the shared waste load allocation of 0.941 kg/day multiplied by the proportion of the Coyote Creek subwatersheds within La Habra Height's jurisdiction and the total area of the Coyote Creek watershed.

[2] Allowable dry Selenium pollutant loads calculated from CTR of 5ug/L multiplied by the volume of 90th percentile dry flow.

Table 5.9. Allowable Wet Loading for 90th Percentile Day in San Jose Creek Subwatersheds

Subwatershed	Category 1 Pollutants	Category 3 Pollutants	
	Lead (lbs)[1]	Copper (lbs)	Zinc (lbs)
5173	1.21(1.02)	0.31	1.81
5175	0.22(0.18)	0.05	0.32
5183	0.07(0.06)	0.02	0.11
5189	0.92(0.77)	0.24	1.38
Total	**2.43(2.03)**	**0.62**	**3.62**

[1] Values in parentheses are the loading for Lead in the San Gabriel River Reach 2 which San Jose Creek is tributary to.

Table 5.10. Allowable Dry Loading for 90th Percentile Day in San Jose Creek Subwatersheds

Subwatershed	Category 1	Category 3[2]	
	Selenium (lbs)[1]	Copper (lbs)	Zinc (lbs)
5173	0.002	0.008	0.030
5175	0.001	0.003	0.013
5183	0.001	0.003	0.011
5189	0.004	0.016	0.061
Total	**0.007**	**0.030**	**0.116**

[1]Allowable dry Selenium pollutant loads calculated from the shared waste load allocation of 0.232 kg/day multiplied by the proportion of the San Jose Creek subwatersheds within La Habra Height's jurisdiction and the total area of the San Jose Creek watershed.

[2]Allowable dry Copper and Zinc pollutant loads calculated from the San Gabriel River Metals TMDL of 24.71 ug/L Copper and 144.57 ug/L Zinc multiplied by the volume of 90th percentile dry flow.

Table 5.11. Allowable Indicator Bacteria Loads for Coyote Creek and San Jose Creek

Waterbody	Category 2 Pollutants
	Fecal Indicator Bacteria (MPN/100mL)
Coyote Creek	235
San Jose Creek	235

5.1.3 Target Load Reductions

Target load reductions (TLRs) are the reduction of baseline loads needed to achieve allowable loads for the 90th percentile day. To determine whether pollutant reductions are necessary and the extent of those reductions, the baseline loads for both critical wet and dry conditions determined from the WMMS model (Section 5.1.1) were compared against the allowed loading determined in Section 5.1.2. Comparisons of baseline loading versus allowed loading are detailed below in Tables 5.12 through 5.15.

Table 5.12. Baseline Wet Loading for 90th Percentile Day vs. Allowed Loading

Waterbody	Copper (lbs)		Lead (lbs)		Zinc (lbs)		Selenium (lbs)	
	Baseline Loading	Allowed Loading	Baseline Loading	Allowed Loading	Baseline Loading	Allowed Loading	Baseline Loading	Allowed Loading
Coyote Creek	5.25	9.27	2.19	36.39	18.48	54.23	0.11	1.88
San Jose Creek	0.44	0.62	0.20	2.43 (2.03)	1.64	3.62	N/A	N/A

N/A = not applicable

[1] Values in parentheses are the allowed loading for Lead in the San Gabriel River Reach 2 which San Jose Creek is tributary to.

Table 5.13. Baseline Wet Loading of Fecal Indicator Bacteria for 90th Percentile Day vs. Allowed Loading

Waterbody	Subwatershed	Indicator Bacteria (MPN/100mL)		Target Load Reductions (%)
		Baseline Loading	Allowed Loading	
Coyote Creek	5046	17,248	235	98.6
	5065	16,293	235	98.6
	5066	16,317	235	98.6
	5079	11,095	235	97.9
	5080	17,430	235	98.7
	5083	18,784	235	98.7
San Jose Creek	5173	16,300	235	98.6
	5175	16,876	235	98.6
	5183	2,080	235	88.7
	5189	16,725	235	98.6

Table 5.14. Baseline Dry Loading for 90th Percentile Day vs. Allowed Loading

Waterbody	Copper (lbs)		Lead (lbs)		Zinc (lbs)		Selenium	
	Baseline Loading	Allowed Loading	Baseline Loading	Allowed Loading	Baseline Loading	Allowed Loading	Baseline Loading	Allowed Loading
Coyote Creek	2.6E-11	0.06	N/A	N/A	N/A	N/A	4.3E-05	0.051
San Jose Creek	2.0E-12	0.03	N/A	N/A	1.7E-11	1.2E-01	3.5E-06	0.007

N/A = not applicable

Table 5.15. Baseline Dry Loading of Fecal Indicator Bacteria for 90th Percentile Day vs. Allowed Loading

Waterbody	Subwatershed	Indicator Bacteria (MPN/100mL)		Target Load Reductions (%)
		Baseline Loading	Allowed Loading	
Coyote Creek	5046	318	235	26
	5065	226	235	0
	5066	185	235	0
	5079	176	235	0
	5080	329	235	29
	5083	142	235	0
San Jose Creek	5173	279	235	16
	5175	118	235	0
	5183	0	235	0
	5189	105	235	0

Based on the results of the model, the TLRs for Category 1 pollutants were determined to be zero. However, TLRs will be required for fecal indicator bacteria (Category 2 pollutant). All modeled Coyote Creek and San Jose Creek subwatersheds will require bacteria-specific TLRs ranging from 88.7 to 98.6 percent reduction during wet weather conditions. Only subwatersheds 5046 and 5080 in Coyote Creek and subwatershed 5173 in San Jose Creek will require bacteria-specific TLRs during dry weather conditions.

5.1.4 Linkage Analysis

The City's current build out and constraints with private land owners make implementation of structural control measure BMPs to reduce loading of fecal indicator bacteria infeasible as discussed in the City's WMP. However, the City will develop a public awareness program to educate private landowners on the benefits of buffers and filter strips along waterways. If willing private land owners are identified through the public awareness program, the City will evaluate whether implementation of these BMPs at interested landowner's parcels can achieve the TLRs in fecal indicator bacteria in wet weather conditions (all City subwatersheds) and dry weather conditions (subwatersheds 5046, 5080, and 5173).

Due to the uncertainty in implementing structural control measure BMPs, the City will rely largely on source control programs and non-structural BMPs to reduce loading of fecal indicator bacteria to surface waters. Percent reductions of fecal indicator bacteria will be accomplished via a formalized internal septic program, (primarily to implement compliance with AB885) and large animal/pet waste runoff program. These source control programs and their implementation timelines are more fully discussed in Sections 5 and 6 of the City's WMP. Percent reductions in fecal indicator bacteria will not be able to be determined until baseline data is collected as part of the City's Integrated Monitoring Program and the WMMS model is locally calibrated as discussed in Section 4.2.

6.1 CONCLUSIONS

The obtained modeled results from the RAA suggest that the City's land use is not a major source of impairment in the Coyote Creek and San Jose Creek watersheds for metals. Baseline loading for wet and dry conditions for the 90th percentile wet and dry days for copper, lead, zinc, selenium, were below the allowable loading for each respective waterbody. However, reductions of fecal indicator bacteria will need to be accomplished in order to meet the potential REC-1 WQOs in Coyote Creek and San Jose Creek. It is noted that a "potential" beneficial use is based on future, possible water quality listings. Reductions of fecal indicator bacteria, based on this potential listing, will be accomplished via source control programs and additional non-structural best management practices that the City will be pursuing are available in the City of La Habra Heights Watershed Management Plan.

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Appendix A

Model Output

HYDROGRAPHS

Coyote Creek Subwatershed Hydrographs

Figure A.1. Coyote Creek Subwatershed 5046 Hydrograph

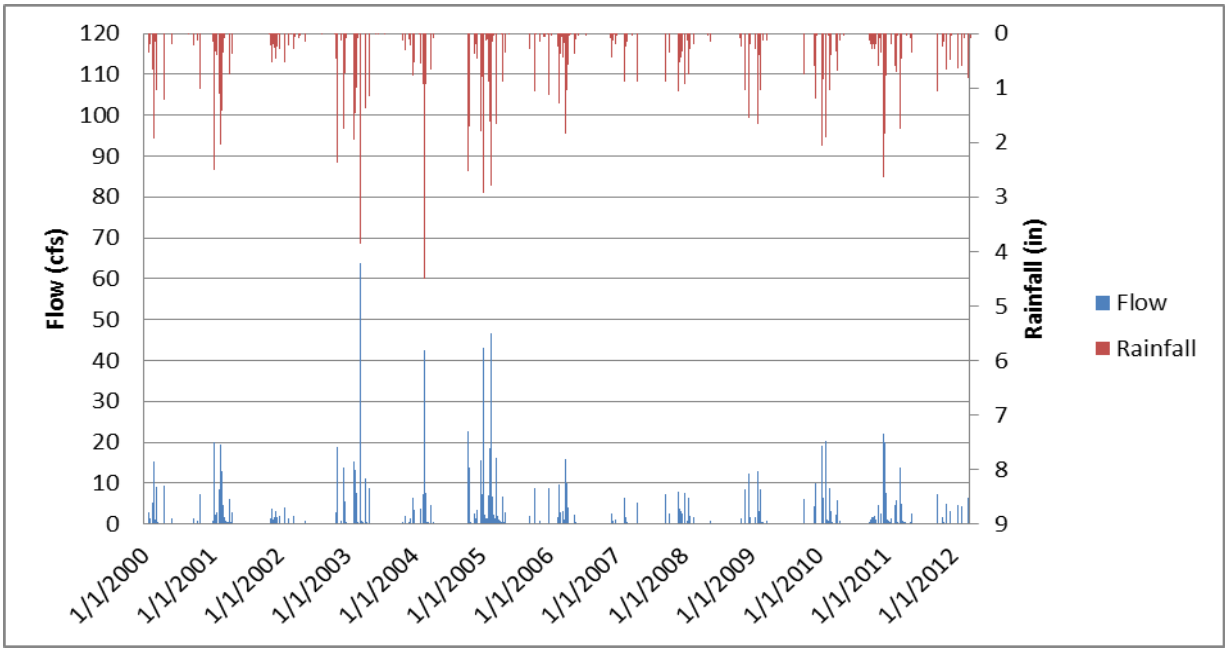


Figure A.2. Coyote Creek Subwatershed 5065 Hydrograph

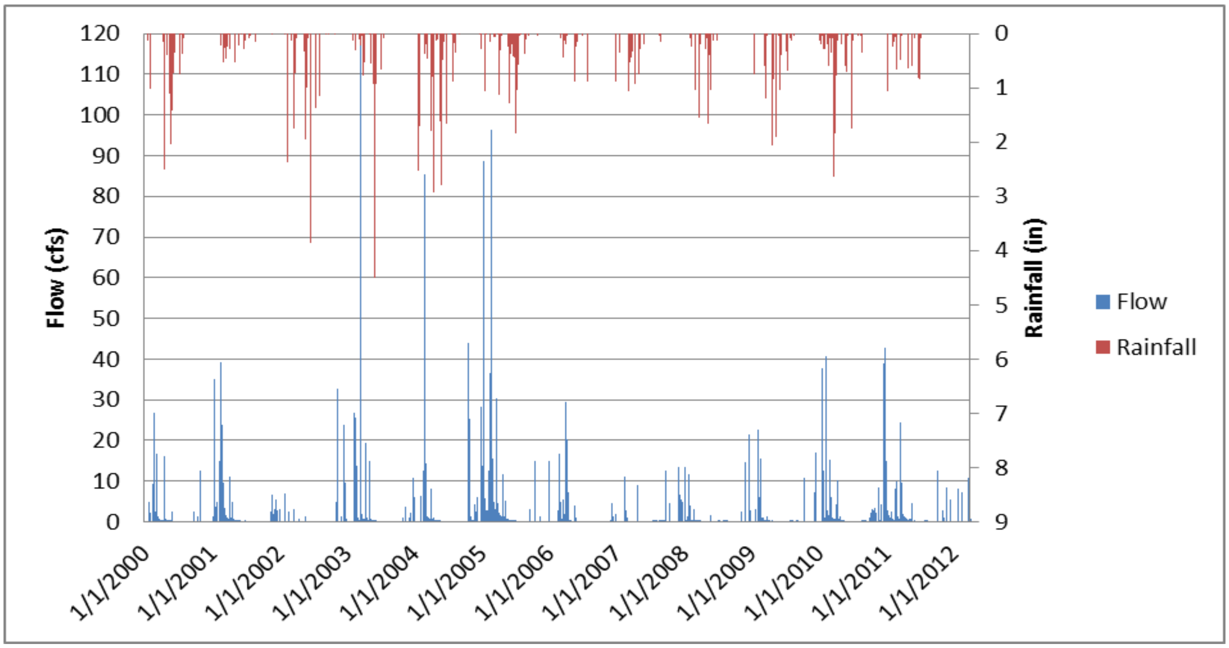


Figure A.3. Coyote Creek Subwatershed 5066 Hydrograph

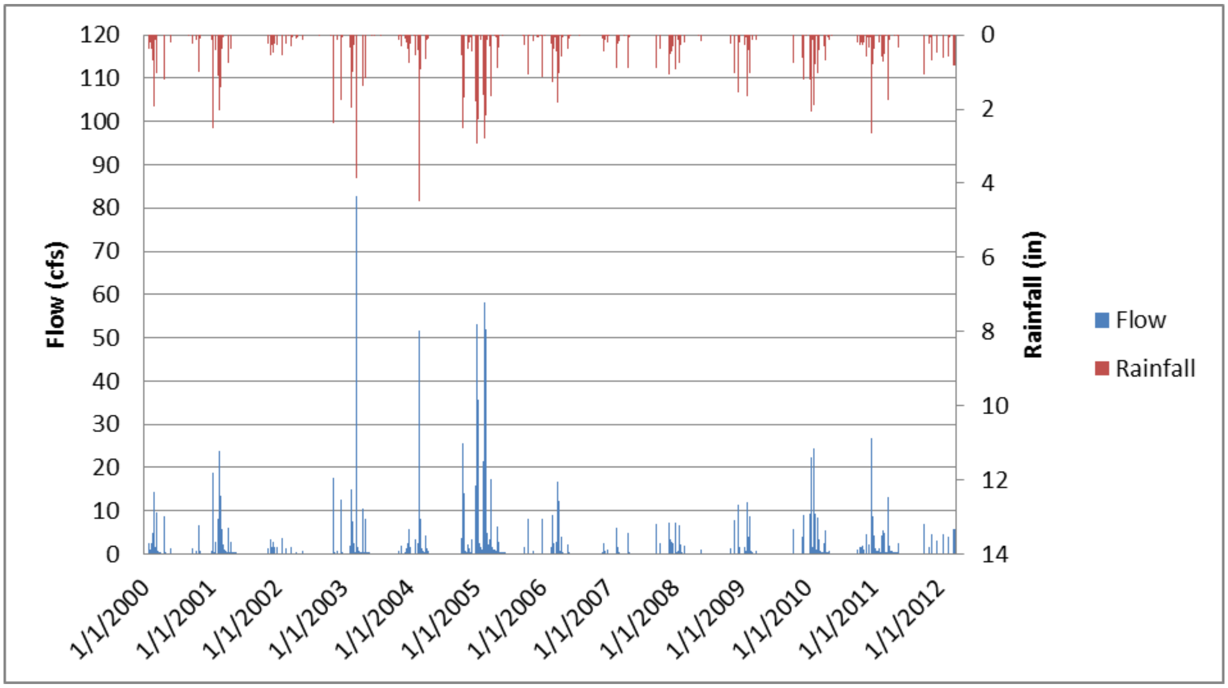


Figure A.4. Coyote Creek Subwatershed 5079 Hydrograph

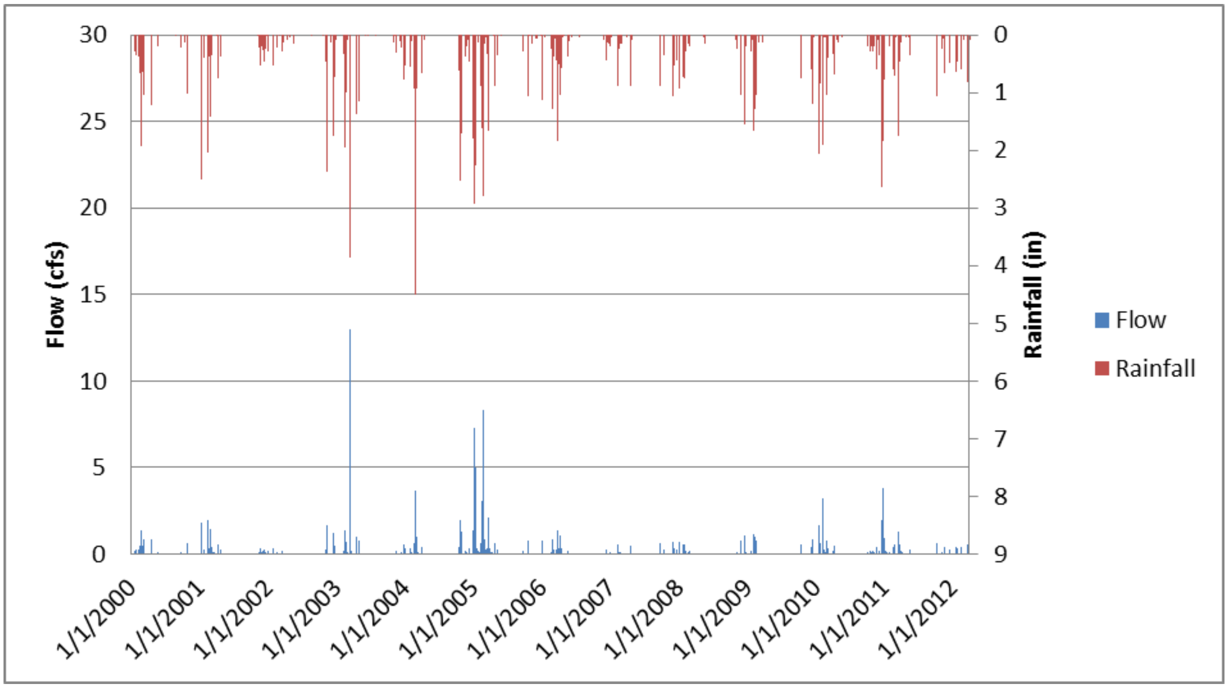


Figure A.5. Coyote Creek Subwatershed 5080 Hydrograph

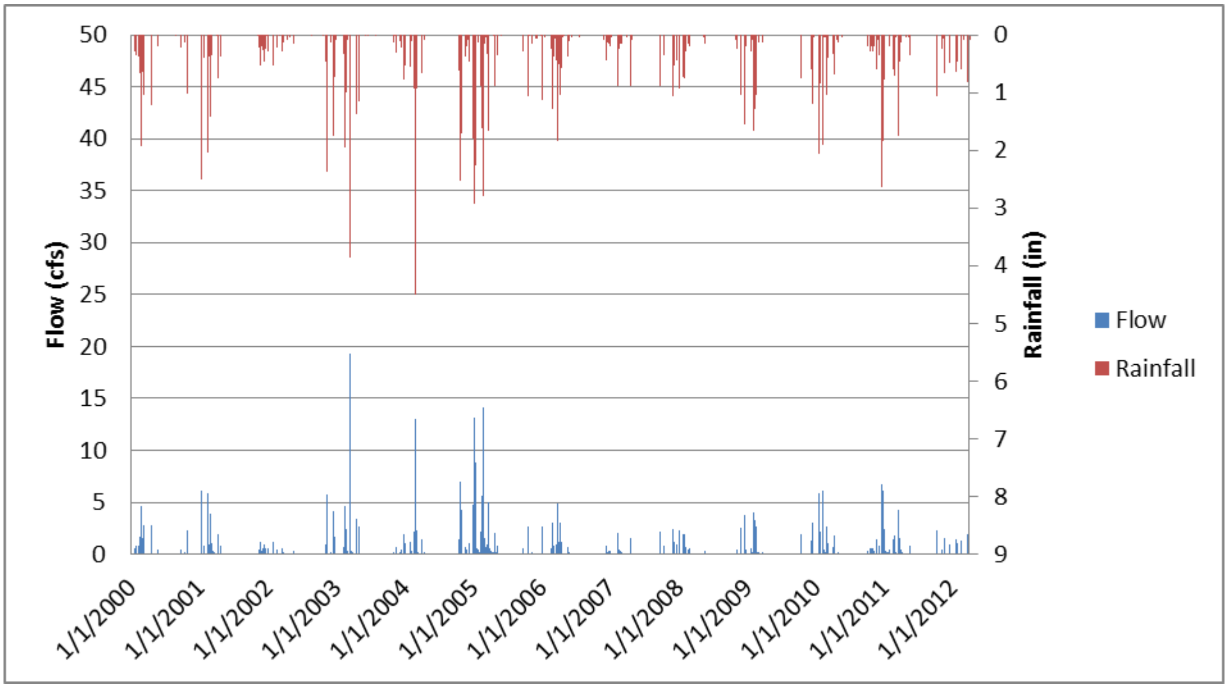
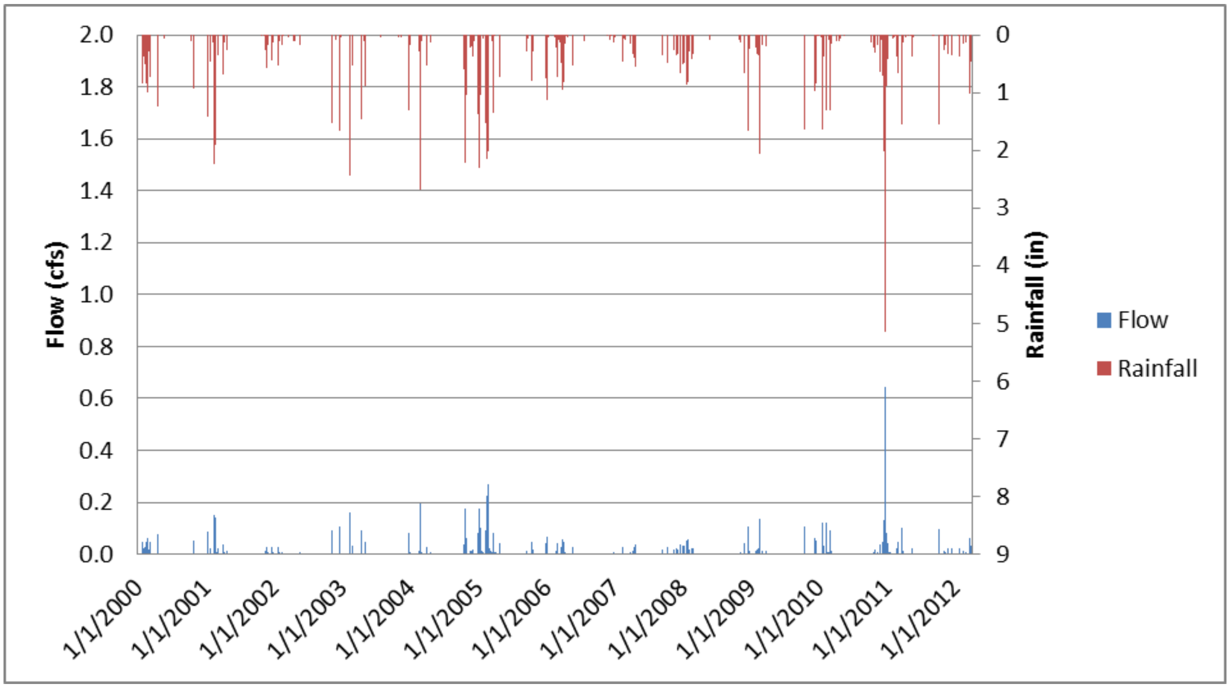


Figure A.6. Coyote Creek Subwatershed 5083 Hydrograph



San Jose Creek Subwatershed Hydrographs

Figure A.7. San Jose Creek Subwatershed 5173 Hydrograph

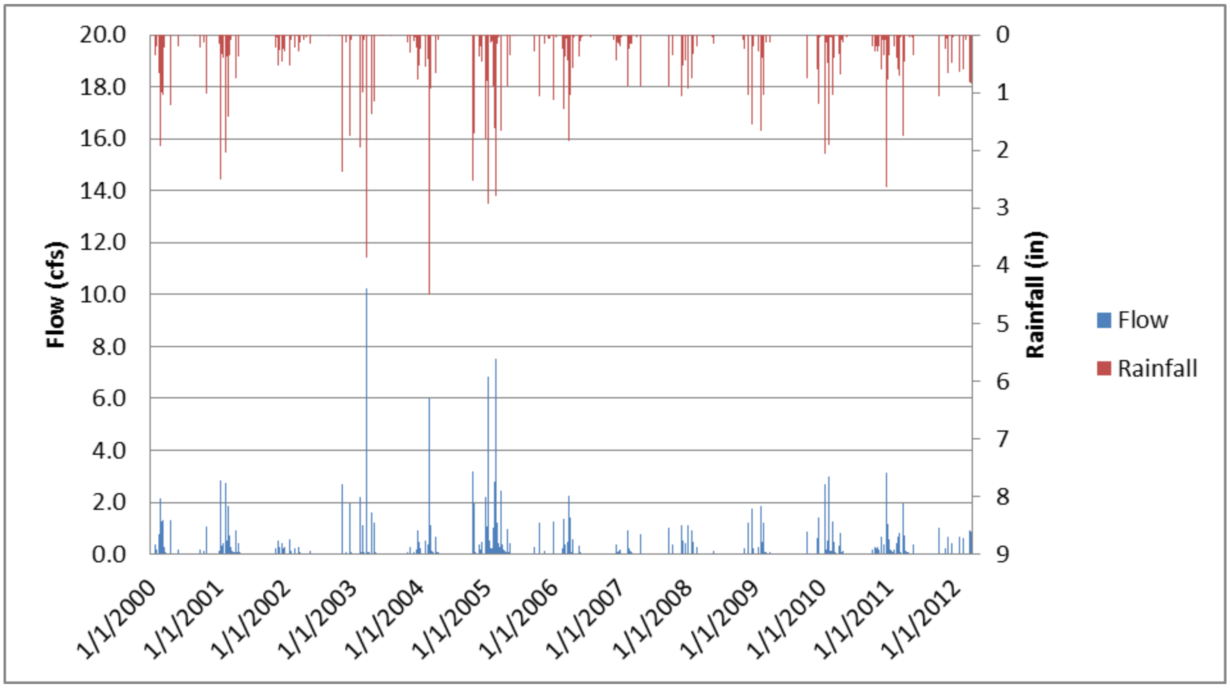


Figure A.8. San Jose Creek Subwatershed 5175 Hydrograph

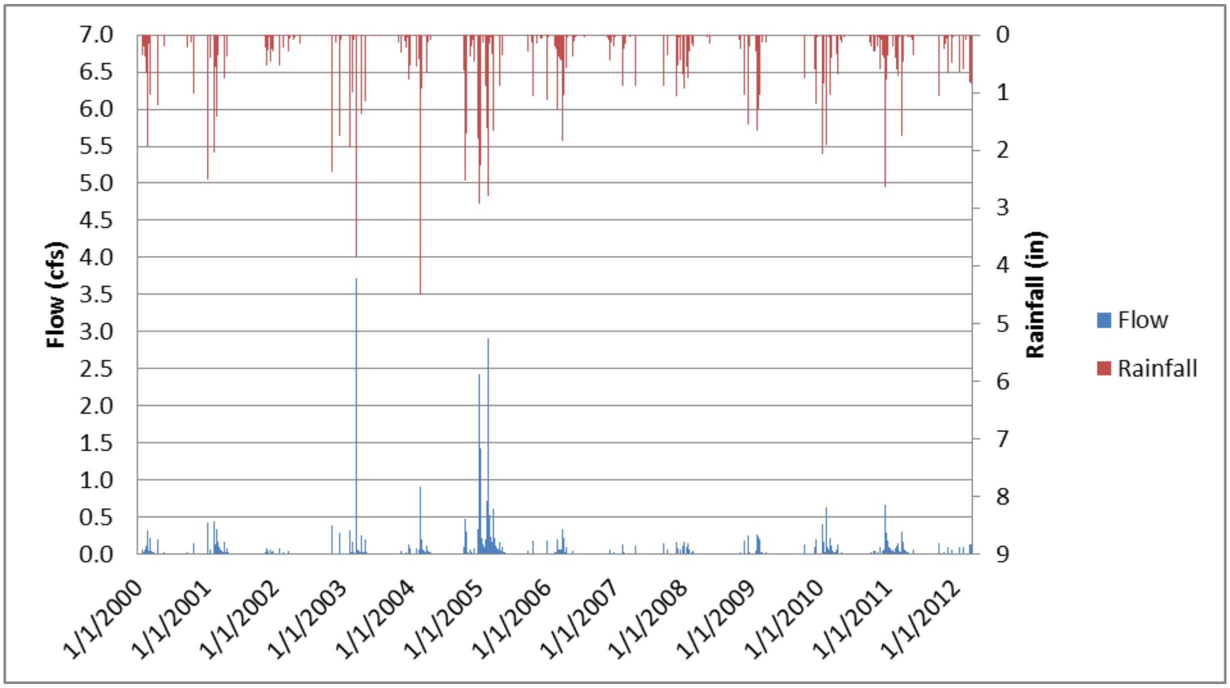


Figure A.9. San Jose Creek Subwatershed 5183 Hydrograph

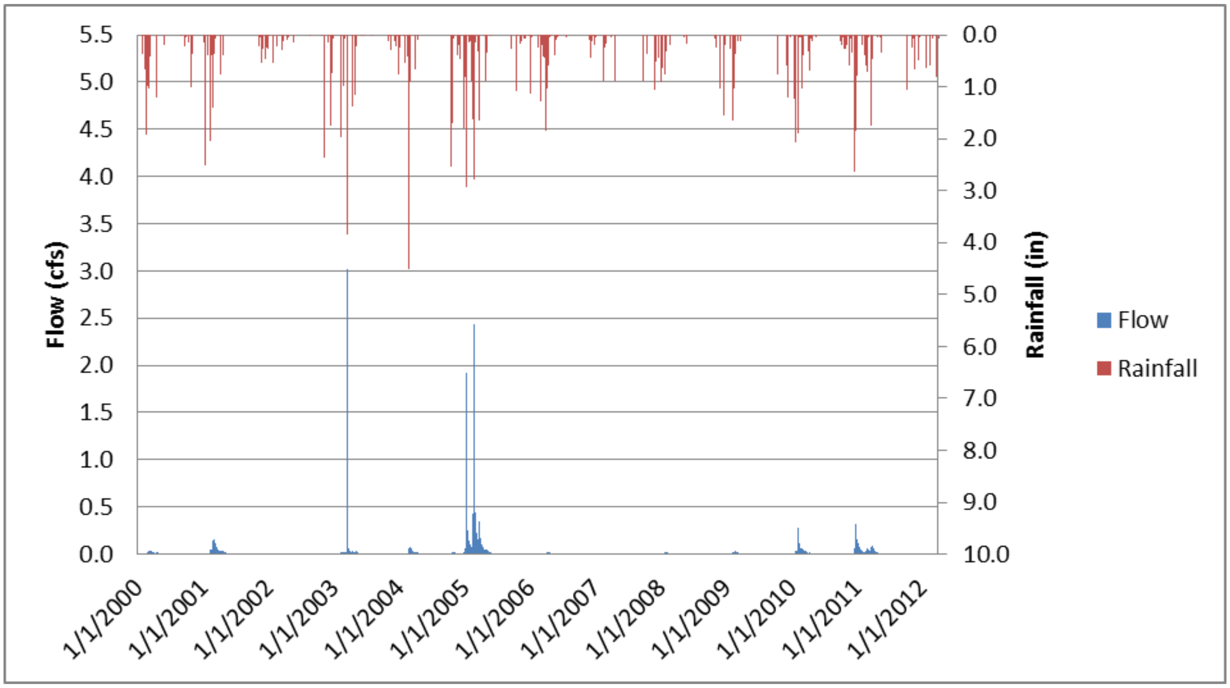
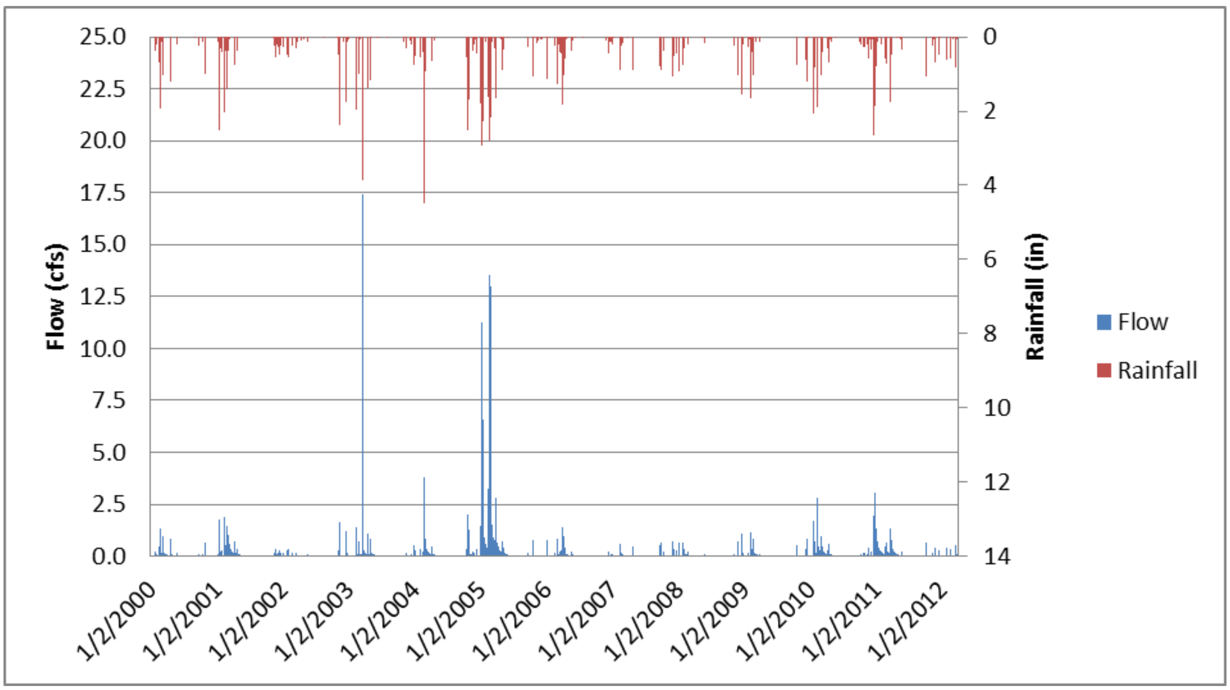


Figure A.10. San Jose Creek Subwatershed 5189 Hydrograph



POLLUTOGRAPHS

Coyote Creek Subwatershed Pollutographs

Figure A.11. Coyote Creek Subwatershed 5046 Copper Pollutograph

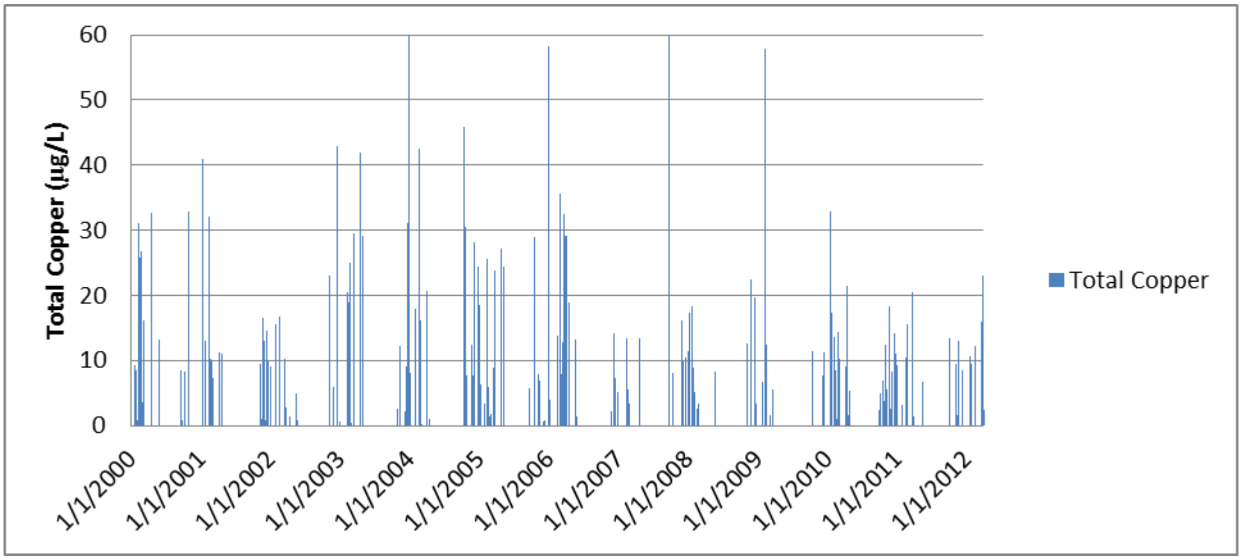


Figure A.12. Coyote Creek Subwatershed 5046 Lead Pollutograph

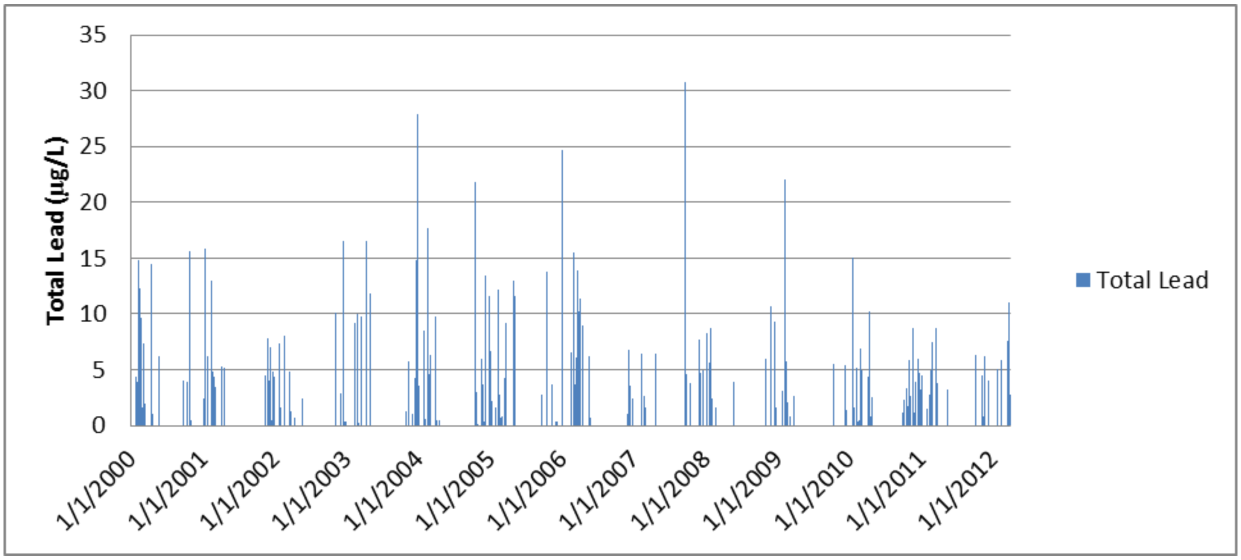


Figure A.13. Coyote Creek Subwatershed 5046 Zinc Pollutograph

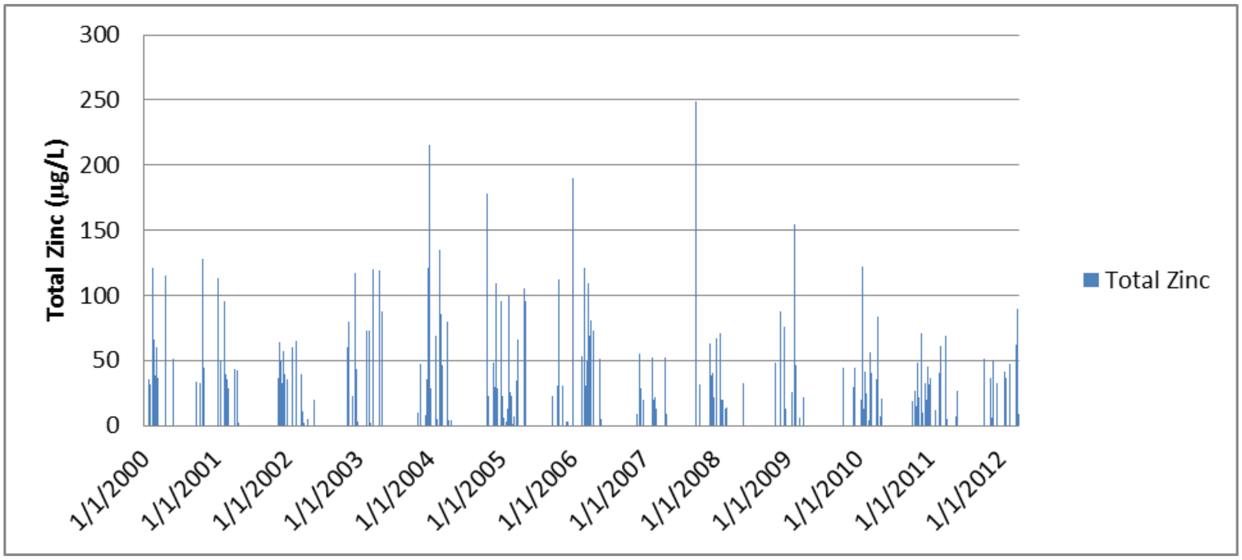


Figure A.14. Coyote Creek Subwatershed 5046 Selenium Pollutograph

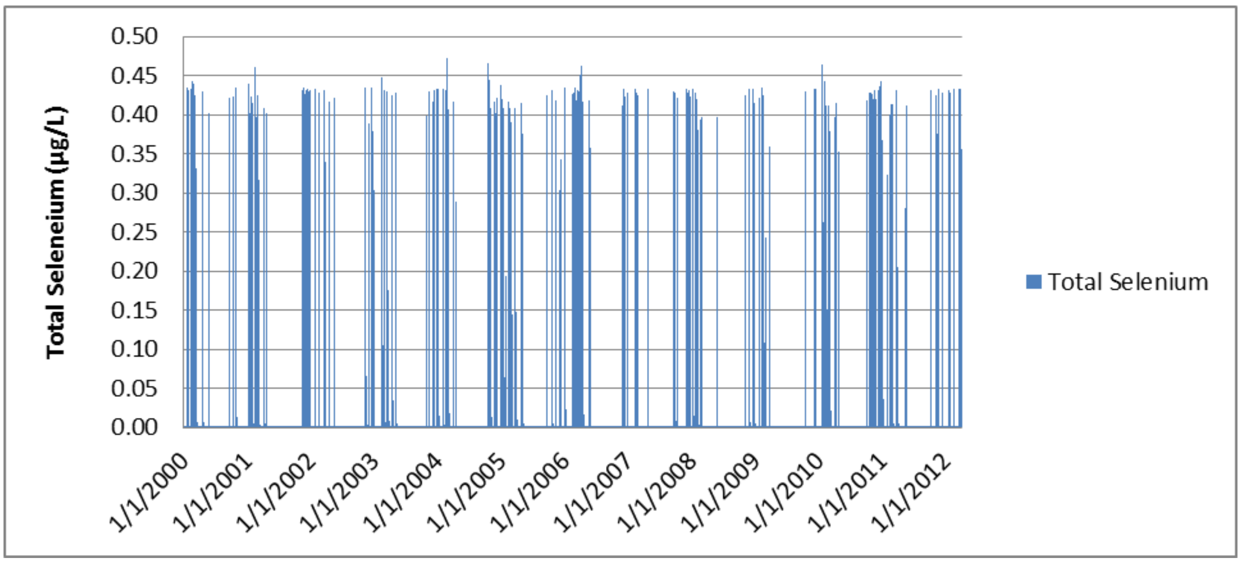


Figure A.15. Coyote Creek Subwatershed 5046 Indicator Bacteria Pollutograph

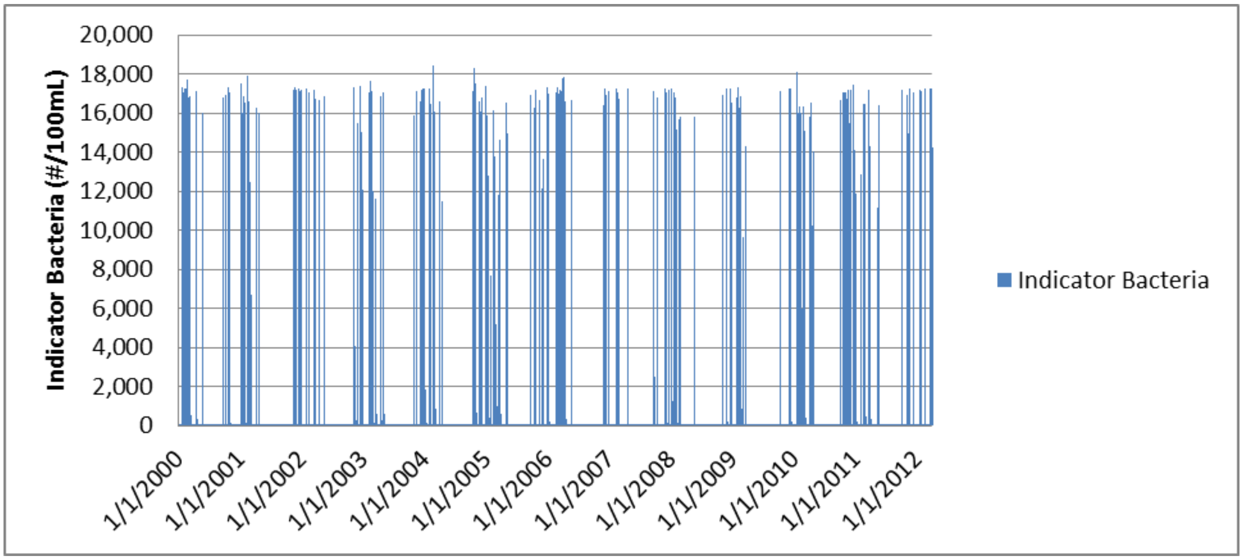


Figure A.16. Coyote Creek Subwatershed 5065 Copper Pollutograph

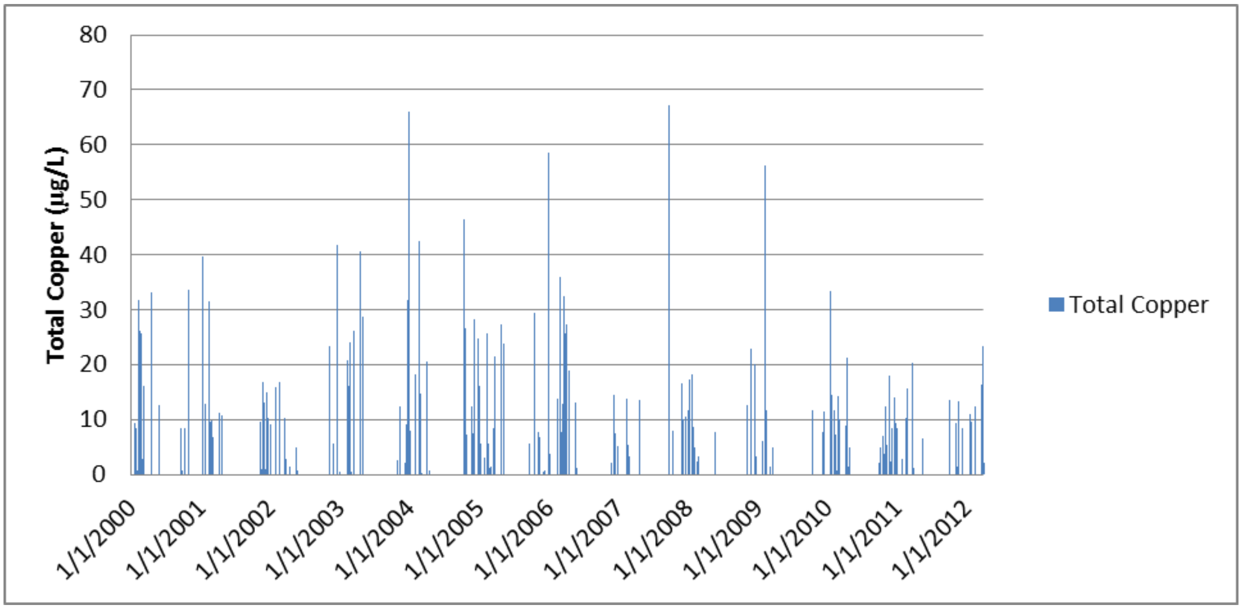


Figure A.17. Coyote Creek Subwatershed 5065 Lead Pollutograph

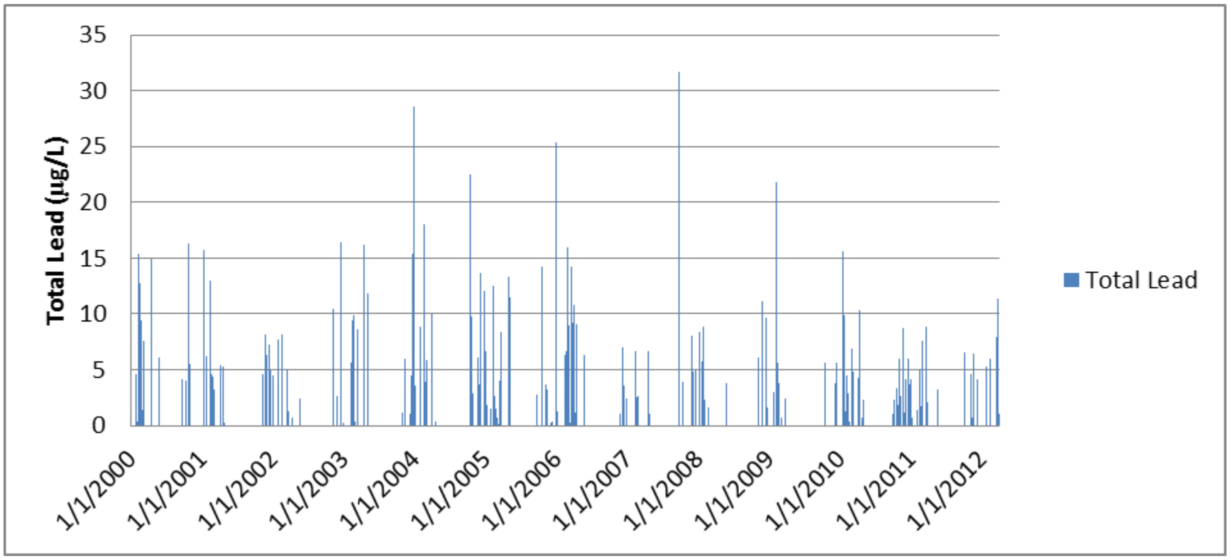


Figure A.18 Coyote Creek Subwatershed 5065 Zinc Pollutograph

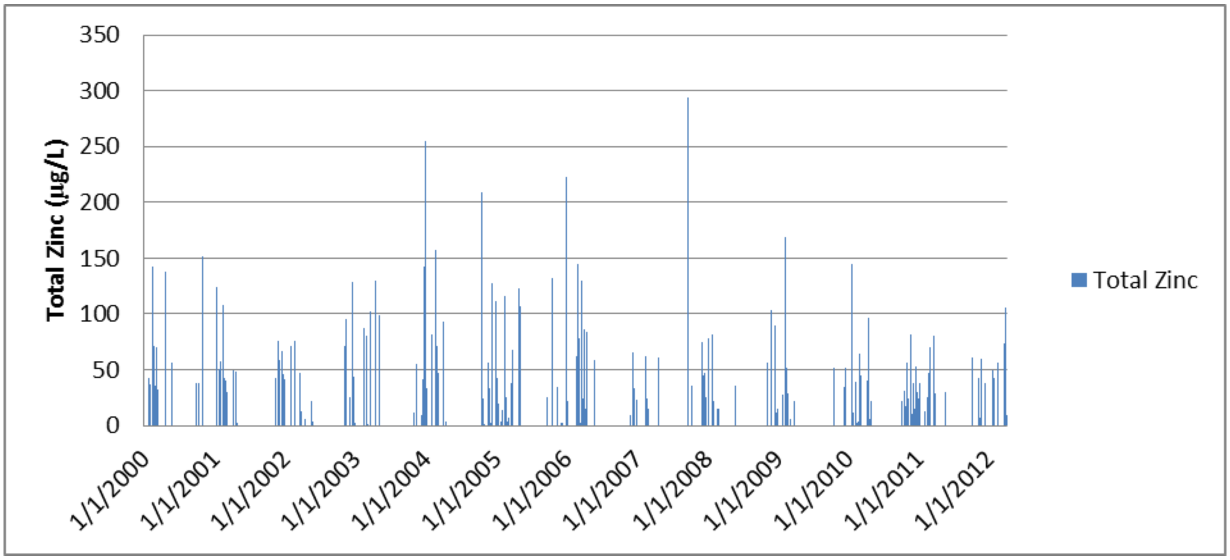


Figure A.19. Coyote Creek Subwatershed 5065 Selenium Pollutograph

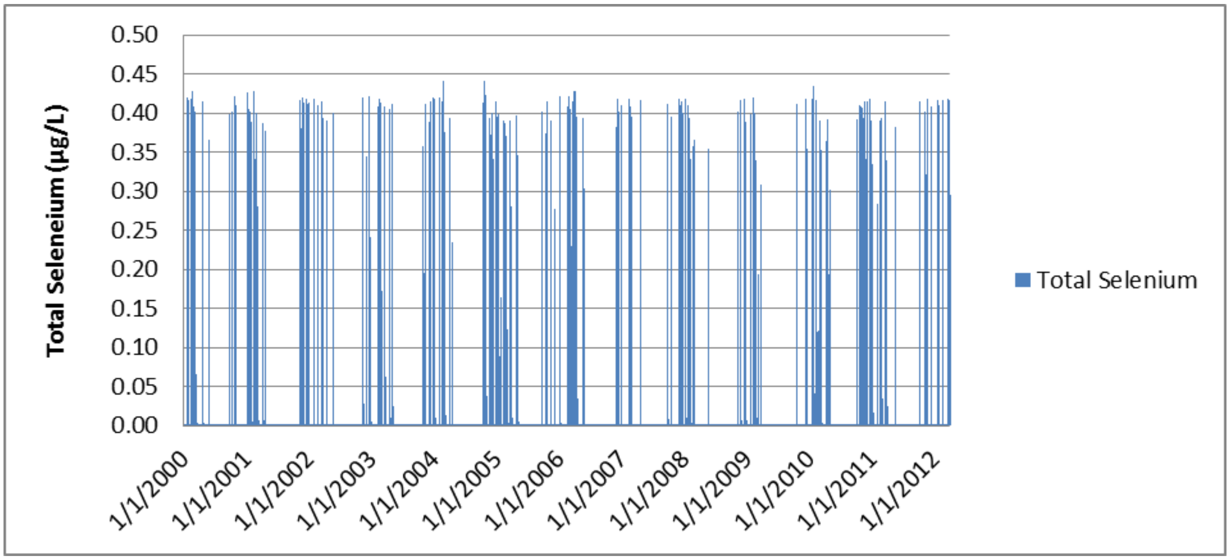


Figure A.20. Coyote Creek Subwatershed 5065 Indicator Bacteria Pollutograph

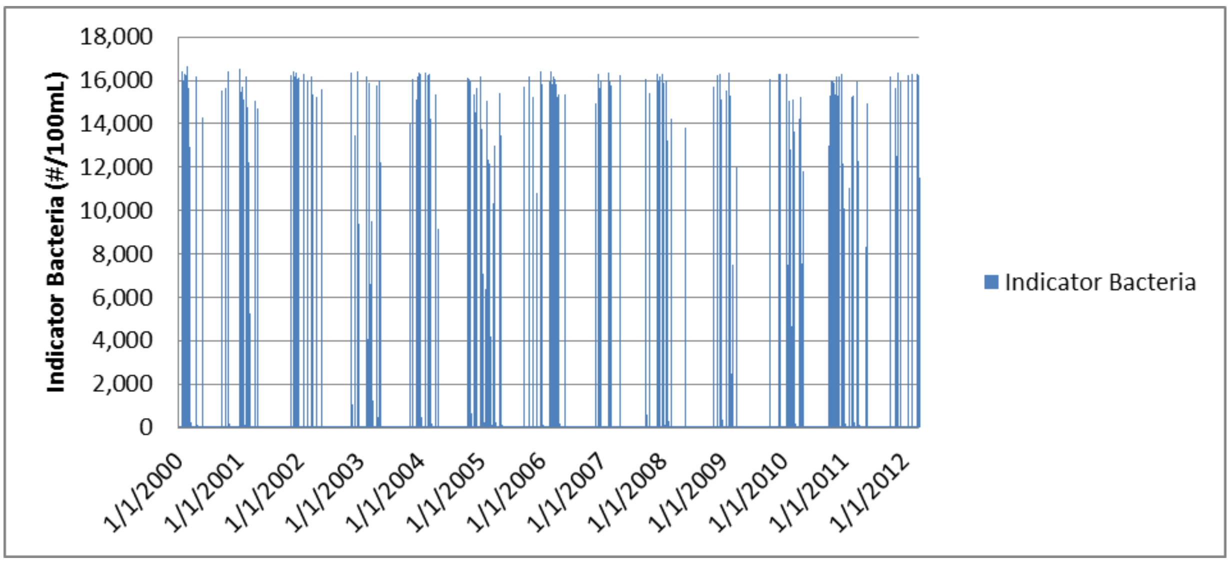


Figure A.21. Coyote Creek Subwatershed 5066 Copper Pollutograph

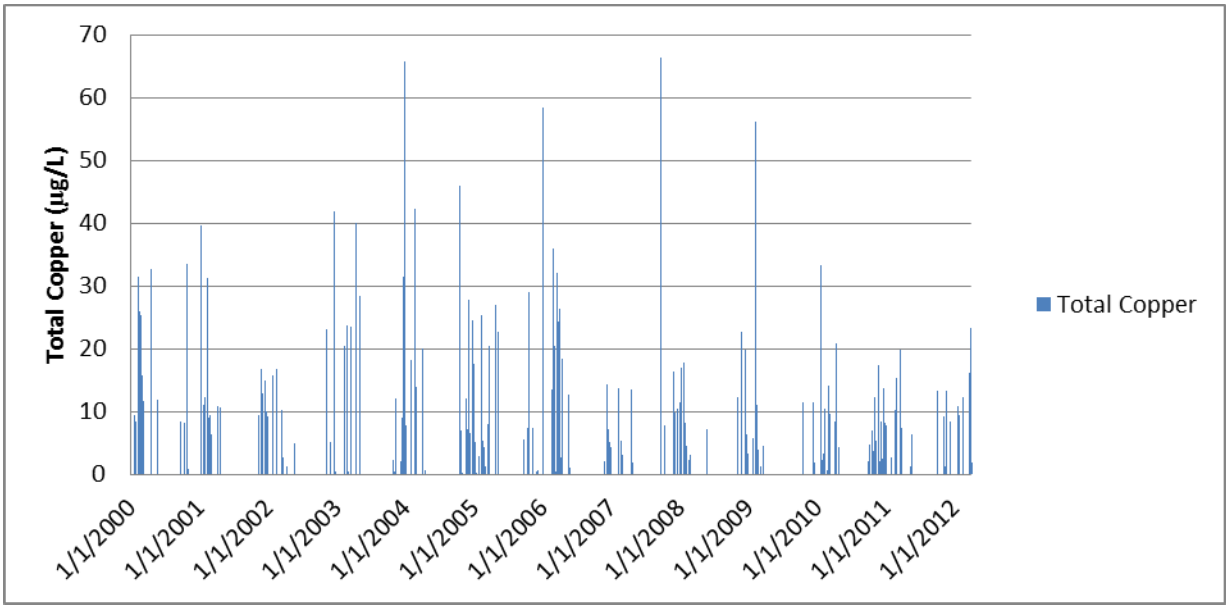


Figure A.22. Coyote Creek Subwatershed 5066 Lead Pollutograph

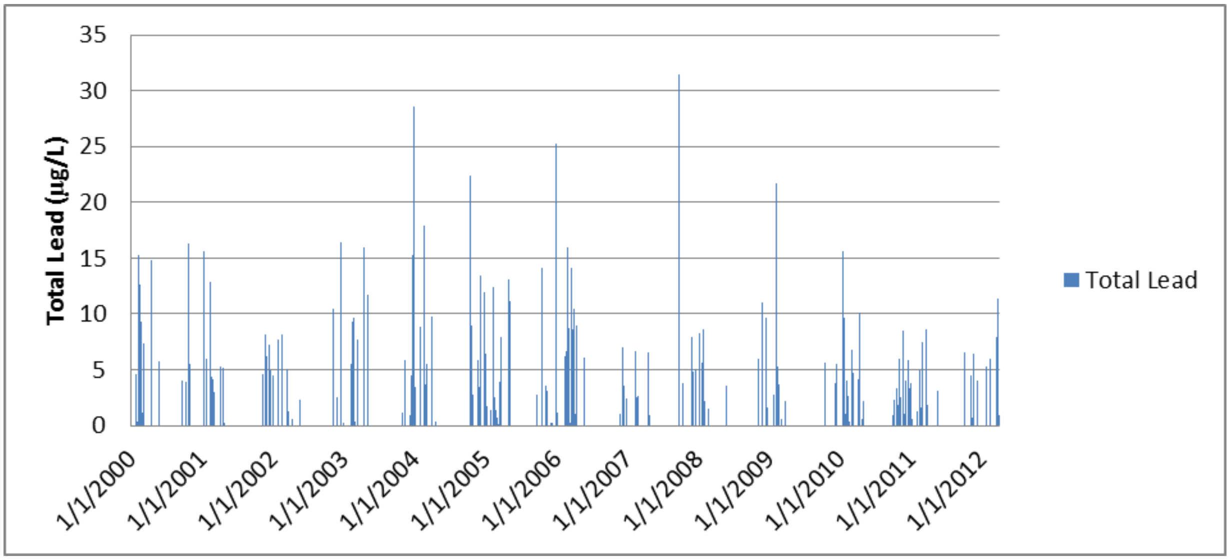


Figure A.23. Coyote Creek Subwatershed 5066 Zinc Pollutograph

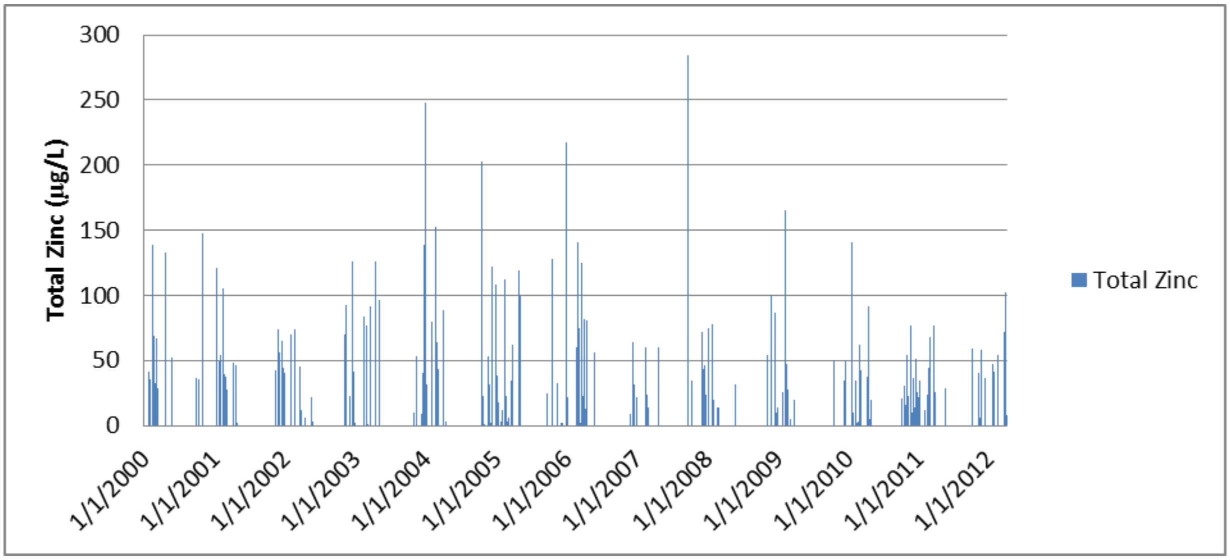


Figure A.24. Coyote Creek Subwatershed 5066 Selenium Pollutograph

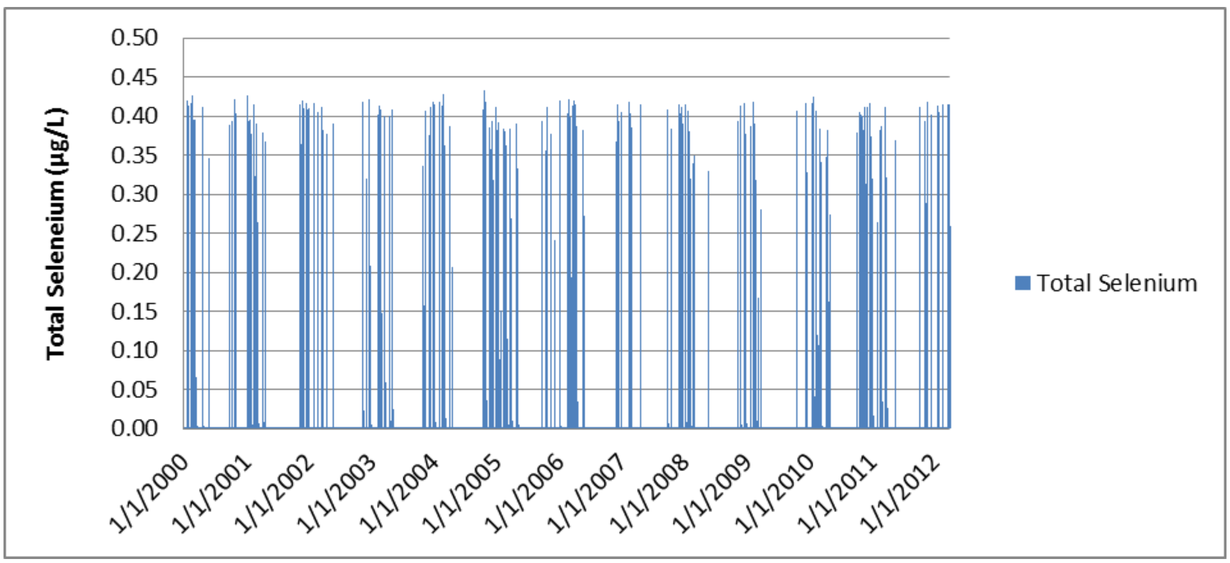


Figure A.25. Coyote Creek Subwatershed 5066 Indicator Bacteria

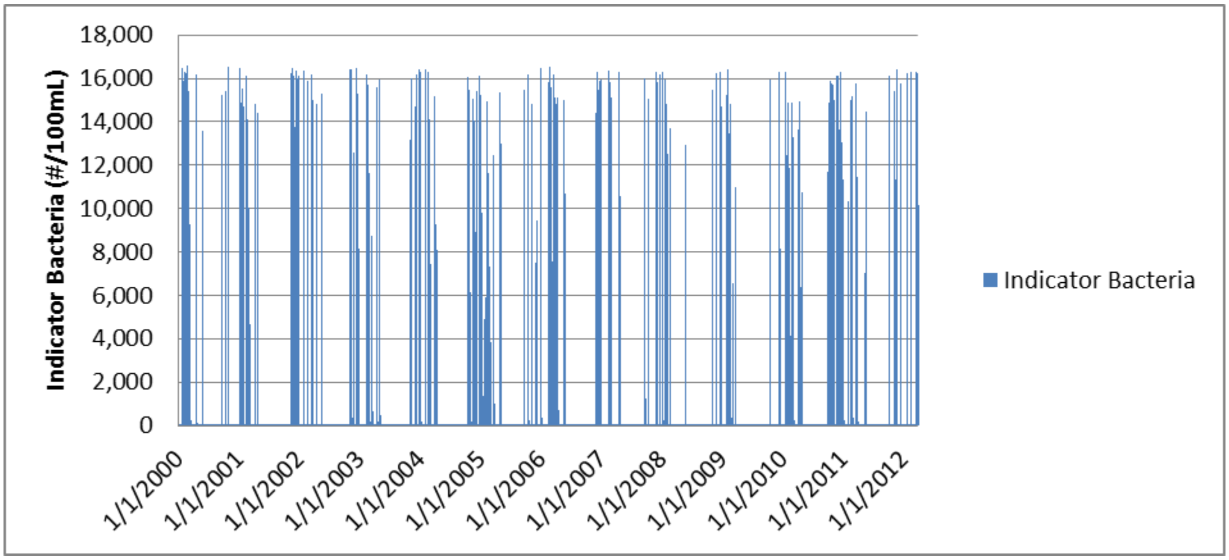


Figure A.26. Coyote Creek Subwatershed 5079 Copper Pollutograph

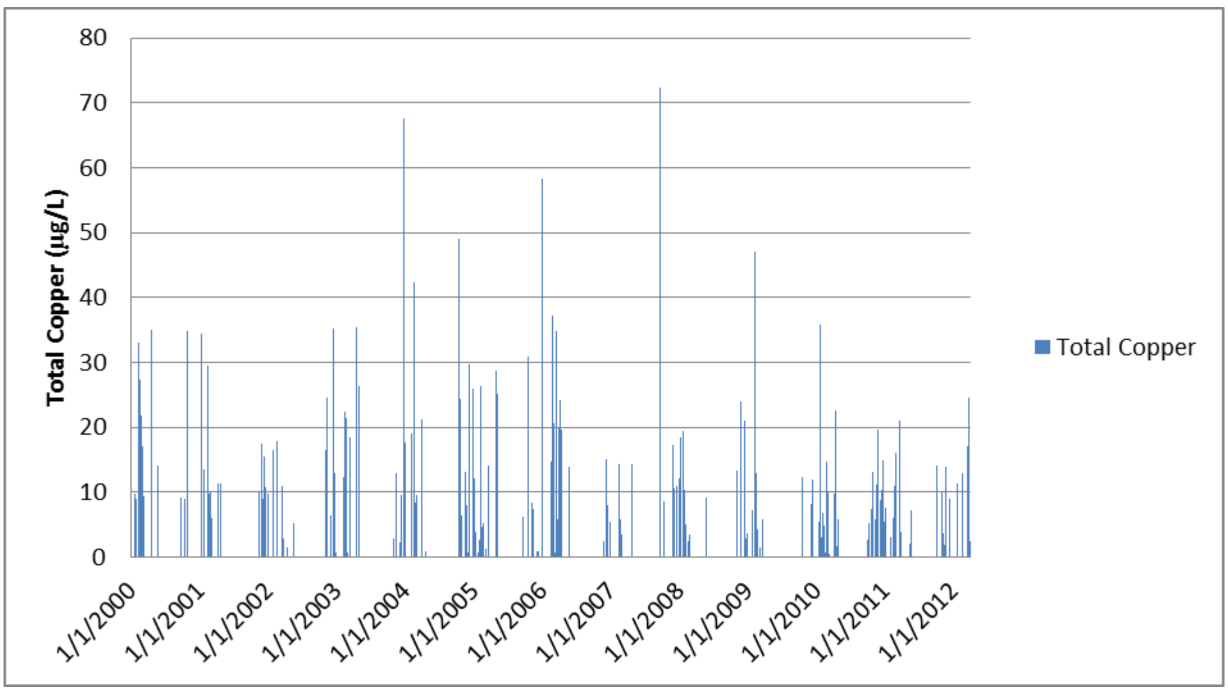


Figure A.27. Coyote Creek Subwatershed 5079 Lead Pollutograph

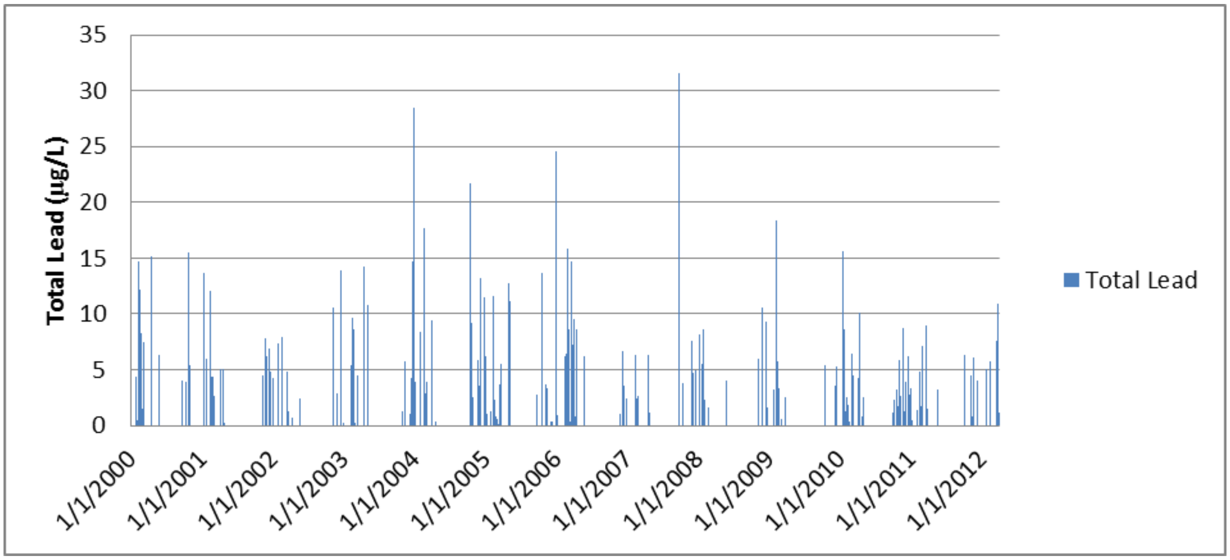


Figure A.28. Coyote Creek Subwatershed 5079 Zinc Pollutograph

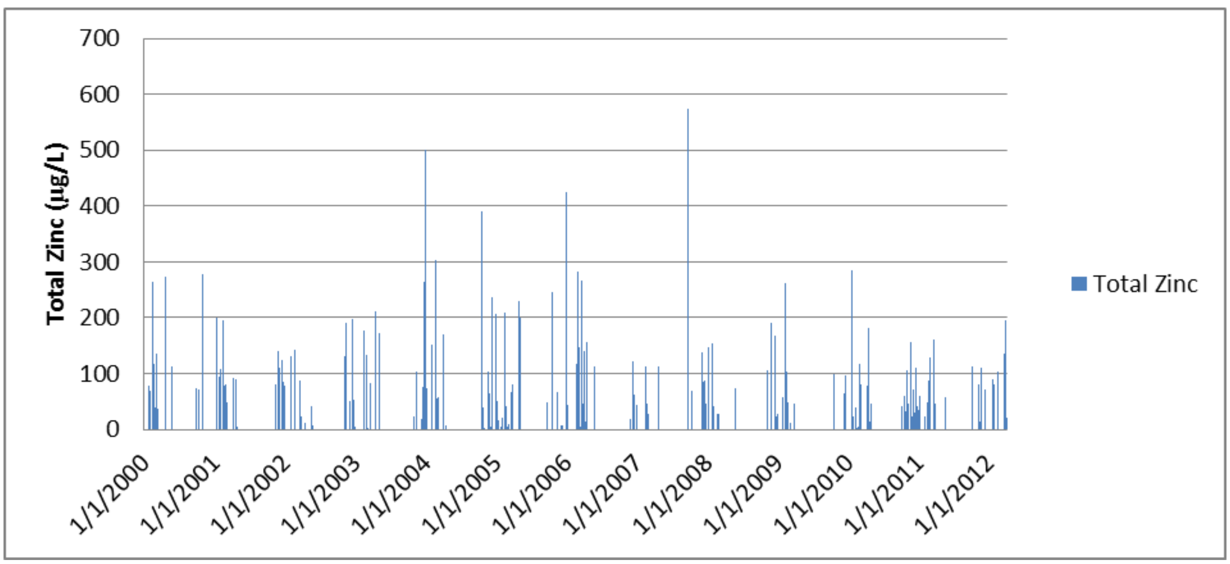


Figure A.29. Coyote Creek Subwatershed 5079 Selenium Pollutograph

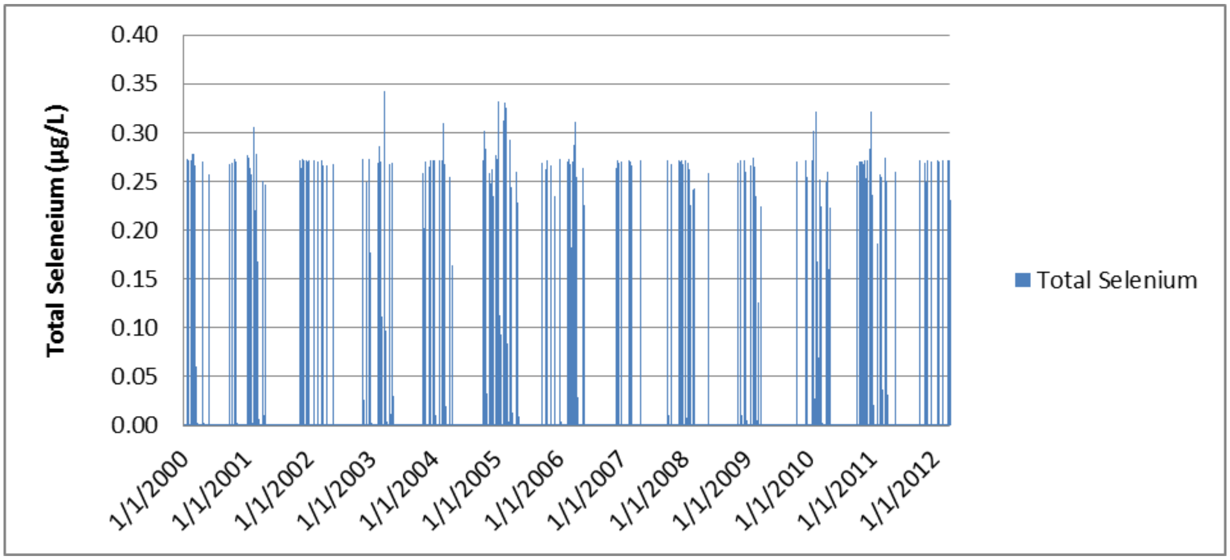


Figure A.30. Coyote Creek Subwatershed 5079 Indicator Bacteria

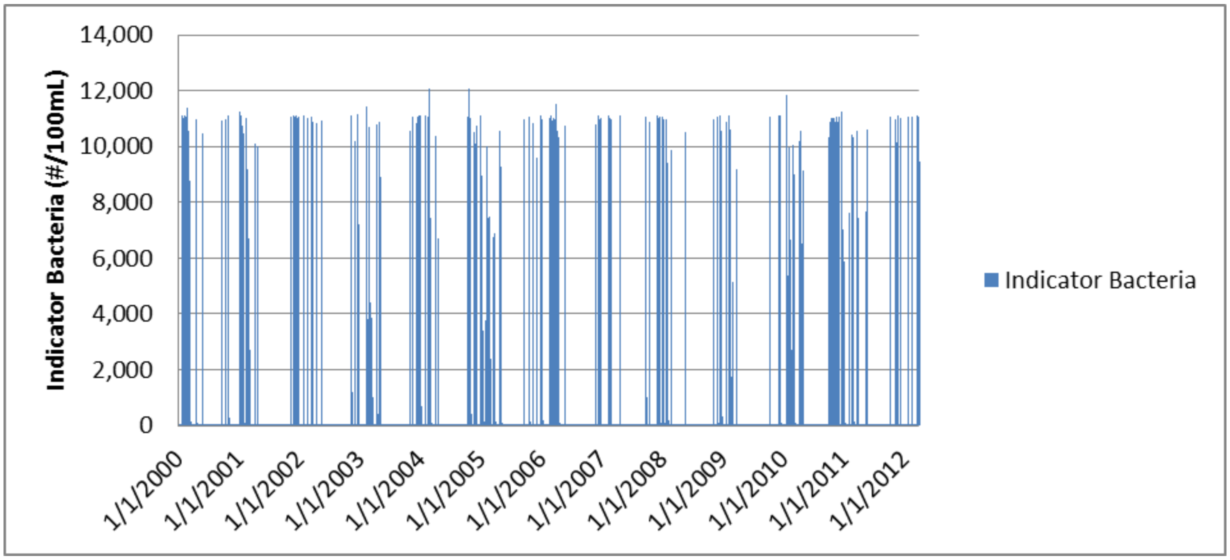


Figure A.31. Coyote Creek Subwatershed 5080 Copper Pollutograph

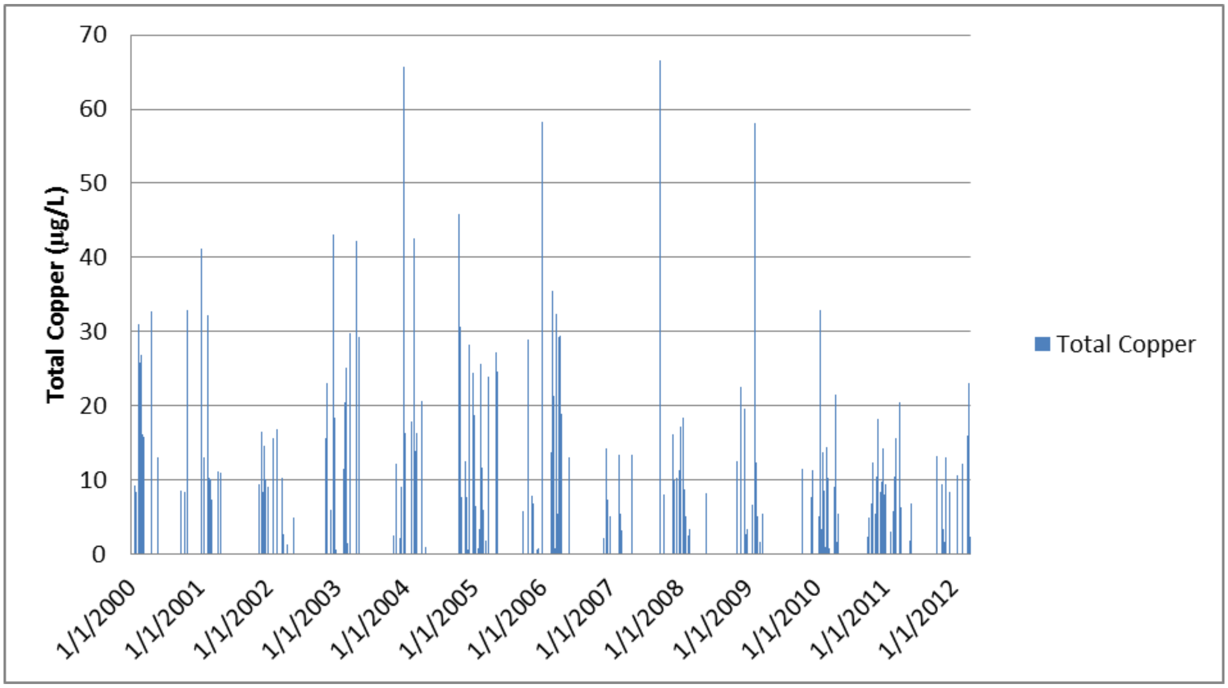


Figure A.32. Coyote Creek Subwatershed 5080 Lead Pollutograph

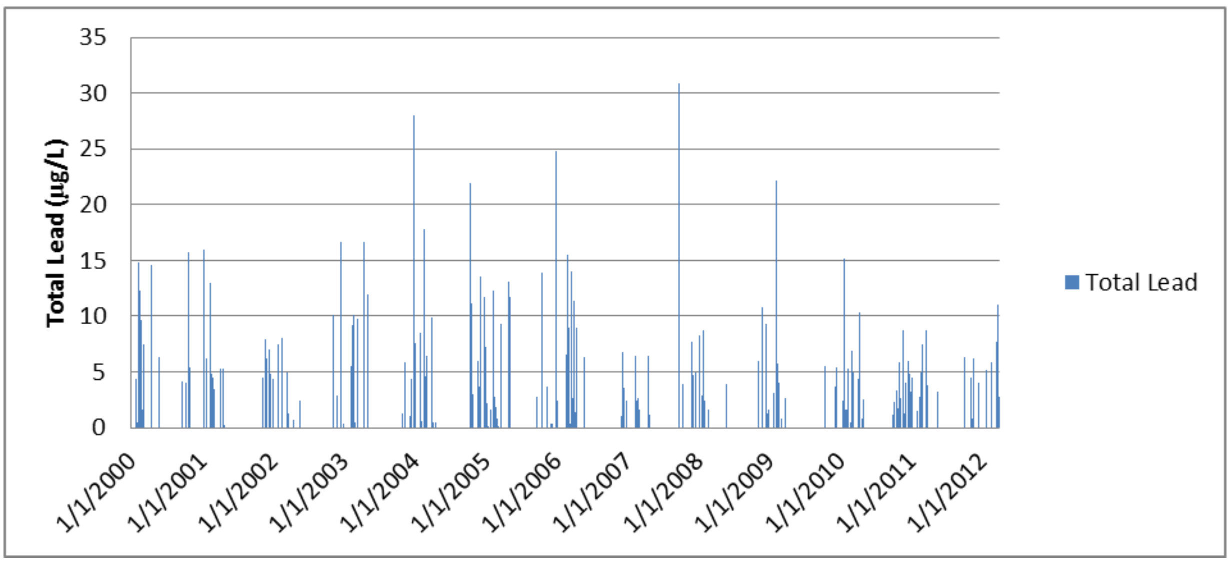


Figure A.33. Coyote Creek Subwatershed 5080 Zinc Pollutograph

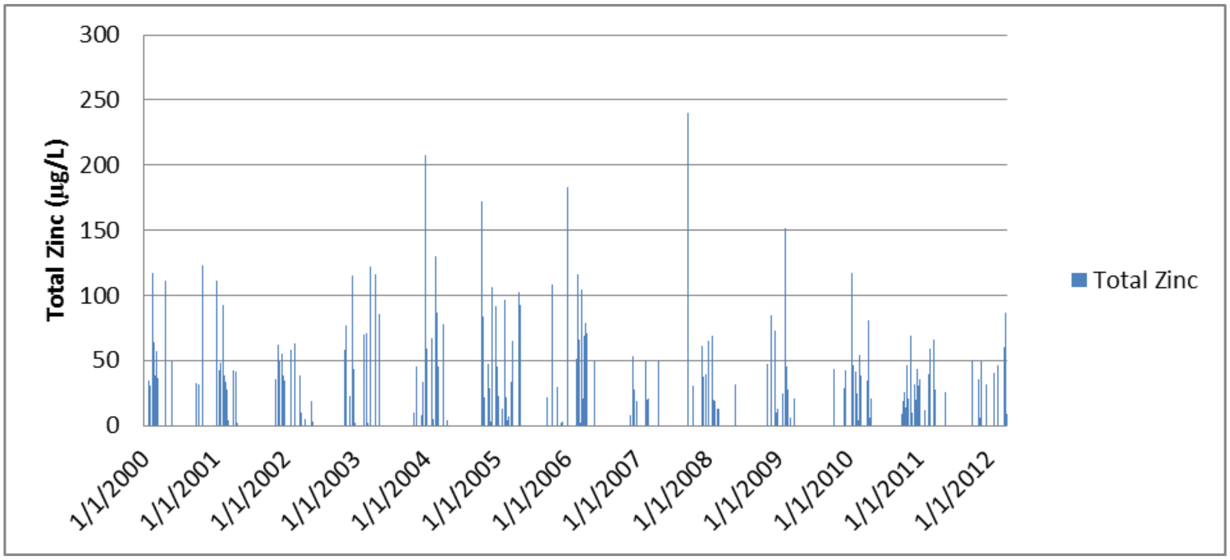


Figure A.34. Coyote Creek Subwatershed 5080 Selenium Pollutograph

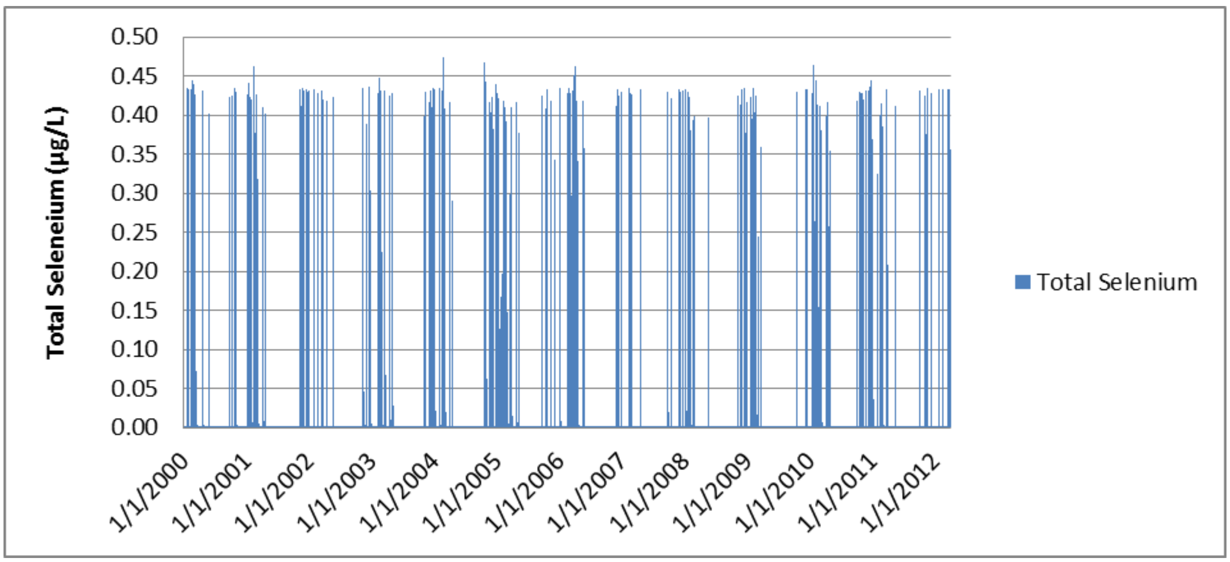


Figure A.35. Coyote Creek Subwatershed 5080 Indicator Bacteria Pollutograph

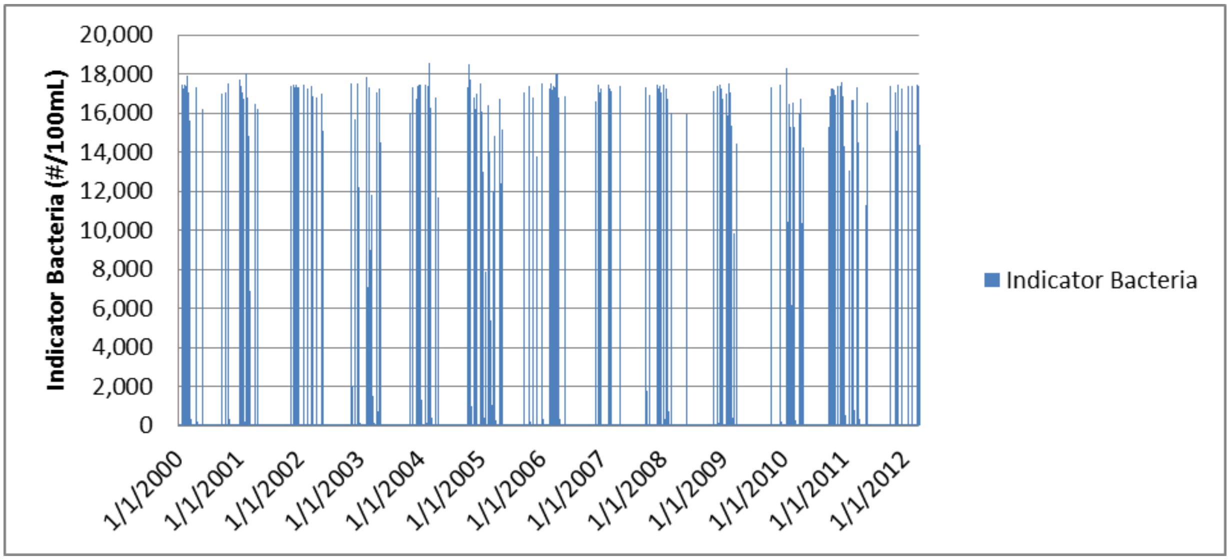


Figure A.36. Coyote Creek Subwatershed 5083 Copper Pollutograph

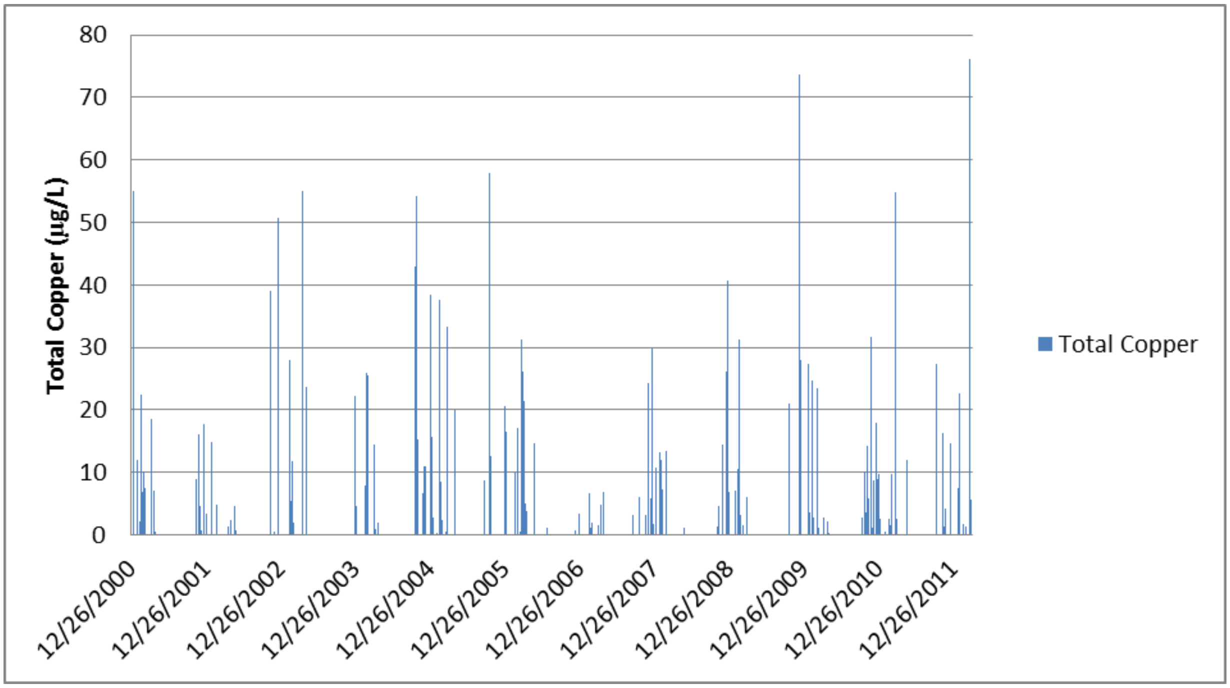


Figure A.37. Coyote Creek Subwatershed 5083 Lead Pollutograph

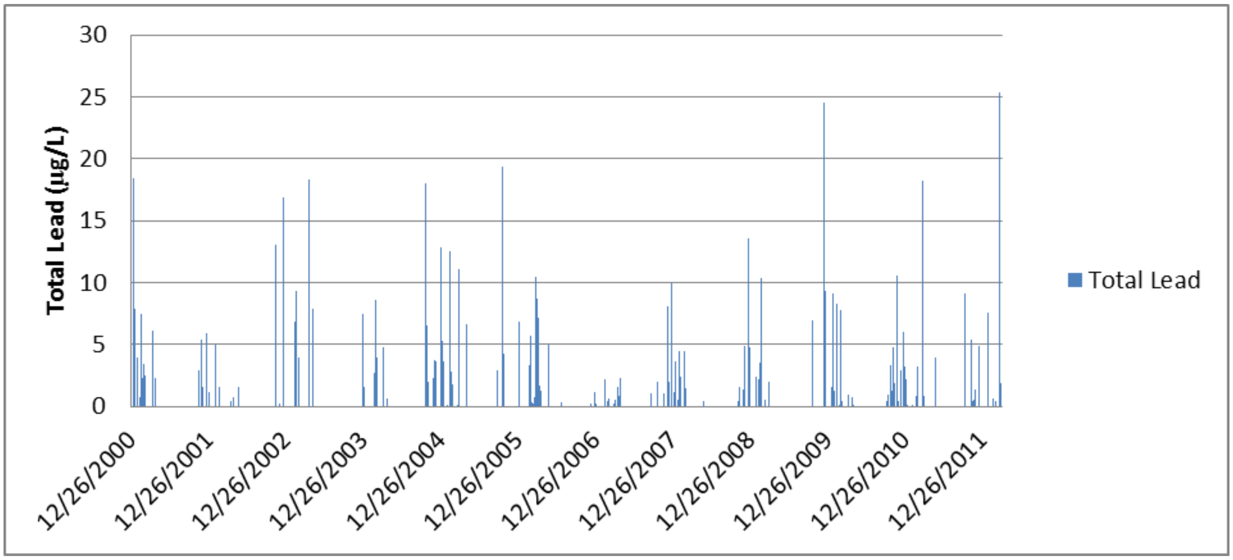


Figure A.38. Coyote Creek Subwatershed 5083 Zinc Pollutograph

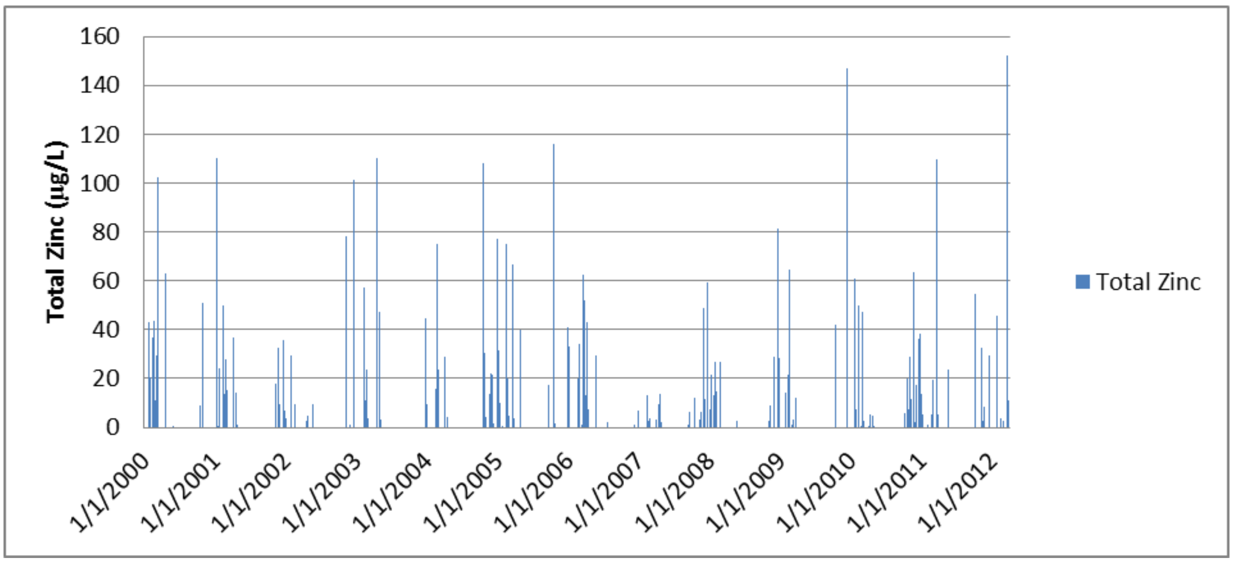


Figure A.39. Coyote Creek Subwatershed 5083 Selenium Pollutograph

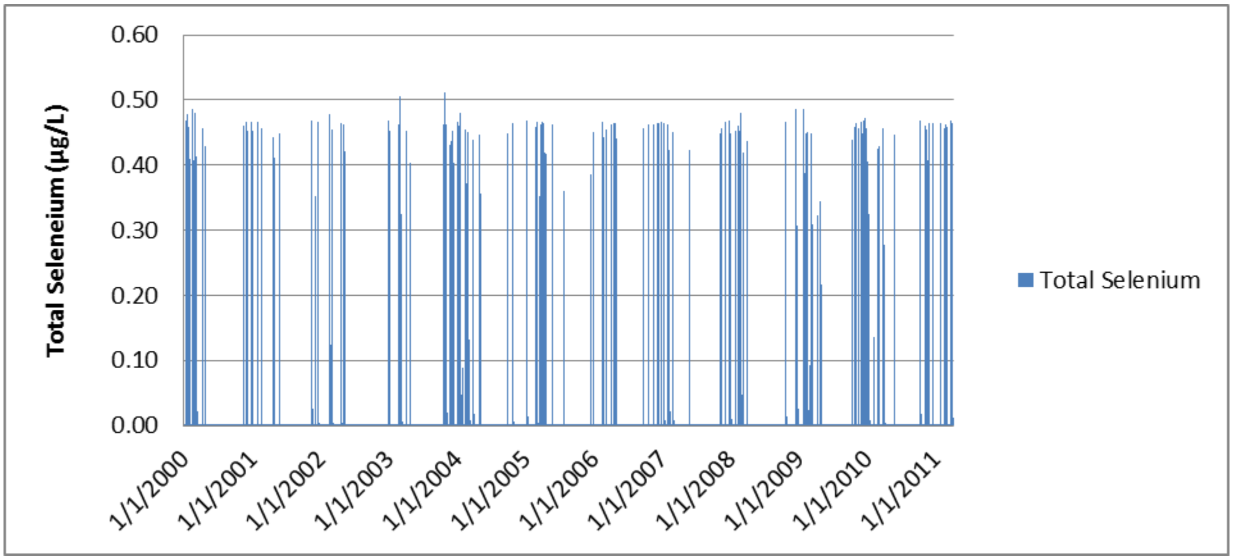
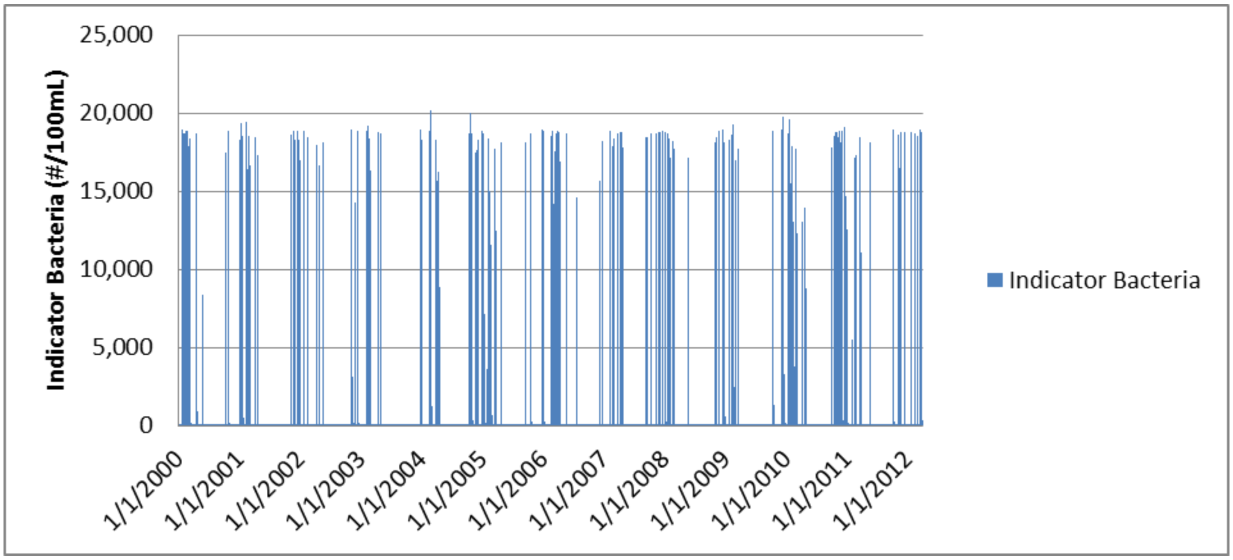


Figure A.40. Coyote Creek Subwatershed 5083 Indicator Bacteria Pollutograph



San Jose Creek Subwatershed Pollutographs

Figure A.41. San Jose Creek Subwatershed 5173 Copper Pollutograph

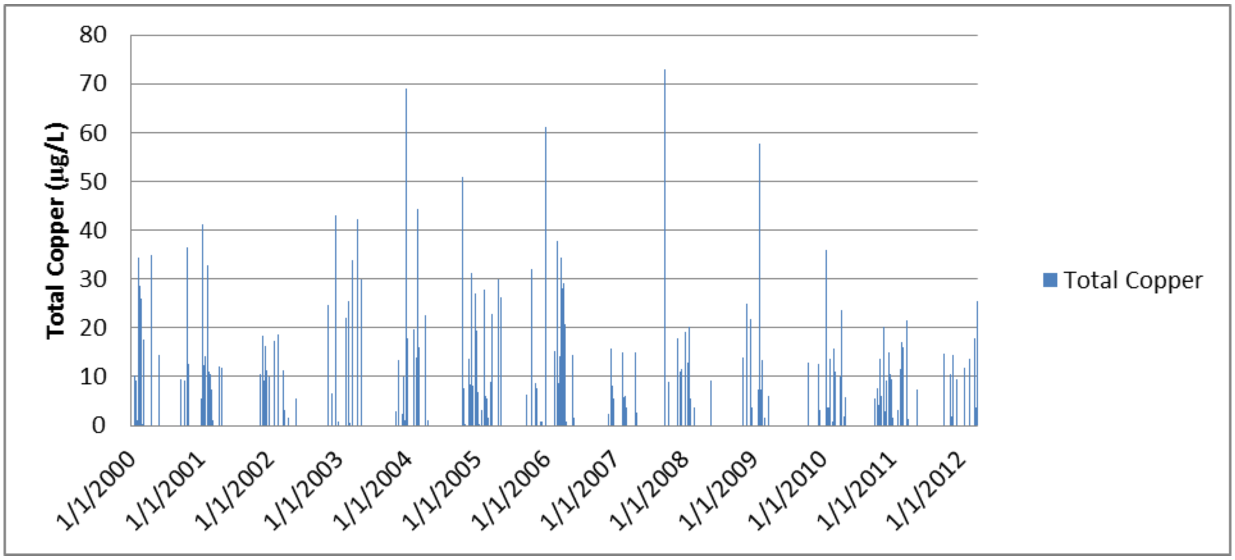


Figure A.42. San Jose Creek Subwatershed 5173 Lead Pollutograph

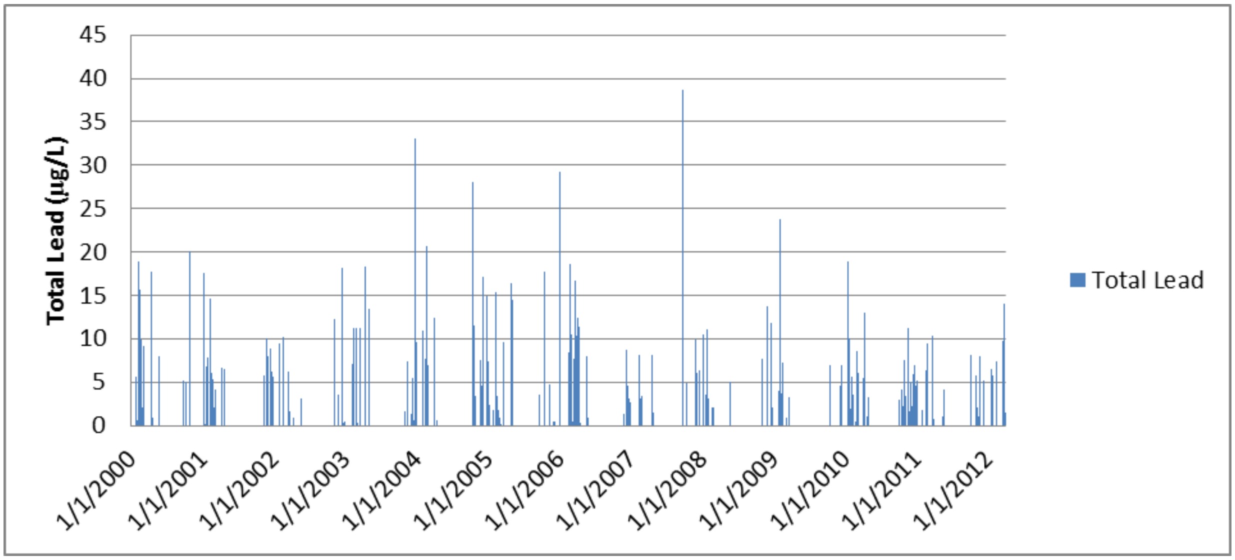


Figure A.43. San Jose Creek Subwatershed 5173 Zinc Pollutograph

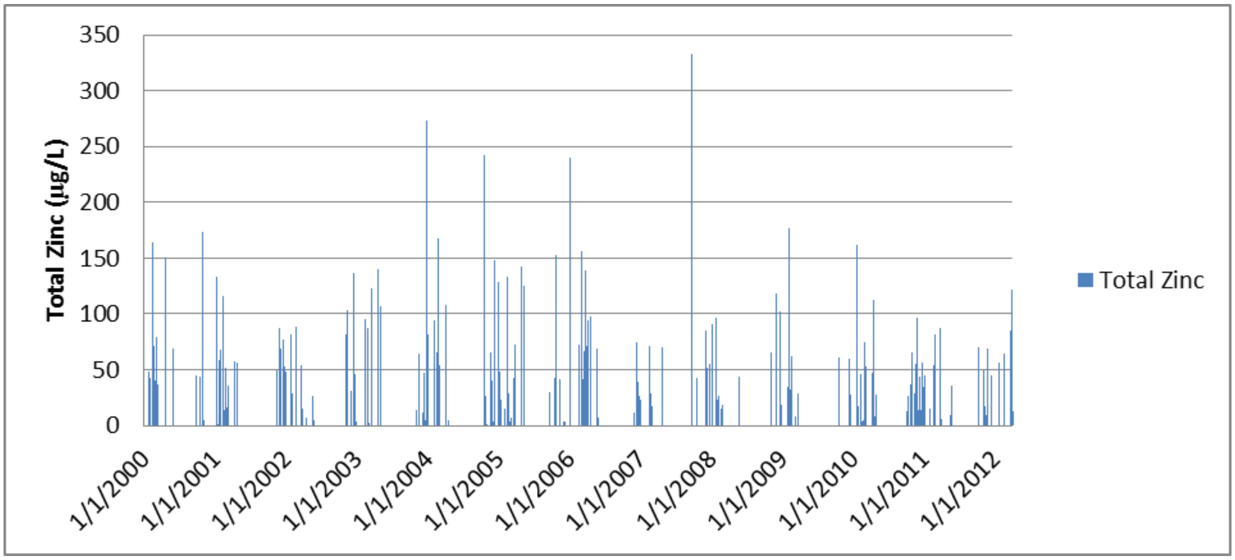


Figure A.44. San Jose Creek Subwatershed 5173 Selenium Pollutograph

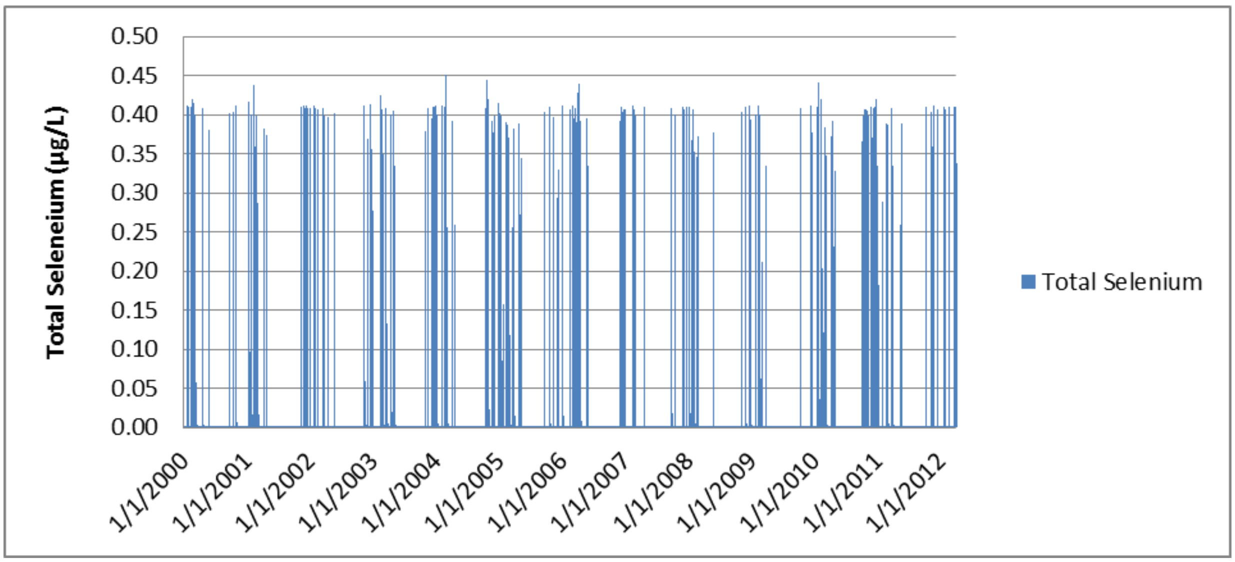


Figure A.45. Coyote Creek Subwatershed 5173 Indicator Bacteria Pollutograph

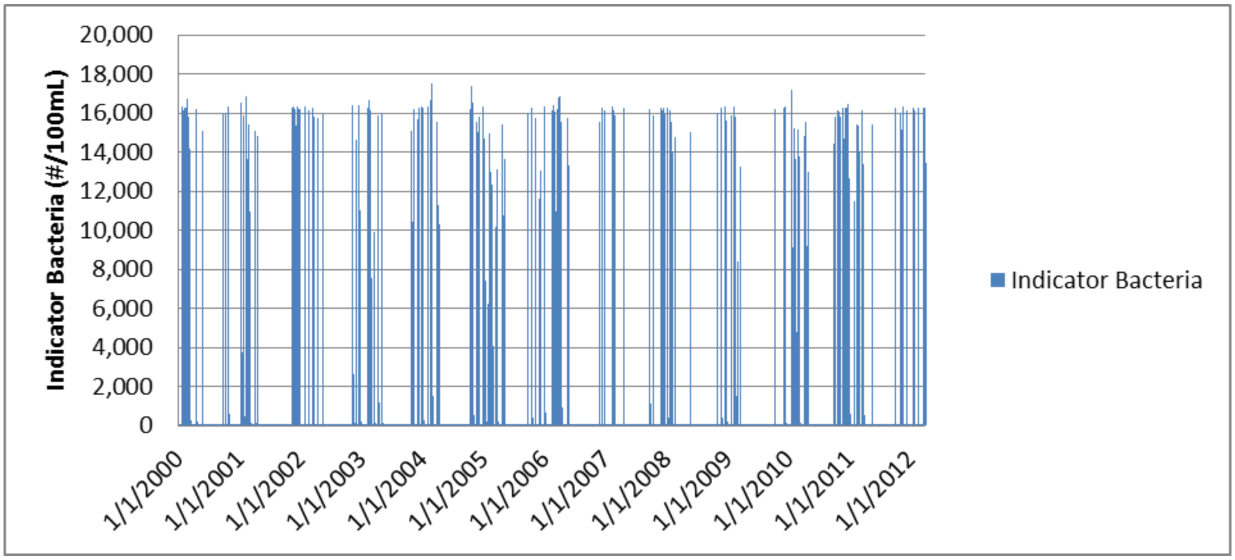


Figure A.46. Coyote Creek Subwatershed 5175 Copper Pollutograph

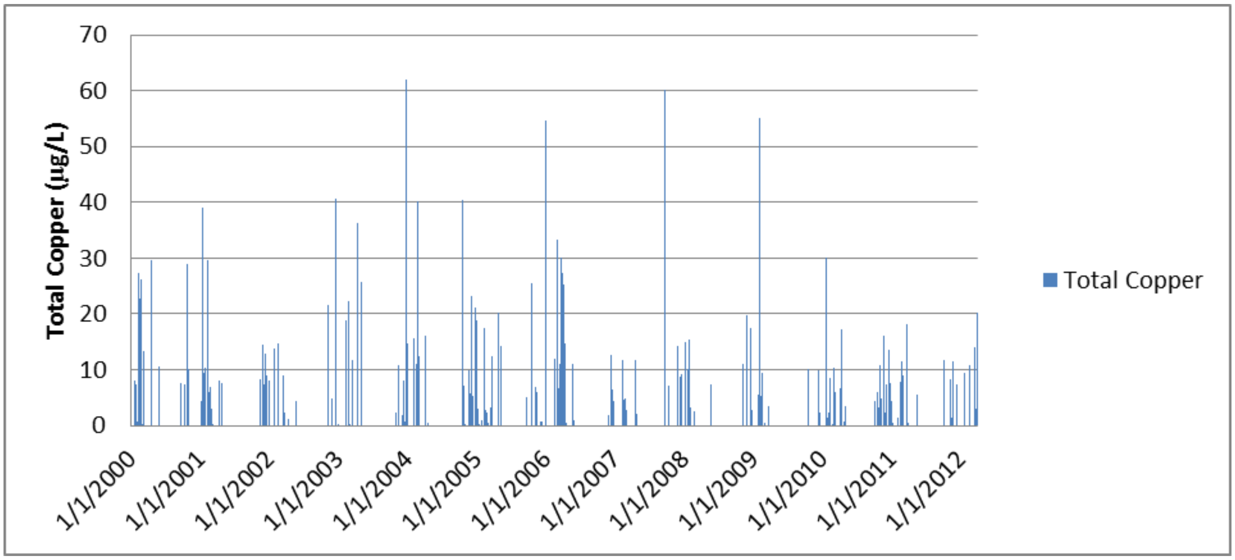


Figure A.47. Coyote Creek Subwatershed 5175 Lead Pollutograph

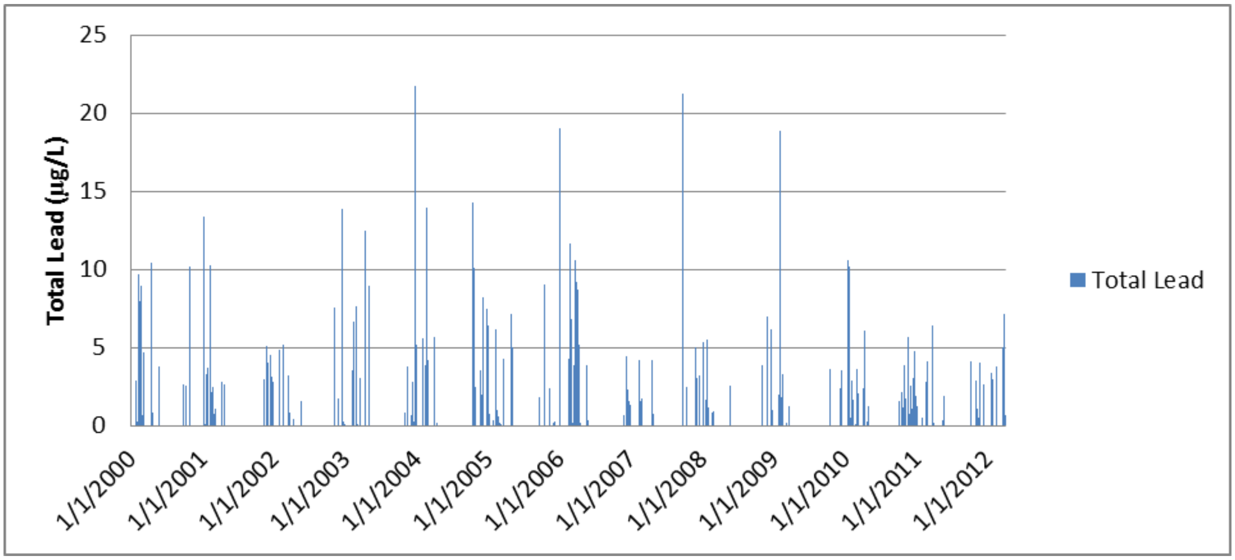


Figure A.48. Coyote Creek Subwatershed 5175 Zinc Pollutograph

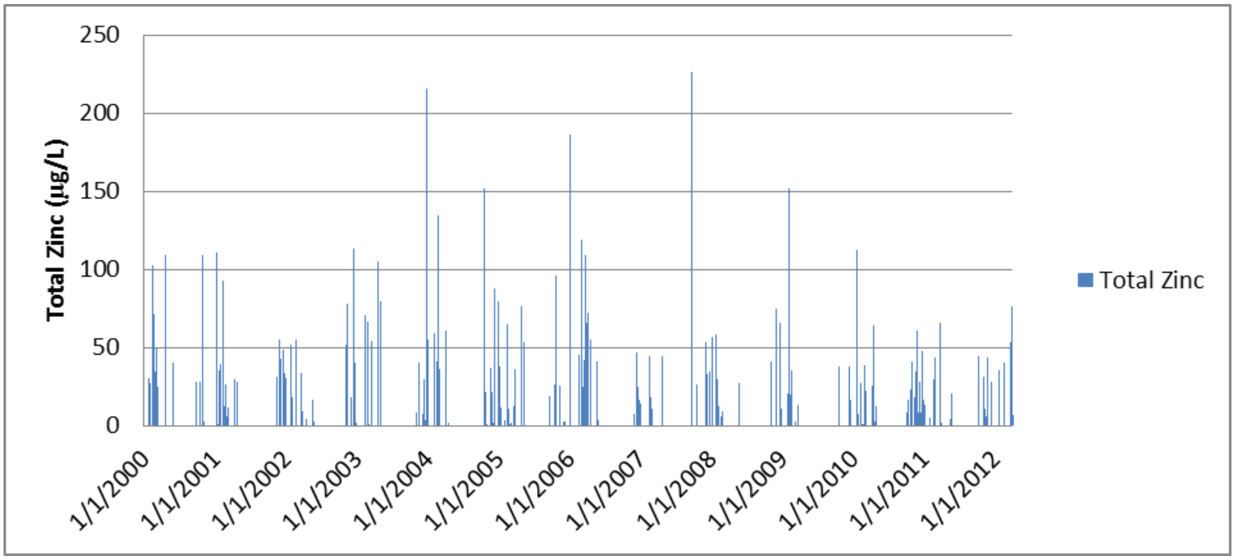


Figure A.49. Coyote Creek Subwatershed 5175 Selenium Pollutograph

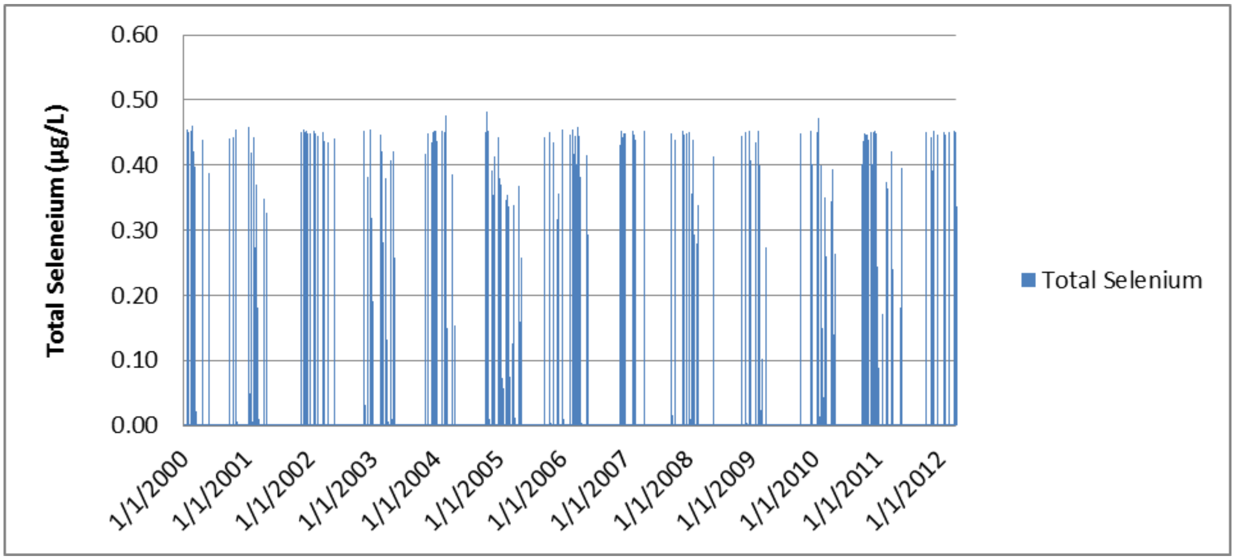


Figure A.50. Coyote Creek Subwatershed 5175 Indicator Bacteria Pollutograph

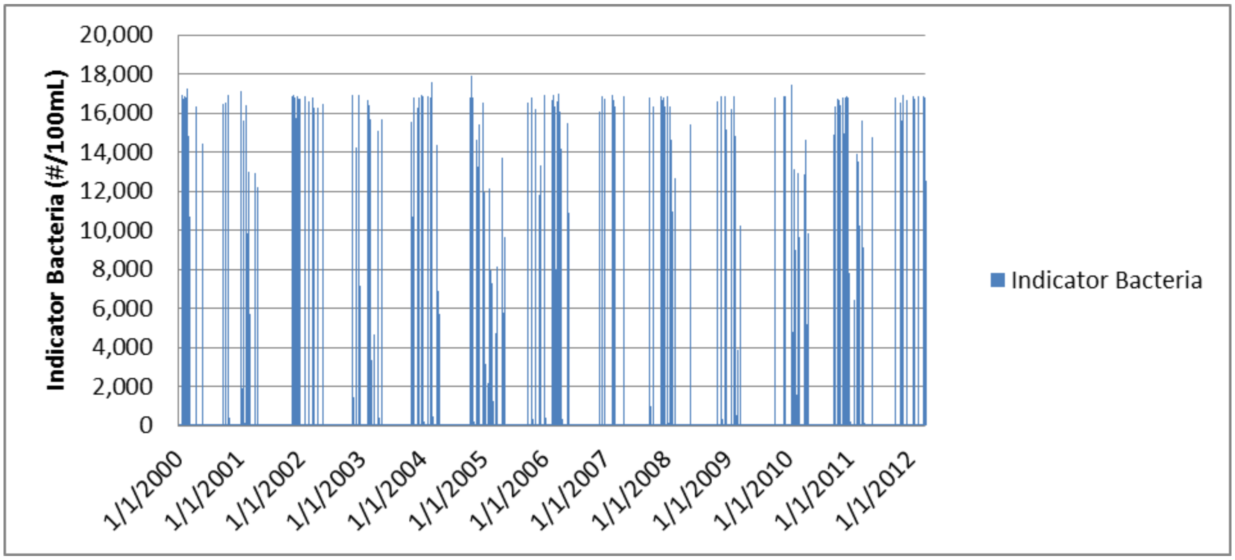


Figure A.51. Coyote Creek Subwatershed 5183 Copper Pollutograph

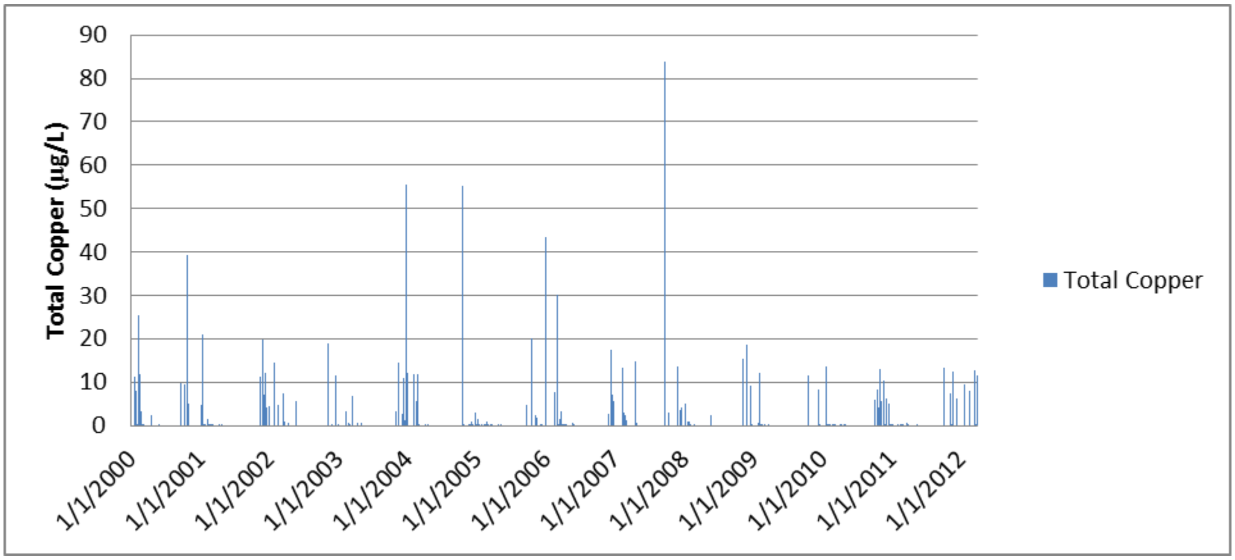


Figure A.52. Coyote Creek Subwatershed 5183 Lead Pollutograph

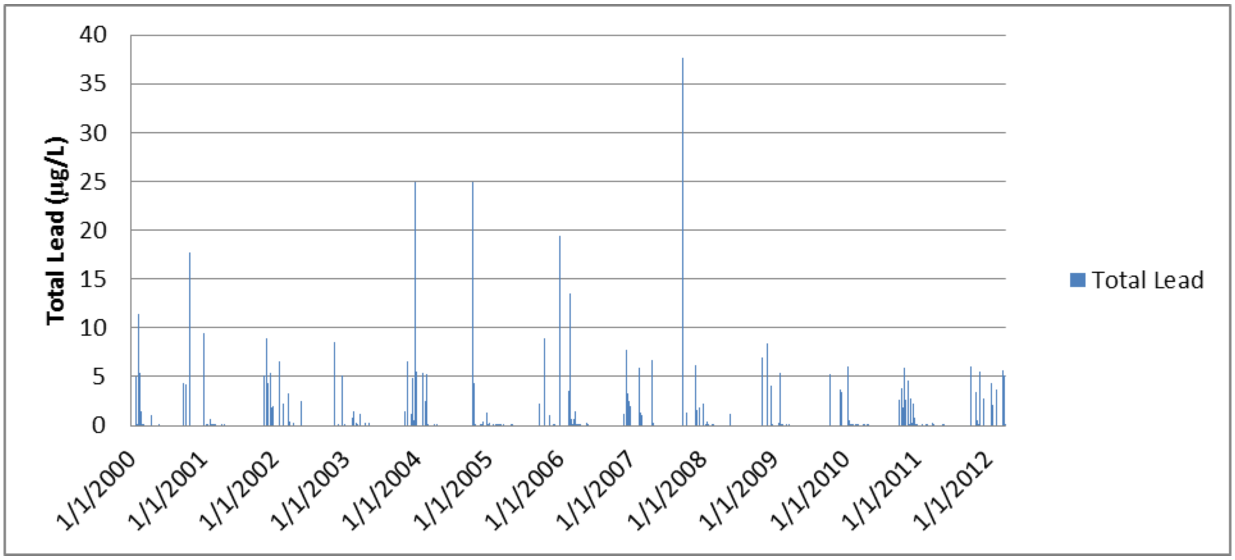


Figure A.53. Coyote Creek Subwatershed 5183 Zinc Pollutograph

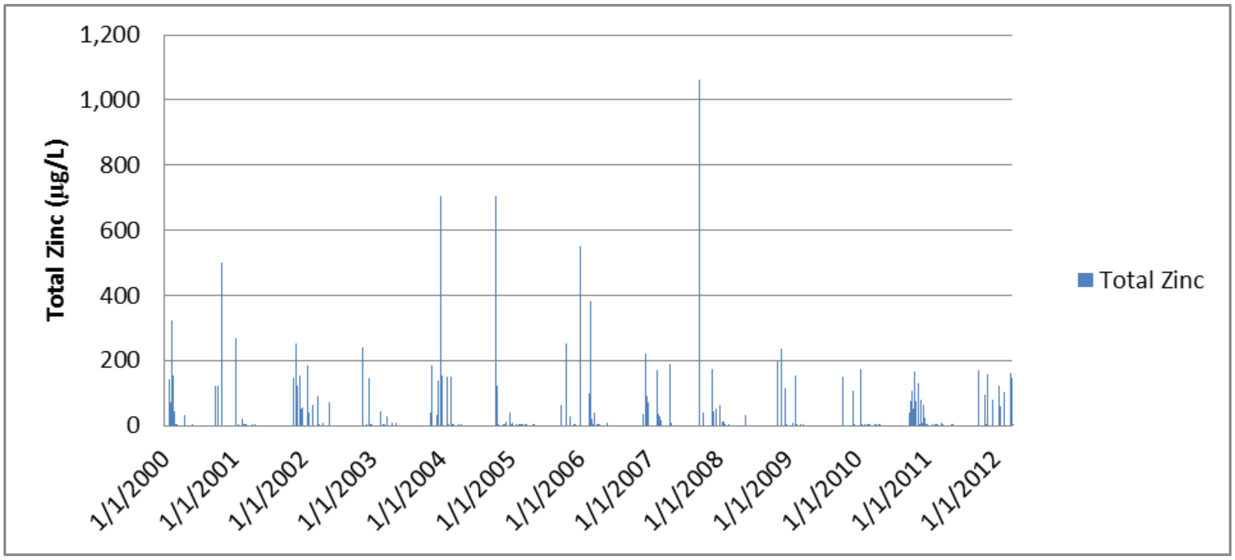


Figure A.54. Coyote Creek Subwatershed 5183 Selenium Pollutograph

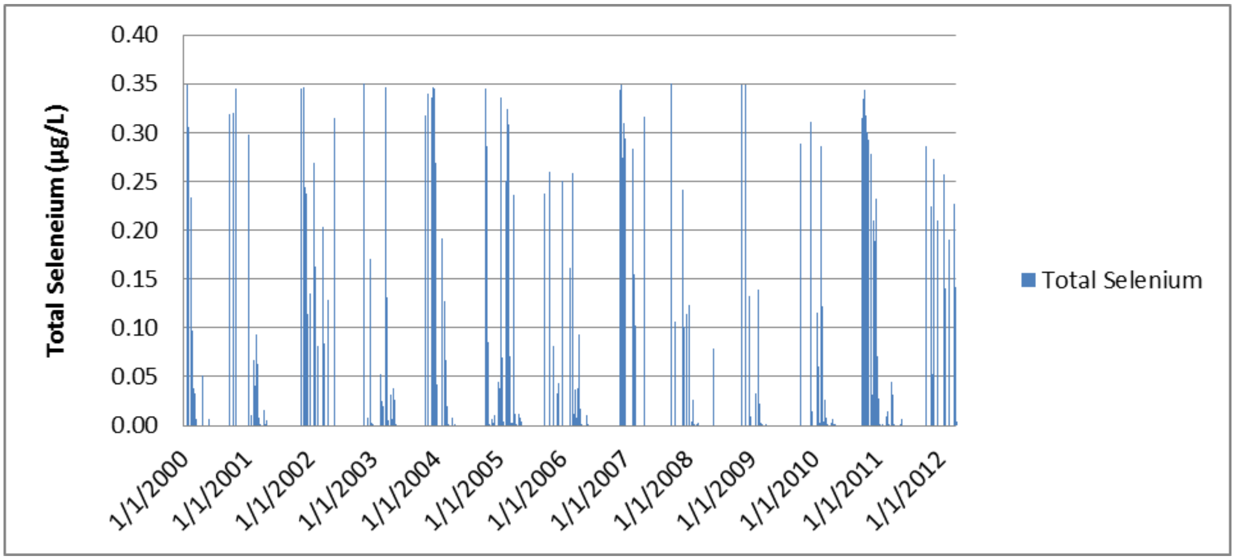


Figure A.55. Coyote Creek Subwatershed 5183 Indicator Bacteria Pollutograph

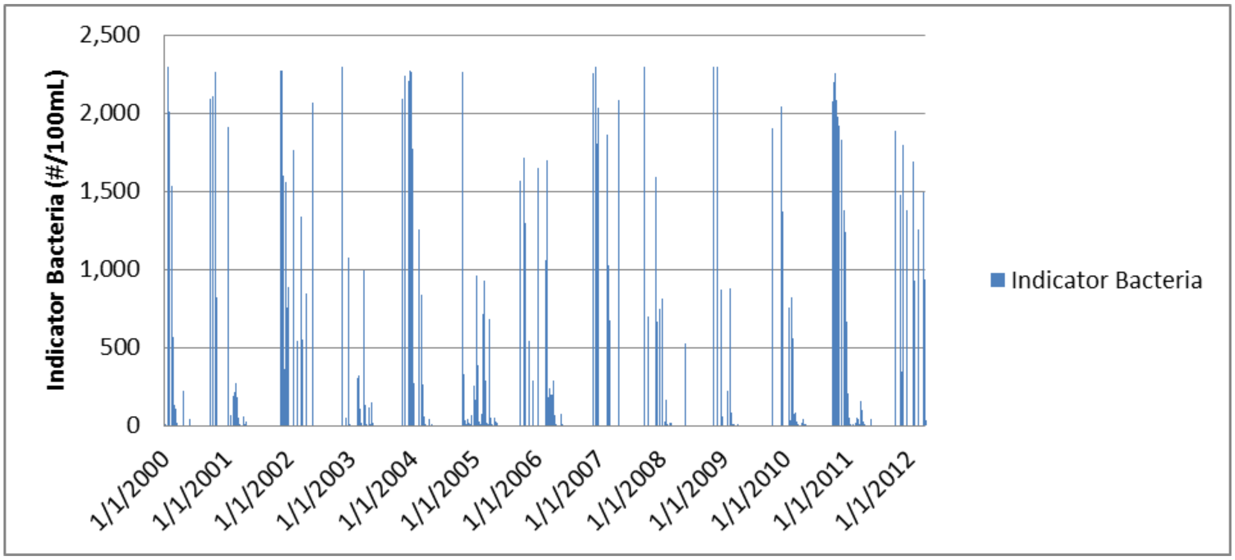


Figure A.56. Coyote Creek Subwatershed 5189 Copper Pollutograph

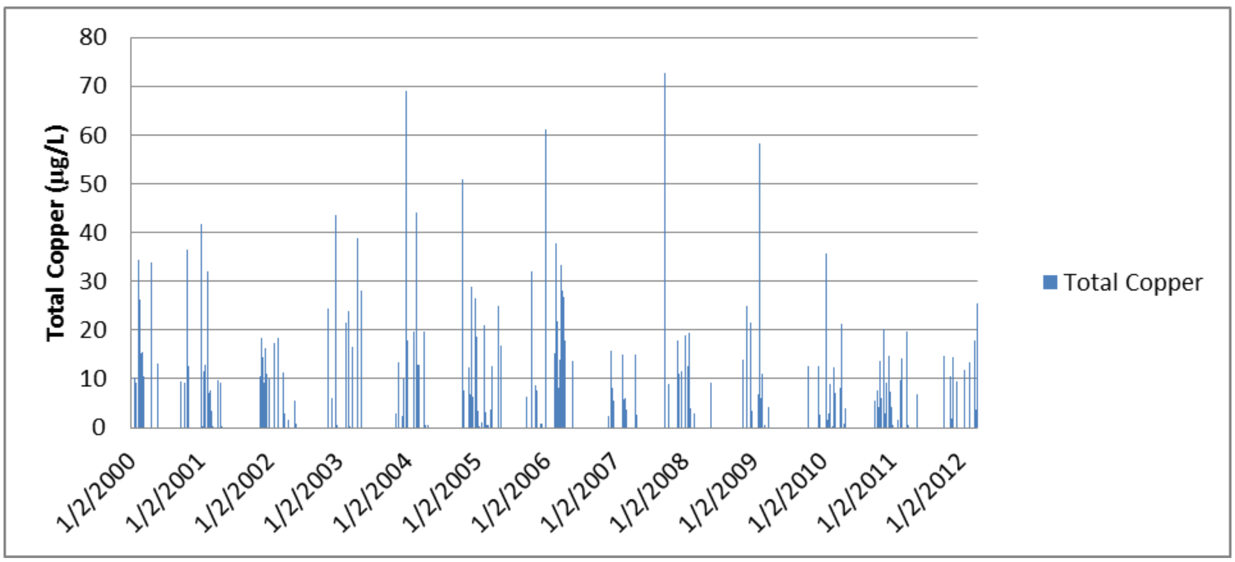


Figure A.57. Coyote Creek Subwatershed 5189 Lead Pollutograph

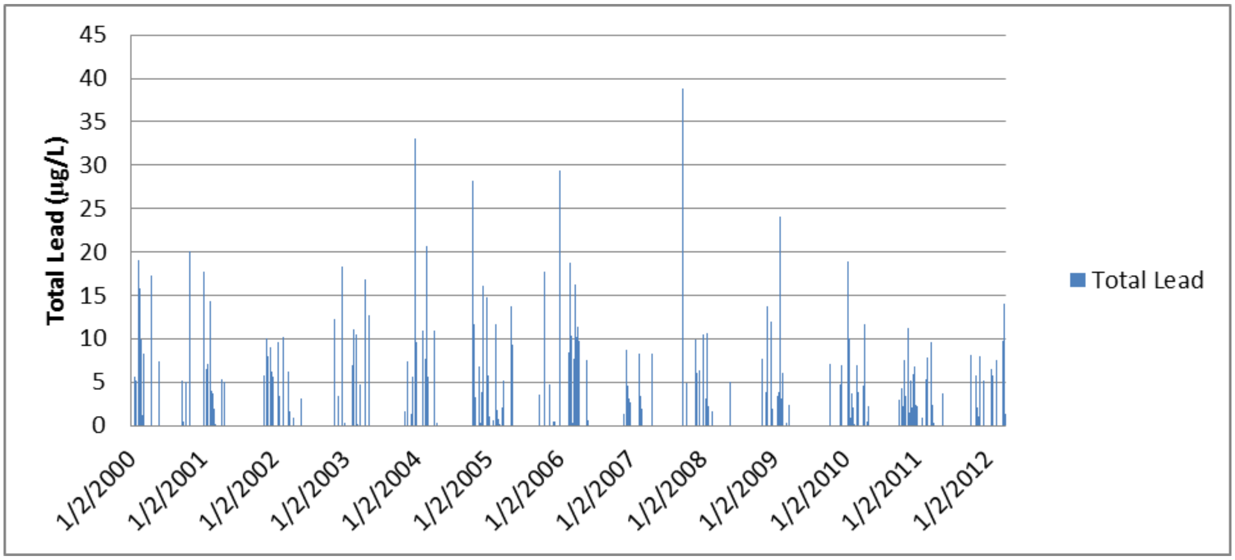


Figure A.58. Coyote Creek Subwatershed 5189 Zinc Pollutograph

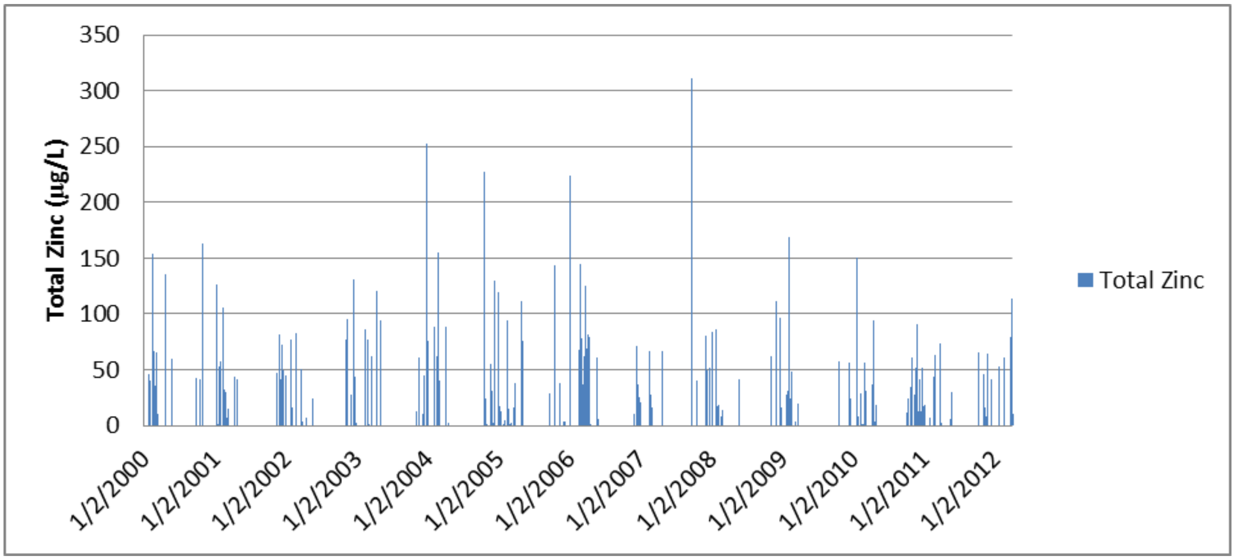


Figure A.59. Coyote Creek Subwatershed 5189 Selenium Pollutograph

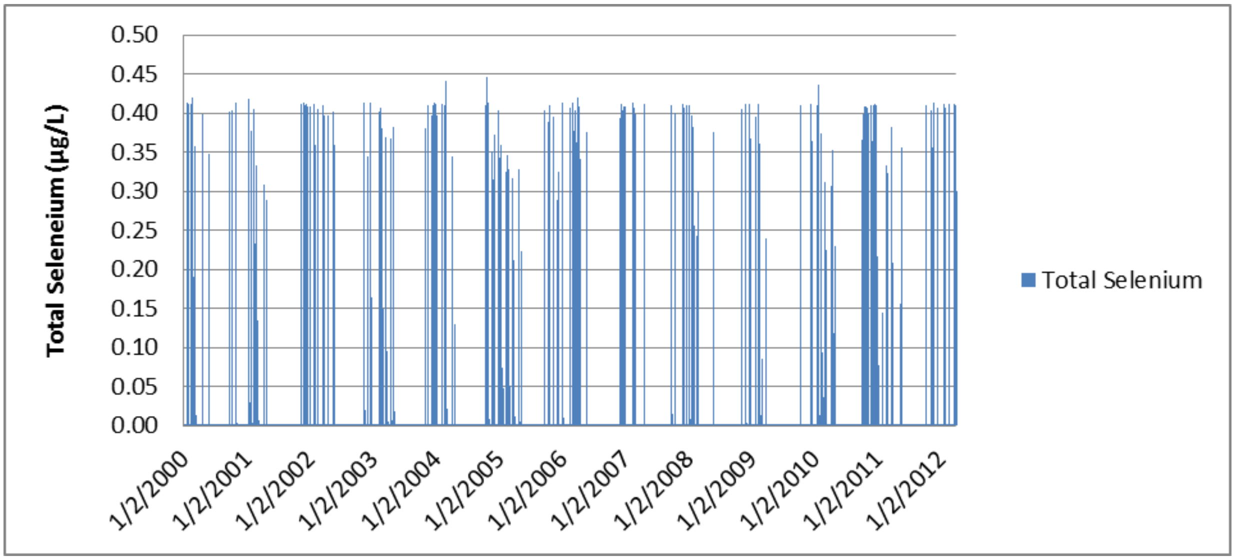
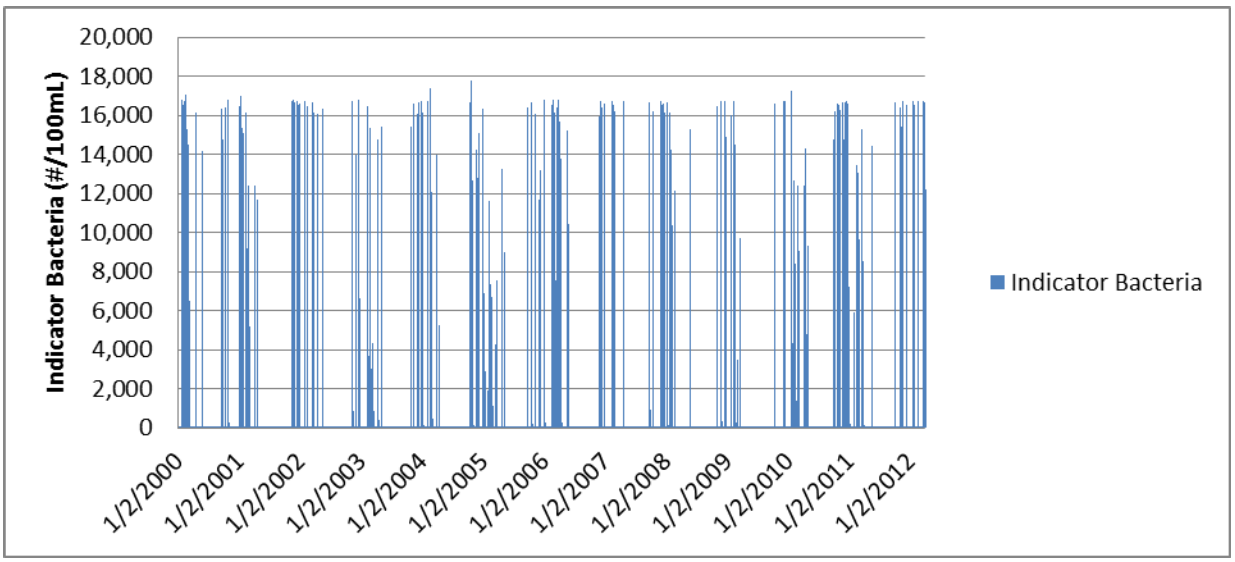


Figure A.60. Coyote Creek Subwatershed 5189 Indicator Bacteria Pollutograph



Appendix B

Summary of Data Sources

Table B.1. Summary of Data Sources used in the WMMS La Habra Heights Reasonable Assurance Analysis

Data Type	File Name	Source	Data Period	Notes
Geometric Data				
Topography Layer(s)	n34w118.dbf n34w119.dbf n35w118.dbf n35w119.dbf	USGS National Elevation Dataset (NED)	Accessed 02/2014	
Land Use	Parcel History.gdb City_Streets.dbf	City of La Habra Heights	Accessed 02/2014	
Stream Network	NHDH_CA.gdb	USGS National Hydrography Dataset (NHD)	Accessed 02/2014	
Drainage Areas	WMMS LAC Subwatersheds	WMMS	2012	
Meteorological Data				
Precipitation	1088B.pre 106F.pre	WMMS	01/04/1986 - 04/26/2012	
Evaporation	23129.air 96.air	WMMS	12/31/1985 - 04/30/2012	
Soil Hydrologic Data				
Hydrologic Soil Groups	gsmsoilmu_a_ca.shp	Natural Resources Conservation Service (NRCS).2006. STATSGO2	2006	
Percent of Area Distribution	gsmsoilmu_a_ca.shp	Natural Resources Conservation Service (NRCS).2006. STATSGO2	2006	
Fraction of Sand, Silt, and Clay for Different Soil Groups	N/A	N/A	N/A	
Average Slope	Sta.bmp	Calculated from USGS National Elevation Dataset (NED)	NED Accessed 02/2014	Calculated from USGS DEM 0.3 arc seconds
Vegetative Cover for Different Soil Groups	NLCD2001_CAN_N33W117_v1.tif	Percent Tree Canopy (Version 1.0) data (NLCD 2001)	Accessed 02/2014	
Hydrologic Data				
In-Stream Flow	N/A	N/A	N/A	
In-Stream Depth	N/A	N/A	N/A	
Point Source Data*				
Point Source Location				
Point Source Discharge				
Point Source Concentration				

N/A = not applicable

Notes: *No point sources of discharge are located within the City of La Habra Heights.

Appendix C

Model Input Parameters

```
c-----------------------------------------------------------------
-------------------------
c LSPC -- Loading Simulation Program, C++
c Version 4.1.0 - April 11, 2011
c
c Designed and maintained by:
c     Tetra Tech, Inc.
c     10306 Eaton Place, Suite 340
c     Fairfax, VA 22030
c     (703) 385-6000
c-----------------------------------------------------------------
-------------------------
c LSPC MODEL INPUT FILE
c This input file was created at 01:02:41am on 09/08/2014
c-----------------------------------------------------------------
-------------------------
c0   general control
c
c    snowfg   if = 1 run snow module
c    pwatfg   if = 1 run pwater
c    sedfg    if = 1 run sediment
c    pqalfg   if = 1 run general quality
c    tempfg   if = 1 run temperature module
c    oxfg     if = 1 run DO-BOD module
c    nutfg    if = 1 run nutrients module
c    plkfg    if = 1 run plank module
c    phfg     if = 1 run pH-CO2 module
c    mstlfg   if = 1 run mstlay module
c    pestfg   if = 1 run pest module
c    nitrfg   if = 1 run nitr module
c    phosfg   if = 1 run phos module
c    tracfg   if = 1 run tracer module
c    mdasfg   if = 1 run mdas module
c
c     snowfg     pwatfg     sedfg pqalfg     tempfg     oxfg  nutfg
      plkfg phfg  mstlfg     pestfg   nitrfg   phosfg   tracfg
mdasfg
      0    1    1    1    0    0    0    0    0    0    0
      0    0    0    0
c-----------------------------------------------------------------
-------------------------
c10  weather file definition (name and parameters)
c
c    wfileid    weather file id
c    wfilename  weather file name
c    wparamnum  number of parameters in the weather file
c    wparamid   weather paramter id
c               1-precipitation (in/ivl)
c               2-potential evaporation (in/ivl)
c               3-air temperature (degree F)
c               4-wind speed (mile/ivl)
c               5-solar radiation (ly/ivl)
```

```
c               6-dew point (degree F)
c               7-cloud cover (tenth)
c
c    wfileid   wfilename   wparamnum   wparamid...
     1    23129.air  1    2
     17   D96.air    1    2
     1014 D106.pre   1    1
     1021 D1088.pre  1    1
c-----------------------------------------------------------------
-------------------------
c15  weather station definition (station id and associated
weather files)
c
c    wstationid  weather station id
c    wfilenum    number of files for the weather station
c    wfileid     weather file id (card 10)
c
c   wstationid   wfilenum   wfileid...
     14   2     1014  1
     21   2     1021  17
c-----------------------------------------------------------------
-------------------------
c20  weather parameter multiplier
c
c    wstationid  weather station id (card 15)
c    wparmmult   multiplier for each weather parameter
c               1- multiplier for precipitation
c               2- multiplier for potential evaporation
c               3- multiplier for air temperature
c               4- multiplier for wind speed
c               5- multiplier for solar radiation
c               6- multiplier for dew point
c               7- multiplier for cloud cover
c
c  wstationid  wparmmult1...
     14   1.000000   1.000000
     21   1.000000   1.000000
c-----------------------------------------------------------------
-------------------------
c30  output file path     input (weather) file path  (each must
be a continuous string)
     C:\LA_Mapwindow\DATA\Output\     C:\LA_MapWindow\Weather\
c-----------------------------------------------------------------
-------------------------
c40  general watershed controls
c
c    nsubbasin   number of subwatersheds
c    nrchid      number of stream channels (corresponds with
number of subwatersheds)
c    nrgid       number of stream groups to assign parameters
c    ndefid      number of land groups to assign parameters
c    ndeluid     maximum number of land use
```

```
c
c     nsws   nrch    nrgroup    nlgroup    nlandp
      10   10   1    1    21
c-----------------------------------------------------------------
-------------------------
c45  general output controls
c
c    Standard    Output standard model parameters
c    Snow        Output snow related parameters
c    Hydrology  Output hydrology related parameters
c    Sediment    Output sediment related parameters
c    GQUAL      Output general water quality related parameters
c    AGCHEM           Output agricultural water quality related
parameters
c    RQUAL      Output biochemical water quality related
parameters
c    Custom      Output user specified parameters
c    Landuse     Output landuse summary
c                     if = 0 no output
c                     if = 1 average annual output
c                     if = 2 yearly output
c                     if = 3 monthly output
c    Stream      Output stream summary
c                     if = 0 no output
c                     if = 1 average annual output
c                     if = 2 yearly output
c                     if = 3 monthly output
c    Threshold   Output threshold analysis summary
c                     if = 0 no output
c                     if = 1 average monthly output
c
c     Standard  Snow  Hydrology  Sediment  GQUAL  AGCHEM   RQUAL
Custom  Landuse  Stream  Threshold
      1    0    0    0    0    0    0    0    1    1    0
c-----------------------------------------------------------------
-------------------------
c46  user specified output parameter list
c
c   PRECP   AIRTMP  SNOTMP  SNOWF   RAINF   PRAIN   MELT   SNOWE
WYIELD  PACK    PACKF   PACKW   PACKI   PDEPTH  COVINDX   NEGHTS
XLNMELT     RDENPKF     SKYCLEAR    SNOCOV  DULLNESS    ALBEDO
PAKTEMP     DEWTMP  SURS    UZS     LZS     AGWS    SURO    IFWO
AGWO    PERO    TAET    PERC    INFIL   GWI     IGWI    AGWI
DEP     AVDEP   HRAD    AVVEL   SAREA   VOLUME   RO  TAU   WSSD
SCRSD   SOSED  SOBER   SSEDC  LSSED   LRSED  LBEDDEP  LDEPSCR
LROSED  SQO     WASHQS  SCRQS   SOQO    POQUAL  SOQUAL  IOQUAL
GOQUAL  POQC  CONC  CONCOUT  CONCSQAL   MATSQAL  MATIN   MATOUT
MATOSQAL  DOX   DOXMIN  DOXMAX   DOXAV   DOXX   BOD   BODX  NO3
NO3X   TAM    TAMX    NO2    NO2X    PO4    PO4X   SNH4   SNH4X
SPO4   SPO4X    PHYTO   PHYTOX   PHYCLA   BENAL   ORN     ORNX
ORP     ORPX   ORC   ORCX   PH    ALK   TIC   TICX   CO2   CO2X
TEMP   MDASNH4   MDASNO3   MDASSO4   MDASDFe  MDASTFe  MDASDAl
```

```
MDASTAl    MDASpH    MDASACID    MDASALK    MDASOrgN   MDASH2O
MDASH   MDASCa   MDASCO3   MDASOrg   MDASNO2
c-----------------------------------------------------------------
-------------------------
c50  model simulation time period
c
c    mstart   model start day.
c    mend     model end day.
c    delt     time step in minutes.
c    mostart  model output start day.
c    moend    model output end day.
c    optlevel  if = 1 general output (daily)
c              if = 2 output per time interval (min)
c
c     mstart   mend    delt mostart    moend   optlevel
      10/1/1998  3/31/2012  60    1/1/2000   3/31/2012  1
c-----------------------------------------------------------------
-------------------------
c60  group information
c
c    subbasin  subbasin id
c    defid     group parameter id
c    nwst      number of weather stations assigned to the
watershed  (<=5)
c    wsti = station id
c    wti = weighting to calculate input
c
c     subbasin   defid   nwst  wst1   wt1   wst2   wt2   ...
      5046  1     1     21    1.000000
      5065  1     1     21    1.000000
      5066  1     1     21    1.000000
      5079  1     1     21    1.000000
      5080  1     1     21    1.000000
      5083  1     1     14    1.000000
      5173  1     1     21    1.000000
      5175  1     1     21    1.000000
      5183  1     1     21    1.000000
      5189  1     1     21    1.000000
c-----------------------------------------------------------------
-------------------------
c70  modeled land use names
c
c    deluid     landuse id
c    deluname   landuse name
c
c     deluid    deluname
      1     HD_SF_Residential
      2     LD_SF_Res_Moderate
      3     LD_SF_Res_Steep
      4     MF_Res
      5     Commercial
      6     Institutional
```

```
      7     Industrial
      8     Transportation
      9     Secondary_Roads
      10    Urban_Grass_Irrigated
      11    Urban_Grass_NonIrrigated
      12    Agriculture_Moderate_B
      13    Agriculture_Moderate_D
      14    Vacant_Moderate_B
      15    Vacant_Moderate_D
      16    Vacant_Steep_A
      17    Vacant_Steep_B
      18    Vacant_Steep_C
      19    Vacant_Steep_D
      20    Water
      21    Water_Reuse
c-----------------------------------------------------------------
-------------------------
c80  land use to stream routing
c
c    defid       landuse default group id
c    deluid      land use id
c    route_suro  fraction of surface runoff that routes to the
stream (0-1)
c    route_ifwo  fraction of interflow outflow that routes to the
stream (0-1)
c    route_agwo  fraction of groundwater outflow that routes to
the stream (0-1)
c
c    Note: The remaining fraction is routed directly to the next
downstream reach segment(s)
c
c  defid  deluid  route_suro  route_ifwo  route_agwo
      1     1    1.000000   1.000000   1.000000
      1     2    1.000000   1.000000   1.000000
      1     3    1.000000   1.000000   1.000000
      1     4    1.000000   1.000000   1.000000
      1     5    1.000000   1.000000   1.000000
      1     6    1.000000   1.000000   1.000000
      1     7    1.000000   1.000000   1.000000
      1     8    1.000000   1.000000   1.000000
      1     9    1.000000   1.000000   1.000000
      1     10   1.000000   1.000000   1.000000
      1     11   1.000000   1.000000   1.000000
      1     12   1.000000   1.000000   1.000000
      1     13   1.000000   1.000000   1.000000
      1     14   1.000000   1.000000   1.000000
      1     15   1.000000   1.000000   1.000000
      1     16   1.000000   1.000000   1.000000
      1     17   1.000000   1.000000   1.000000
      1     18   1.000000   1.000000   1.000000
      1     19   1.000000   1.000000   1.000000
      1     20   1.000000   1.000000   1.000000
```

```
     1    21   1.000000   1.000000   1.000000
c-----------------------------------------------------------------
-------------------------
c90  land use information
c
c    subbasin   subbasin id
c    deluid     land use id
c    deluname   land use name
c    perimp     1 imperivous land (subsurface processes disabled)
c               2 pervious  land (subsurface processes activated)
c    area_ac    area (acres)
c    slsur      slope of overland flow plane (none)
c    lsur       length of overland flow plane (feet)
c
c  subbasin  deluid  deluname  perimp  area_ac  slsur   lsur
     5046  1    HD_SF_Residential    1    0.000000   0.040000
     300.000000
     5046  2    LD_SF_Res_Moderate   1    0.000000   0.040000
     300.000000
     5046  3    LD_SF_Res_Steep 1    176.109395 0.040000
     300.000000
     5046  4    MF_Res     1    0.000000   0.040000   300.000000
     5046  5    Commercial 1    0.000000   0.040000   300.000000
     5046  6    Institutional   1    5.131054   0.040000
     300.000000
     5046  7    Industrial 1    0.022494   0.040000   300.000000
     5046  8    Transportation  1    0.000000   0.040000
     300.000000
     5046  9    Secondary_Roads 1    12.781862  0.040000
     300.000000
     5046  10   Urban_Grass_Irrigated 2    58.703132  0.040000
     300.000000
     5046  11   Urban_Grass_NonIrrigated   2    16.905039
     0.040000   300.000000
     5046  12   Agriculture_Moderate_B     2    0.000000
     0.040000   300.000000
     5046  13   Agriculture_Moderate_D     2    16.772323
     0.040000   300.000000
     5046  14   Vacant_Moderate_B    2    0.000000   0.050000
     300.000000
     5046  15   Vacant_Moderate_D    2    0.000000   0.050000
     300.000000
     5046  16   Vacant_Steep_A  2    0.000000   0.300000
     300.000000
     5046  17   Vacant_Steep_B  2    0.000000   0.300000
     300.000000
     5046  18   Vacant_Steep_C  2    614.883128 0.300000
     300.000000
     5046  19   Vacant_Steep_D  2    0.000000   0.300000
     300.000000
     5046  20   Water 2    0.000000   0.050000   300.000000
     5046  21   Water_Reuse     2    0.000000   0.050000
```

300.000000
5065 1 HD_SF_Residential 1 0.000000 0.040000
300.000000
5065 2 LD_SF_Res_Moderate 1 0.000000 0.040000
300.000000
5065 3 LD_SF_Res_Steep 1 132.647989 0.040000
300.000000
5065 4 MF_Res 1 0.000000 0.040000 300.000000
5065 5 Commercial 1 0.000000 0.040000 300.000000
5065 6 Institutional 1 10.780515 0.040000
300.000000
5065 7 Industrial 1 2.512259 0.040000 300.000000
5065 8 Transportation 1 0.000000 0.040000
300.000000
5065 9 Secondary_Roads 1 10.480644 0.040000
300.000000
5065 10 Urban_Grass_Irrigated 2 44.215996 0.040000
300.000000
5065 11 Urban_Grass_NonIrrigated 2 15.504804
0.040000 300.000000
5065 12 Agriculture_Moderate_B 2 0.000000
0.040000 300.000000
5065 13 Agriculture_Moderate_D 2 12.633142
0.040000 300.000000
5065 14 Vacant_Moderate_B 2 0.000000 0.050000
300.000000
5065 15 Vacant_Moderate_D 2 0.000000 0.050000
300.000000
5065 16 Vacant_Steep_A 2 0.000000 0.300000
300.000000
5065 17 Vacant_Steep_B 2 0.000000 0.300000
300.000000
5065 18 Vacant_Steep_C 2 522.691290 0.300000
300.000000
5065 19 Vacant_Steep_D 2 0.000000 0.300000
300.000000
5065 20 Water 2 0.000000 0.050000 300.000000
5065 21 Water_Reuse 2 0.000000 0.050000
300.000000
5066 1 HD_SF_Residential 1 0.000000 0.040000
300.000000
5066 2 LD_SF_Res_Moderate 1 0.000000 0.040000
300.000000
5066 3 LD_SF_Res_Steep 1 154.120284 0.040000
300.000000
5066 4 MF_Res 1 0.000000 0.040000 300.000000
5066 5 Commercial 1 0.000000 0.040000 300.000000
5066 6 Institutional 1 9.135998 0.040000
300.000000
5066 7 Industrial 1 2.331311 0.040000 300.000000
5066 8 Transportation 1 0.000000 0.040000
300.000000

5066	9	Secondary_Roads	1	12.540831	0.040000	300.000000
5066	10	Urban_Grass_Irrigated	2	227.221577	0.040000	300.000000
5066	11	Urban_Grass_NonIrrigated	2	17.611682	0.040000	300.000000
5066	12	Agriculture_Moderate_B	2	0.000000	0.040000	300.000000
5066	13	Agriculture_Moderate_D	2	14.678122	0.040000	300.000000
5066	14	Vacant_Moderate_B	2	0.000000	0.050000	300.000000
5066	15	Vacant_Moderate_D	2	0.000000	0.050000	300.000000
5066	16	Vacant_Steep_A	2	0.000000	0.300000	300.000000
5066	17	Vacant_Steep_B	2	0.000000	0.300000	300.000000
5066	18	Vacant_Steep_C	2	732.393154	0.300000	300.000000
5066	19	Vacant_Steep_D	2	0.000000	0.300000	300.000000
5066	20	Water	2	0.000000	0.050000	300.000000
5066	21	Water_Reuse	2	0.000000	0.050000	300.000000
5079	1	HD_SF_Residential	1	0.000000	0.040000	300.000000
5079	2	LD_SF_Res_Moderate	1	0.000000	0.040000	300.000000
5079	3	LD_SF_Res_Steep	1	9.265989	0.040000	300.000000
5079	4	MF_Res	1	0.000000	0.040000	300.000000
5079	5	Commercial	1	0.000000	0.040000	300.000000
5079	6	Institutional	1	1.158242	0.040000	300.000000
5079	7	Industrial	1	6.558462	0.040000	300.000000
5079	8	Transportation	1	0.000000	0.040000	300.000000
5079	9	Secondary_Roads	1	0.445738	0.040000	300.000000
5079	10	Urban_Grass_Irrigated	2	3.088663	0.040000	300.000000
5079	11	Urban_Grass_NonIrrigated	2	0.834351	0.040000	300.000000
5079	12	Agriculture_Moderate_B	2	0.000000	0.040000	300.000000
5079	13	Agriculture_Moderate_D	2	0.882475	0.040000	300.000000
5079	14	Vacant_Moderate_B	2	0.000000	0.050000	300.000000
5079	15	Vacant_Moderate_D	2	0.000000	0.050000	300.000000

5079 16 Vacant_Steep_A 2 0.000000 0.300000
300.000000
5079 17 Vacant_Steep_B 2 0.000000 0.300000
300.000000
5079 18 Vacant_Steep_C 2 0.000000 0.300000
300.000000
5079 19 Vacant_Steep_D 2 118.184315 0.300000
300.000000
5079 20 Water 2 0.000000 0.050000 300.000000
5079 21 Water_Reuse 2 0.000000 0.050000
300.000000
5080 1 HD_SF_Residential 1 0.000000 0.040000
300.000000
5080 2 LD_SF_Res_Moderate 1 0.000000 0.040000
300.000000
5080 3 LD_SF_Res_Steep 1 54.482587 0.040000
300.000000
5080 4 MF_Res 1 0.000000 0.040000 300.000000
5080 5 Commercial 1 0.000000 0.040000 300.000000
5080 6 Institutional 1 0.790729 0.040000
300.000000
5080 7 Industrial 1 0.000000 0.040000 300.000000
5080 8 Transportation 1 0.000000 0.040000
300.000000
5080 9 Secondary_Roads 1 4.025620 0.040000
300.000000
5080 10 Urban_Grass_Irrigated 2 18.160862 0.040000
300.000000
5080 11 Urban_Grass_NonIrrigated 2 5.117885
0.040000 300.000000
5080 12 Agriculture_Moderate_B 2 0.000000
0.040000 300.000000
5080 13 Agriculture_Moderate_D 2 5.188818
0.040000 300.000000
5080 14 Vacant_Moderate_B 2 0.000000 0.050000
300.000000
5080 15 Vacant_Moderate_D 2 0.000000 0.050000
300.000000
5080 16 Vacant_Steep_A 2 0.000000 0.300000
300.000000
5080 17 Vacant_Steep_B 2 0.000000 0.300000
300.000000
5080 18 Vacant_Steep_C 2 182.550651 0.300000
300.000000
5080 19 Vacant_Steep_D 2 0.000000 0.300000
300.000000
5080 20 Water 2 0.000000 0.050000 300.000000
5080 21 Water_Reuse 2 0.000000 0.050000
300.000000
5083 1 HD_SF_Residential 1 0.000000 0.040000
300.000000
5083 2 LD_SF_Res_Moderate 1 0.000000 0.040000

300.000000
5083 3 LD_SF_Res_Steep 1 1.552663 0.040000
300.000000
5083 4 MF_Res 1 0.000000 0.040000 300.000000
5083 5 Commercial 1 0.000000 0.040000 300.000000
5083 6 Institutional 1 0.000000 0.040000
300.000000
5083 7 Industrial 1 0.000000 0.040000 300.000000
5083 8 Transportation 1 0.000000 0.040000
300.000000
5083 9 Secondary_Roads 1 0.000000 0.040000
300.000000
5083 10 Urban_Grass_Irrigated 2 0.517554 0.040000
300.000000
5083 11 Urban_Grass_NonIrrigated 2 0.000000
0.040000 300.000000
5083 12 Agriculture_Moderate_B 2 0.000000
0.040000 300.000000
5083 13 Agriculture_Moderate_D 2 0.147873
0.040000 300.000000
5083 14 Vacant_Moderate_B 2 0.000000 0.050000
300.000000
5083 15 Vacant_Moderate_D 2 0.000000 0.050000
300.000000
5083 16 Vacant_Steep_A 2 0.000000 0.300000
300.000000
5083 17 Vacant_Steep_B 2 0.000000 0.300000
300.000000
5083 18 Vacant_Steep_C 2 6.289888 0.300000
300.000000
5083 19 Vacant_Steep_D 2 0.000000 0.300000
300.000000
5083 20 Water 2 0.000000 0.050000 300.000000
5083 21 Water_Reuse 2 0.000000 0.050000
300.000000
5173 1 HD_SF_Residential 1 0.000000 0.040000
300.000000
5173 2 LD_SF_Res_Moderate 1 0.000000 0.040000
300.000000
5173 3 LD_SF_Res_Steep 1 23.500071 0.040000
300.000000
5173 4 MF_Res 1 0.000000 0.040000 300.000000
5173 5 Commercial 1 0.000000 0.040000 300.000000
5173 6 Institutional 1 0.964665 0.040000
300.000000
5173 7 Industrial 1 0.000000 0.040000 300.000000
5173 8 Transportation 1 0.000000 0.040000
300.000000
5173 9 Secondary_Roads 1 3.066195 0.040000
300.000000
5173 10 Urban_Grass_Irrigated 2 7.833357 0.040000
300.000000

5173 11 Urban_Grass_NonIrrigated 2 3.988738
0.040000 300.000000
5173 12 Agriculture_Moderate_B 2 0.000000
0.040000 300.000000
5173 13 Agriculture_Moderate_D 2 2.238102
0.040000 300.000000
5173 14 Vacant_Moderate_B 2 0.000000 0.050000
300.000000
5173 15 Vacant_Moderate_D 2 0.000000 0.050000
300.000000
5173 16 Vacant_Steep_A 2 0.000000 0.300000
300.000000
5173 17 Vacant_Steep_B 2 0.000000 0.300000
300.000000
5173 18 Vacant_Steep_C 2 115.297776 0.300000
300.000000
5173 19 Vacant_Steep_D 2 0.000000 0.300000
300.000000
5173 20 Water 2 0.000000 0.050000 300.000000
5173 21 Water_Reuse 2 0.000000 0.050000
300.000000
5175 1 HD_SF_Residential 1 0.000000 0.040000
300.000000
5175 2 LD_SF_Res_Moderate 1 0.000000 0.040000
300.000000
5175 3 LD_SF_Res_Steep 1 3.565438 0.040000
300.000000
5175 4 MF_Res 1 0.000000 0.040000 300.000000
5175 5 Commercial 1 0.000000 0.040000 300.000000
5175 6 Institutional 1 0.483839 0.040000
300.000000
5175 7 Industrial 1 0.000000 0.040000 300.000000
5175 8 Transportation 1 0.000000 0.040000
300.000000
5175 9 Secondary_Roads 1 0.000000 0.040000
300.000000
5175 10 Urban_Grass_Irrigated 2 1.188479 0.040000
300.000000
5175 11 Urban_Grass_NonIrrigated 2 0.120960
0.040000 300.000000
5175 12 Agriculture_Moderate_B 2 0.000000
0.040000 300.000000
5175 13 Agriculture_Moderate_D 2 0.339566
0.040000 300.000000
5175 14 Vacant_Moderate_B 2 0.000000 0.050000
300.000000
5175 15 Vacant_Moderate_D 2 0.000000 0.050000
300.000000
5175 16 Vacant_Steep_A 2 0.000000 0.300000
300.000000
5175 17 Vacant_Steep_B 2 0.000000 0.300000
300.000000

5175 18 Vacant_Steep_C 2 75.422245 0.300000
300.000000
5175 19 Vacant_Steep_D 2 0.000000 0.300000
300.000000
5175 20 Water 2 0.000000 0.050000 300.000000
5175 21 Water_Reuse 2 0.000000 0.050000
300.000000
5183 1 HD_SF_Residential 1 0.000000 0.040000
300.000000
5183 2 LD_SF_Res_Moderate 1 0.000000 0.040000
300.000000
5183 3 LD_SF_Res_Steep 1 0.000000 0.040000
300.000000
5183 4 MF_Res 1 0.000000 0.040000 300.000000
5183 5 Commercial 1 0.000000 0.040000 300.000000
5183 6 Institutional 1 0.009194 0.040000
300.000000
5183 7 Industrial 1 0.000000 0.040000 300.000000
5183 8 Transportation 1 0.000000 0.040000
300.000000
5183 9 Secondary_Roads 1 0.000000 0.040000
300.000000
5183 10 Urban_Grass_Irrigated 2 0.000000 0.040000
300.000000
5183 11 Urban_Grass_NonIrrigated 2 0.002298
0.040000 300.000000
5183 12 Agriculture_Moderate_B 2 0.000000
0.040000 300.000000
5183 13 Agriculture_Moderate_D 2 0.000000
0.040000 300.000000
5183 14 Vacant_Moderate_B 2 0.000000 0.050000
300.000000
5183 15 Vacant_Moderate_D 2 0.000000 0.050000
300.000000
5183 16 Vacant_Steep_A 2 0.000000 0.300000
300.000000
5183 17 Vacant_Steep_B 2 0.000000 0.300000
300.000000
5183 18 Vacant_Steep_C 2 78.131778 0.300000
300.000000
5183 19 Vacant_Steep_D 2 0.000000 0.300000
300.000000
5183 20 Water 2 0.000000 0.050000 300.000000
5183 21 Water_Reuse 2 0.000000 0.050000
300.000000
5189 1 HD_SF_Residential 1 0.000000 0.040000
300.000000
5189 2 LD_SF_Res_Moderate 1 0.000000 0.040000
300.000000
5189 3 LD_SF_Res_Steep 1 14.925257 0.040000
300.000000
5189 4 MF_Res 1 0.000000 0.040000 300.000000

```
      5189  5     Commercial 1     0.000000   0.040000   300.000000
      5189  6     Institutional   1     0.066601   0.040000
      300.000000
      5189  7     Industrial 1     0.000000   0.040000   300.000000
      5189  8     Transportation  1     0.000000   0.040000
      300.000000
      5189  9     Secondary_Roads 1     1.958248   0.040000
      300.000000
      5189  10    Urban_Grass_Irrigated 2     4.975086   0.040000
      300.000000
      5189  11    Urban_Grass_NonIrrigated   2     2.410065
      0.040000   300.000000
      5189  12    Agriculture_Moderate_B     2     0.000000
      0.040000   300.000000
      5189  13    Agriculture_Moderate_D     2     1.421453
      0.040000   300.000000
      5189  14    Vacant_Moderate_B     2     0.000000   0.050000
      300.000000
      5189  15    Vacant_Moderate_D     2     0.000000   0.050000
      300.000000
      5189  16    Vacant_Steep_A  2     0.000000   0.300000
      300.000000
      5189  17    Vacant_Steep_B  2     0.000000   0.300000
      300.000000
      5189  18    Vacant_Steep_C  2     357.890613 0.300000
      300.000000
      5189  19    Vacant_Steep_D  2     0.000000   0.300000
      300.000000
      5189  20    Water 2     0.000000   0.050000   300.000000
      5189  21    Water_Reuse     2     0.000000   0.050000
      300.000000
c-----------------------------------------------------------------
-------------------------
c92  SNOW-FLAGS
c defid     parameter group id
c deluid    landuse id
c iceflag   0 = Ice formation in the snow pack is not simulated
c           1 = Ice formation is simulated
c forest    0.0 - 1.0  Fraction of LAND covered by Forest (winter
transpiration)
c     defid LUID ICEFLAG FOREST
c-----------------------------------------------------------------
----------------------------
c93  SNOW-PARM
c LAT      Latitude of the pervious land segment (PLS) - ENERGY
BALANCE METHOD ONLY (degree)
c          Positive for the northern hemisphere, negative for
southern
c MELEV    Mean elevation of LAND above sea level - ENERGY
BALANCE METHOD ONLY (ft)
c SHADE    Fraction of LAND shaded from solar radiation (i.e. by
trees) - ENERGY BALANCE METHOD ONLY
```

```
c SNOWCF   Precipitation-to-snow multiplier (accounts for poor
gage-catch efficiency during snow)
c COVIND   Maximum snowpack (water equivalent) at which the
entire LAND is covered with snow (in)
c    defid LUID      LAT     MELEV     SHADE    SNOWCF    COVIND
c------------------------------------------------------------------
----------------------------
c94  SNOW-PARM2
c RDCSN    Density of cold, new snow relative to water (For snow
falling at temps below freezing.
c          At higher temperatures the density of snow is
adjusted)
c TSNOW    Air temperature below which precipitation will be
snow, under saturated conditions (deg F)
c          Under non-saturated conditions the temperature is
adjusted slightly.
c SNOEVP   Adapts sublimation equation to field conditions -
ENERGY BALANCE METHOD ONLY
c CCFACT   Adapts snow condensation/convection melt equation to
field conditions - ENERGY BALANCE METHOD ONLY
c MWATER   Maximum water content of the snow pack, in depth of
water per depth of water.
c MGMELT   Maximum rate of snowmelt by ground heat, in depth of
water per day (in/day)
c         This is the value which applies when the pack
temperature is at the freezing point.
c    defid LUID    RDCSN     TSNOW    SNOEVP    CCFACT    MWATER
MGMELT
c------------------------------------------------------------------
----------------------------
c96  SNOW-INIT
c   Pack-snow   Initial quantity of snow in the pack (water
equivalent).
c   Pack-ice    Initial quantity of ice in the pack (water
equivalent).
c   Pack-watr   Initial quantity of liquid water in the pack.
c   RDENPF      Density of the frozen contents (snow and ice) of
the pack, relative to water.
c   DULL        Index of the dullness of the snow pack surface,
from which albedo is estimated - ENERGY BALANCE METHOD ONLY
c   PAKTMP      Mean temperature of the frozen contents of the
snow pack.
c
c   COVINX      Current snow pack depth (water equivalent)
required to obtain complete areal coverage of LAND.
c               If the pack is less than this amount, areal
coverage is prorated (PACKF/COVINX).
c   XLNMLT      Current remaining possible increment to ice
storage in the pack.
c               Relevant when Ice formation is simulated (iceflag
= 1)
c   SKYCLR      Fraction of sky which is assumed to be clear at
```

```
the present time.
c     defid LUID Pack-snow  Pack-ice Pack-watr    RDENPF      DULL
PAKTMP
c-----------------------------------------------------------------
----------------------------
c100 pwat-parm1
c    pervious and impervious land hydrology control
c
c    (value of 0 = use constant pwat-parm4; 1 = use corresponding
monthly variable card)
c
c    vcsfg    interception storage capacity
      (card 150)
c    vuzfg    upper zone nominal storage
      (card 160)
c    vnnfg    manning's n for the overland flow plane       (card
170)
c    vifwfg   interflow inflow parameter
      (card 180)
c    vircfg   interflow recession constant
      (card 190)
c    vlefg    lower zone evapotranspiration (e-t) parameter (card
200)
c
c     vcsfg  vuzfg  vnnfg  vifwfg  vircfg  vlefg
      0     0     0     0     0     0
c-----------------------------------------------------------------
-------------------------
c110 pwat-parm2
c
c    defid   parameter group id
c    deluid  landuse id
c    lzsn    lower zone nominal soil moisture storage (inches)
c    infilt  infiltration capacity of the soil (in/hr)
c    kvary   variable groundwater recession (1/inches)
c    agwrc   base groundwater recession (none)
c
c     defid deluid lzsn      infilt      kvary      agwrc
      1     1     0.000000   0.000000   0.000000   0.000000
      1     2     0.000000   0.000000   0.000000   0.000000
      1     3     0.000000   0.000000   0.000000   0.000000
      1     4     0.000000   0.000000   0.000000   0.000000
      1     5     0.000000   0.000000   0.000000   0.000000
      1     6     0.000000   0.000000   0.000000   0.000000
      1     7     0.000000   0.000000   0.000000   0.000000
      1     8     0.000000   0.000000   0.000000   0.000000
      1     9     0.000000   0.000000   0.000000   0.000000
      1     10    7.000000   0.100000   0.000000   0.800000
      1     11    7.000000   0.100000   0.000000   0.800000
      1     12    7.000000   0.400000   0.000000   0.800000
      1     13    7.000000   0.100000   0.000000   0.800000
      1     14    7.000000   0.400000   0.000000   0.800000
```

```
     1     15    7.000000   0.100000   0.000000   0.800000
     1     16    7.000000   1.000000   0.000000   0.980000
     1     17    7.000000   0.400000   0.000000   0.960000
     1     18    7.000000   0.200000   0.000000   0.950000
     1     19    7.000000   0.100000   0.000000   0.940000
     1     20    7.000000   0.100000   0.000000   0.940000
     1     21    7.000000   0.100000   0.000000   0.800000
c-----------------------------------------------------------------
-------------------------
c120 pwat-parm3
c
c    defid   parameter group id
c    deluid  landuse id
c    petmax  air temperature below which e-t will is reduced (deg
F)
c    petmin  air temperature below which e-t is set to zero (deg
F)
c    infexp  exponent in the infiltration equation (none)
c    INFILD  ratio between the maximum and mean infiltration
capacities over the PLS (none)
c    deepfr  fraction of groundwater inflow that will enter deep
groundwater (none)
c    basetp  fraction of remaining potential e-t that can be
satisfied from baseflow (none)
c    agwetp  fraction of remaining potential e-t that can be
satisfied from active groundwater (none)
c
c     defid deluid   petmax     petmin     infexp     infild
deepfr     basetp     agwetp
     1     1     45.000000  35.000000  0.000000   0.000000
     0.000000   0.000000   0.000000
     1     2     45.000000  35.000000  0.000000   0.000000
     0.000000   0.000000   0.000000
     1     3     45.000000  35.000000  0.000000   0.000000
     0.000000   0.000000   0.000000
     1     4     45.000000  35.000000  0.000000   0.000000
     0.000000   0.000000   0.000000
     1     5     45.000000  35.000000  0.000000   0.000000
     0.000000   0.000000   0.000000
     1     6     45.000000  35.000000  0.000000   0.000000
     0.000000   0.000000   0.000000
     1     7     45.000000  35.000000  0.000000   0.000000
     0.000000   0.000000   0.000000
     1     8     45.000000  35.000000  0.000000   0.000000
     0.000000   0.000000   0.000000
     1     9     45.000000  35.000000  0.000000   0.000000
     0.000000   0.000000   0.000000
     1     10    45.000000  35.000000  2.000000   2.000000
     0.500000   0.000000   0.000000
     1     11    45.000000  35.000000  2.000000   2.000000
     0.500000   0.000000   0.000000
     1     12    45.000000  35.000000  2.000000   2.000000
```

```
     0.500000   0.000000   0.000000
     1     13    45.000000  35.000000  2.000000   2.000000
     0.500000   0.000000   0.000000
     1     14    45.000000  35.000000  2.000000   2.000000
     0.500000   0.000000   0.000000
     1     15    45.000000  35.000000  2.000000   2.000000
     0.500000   0.000000   0.000000
     1     16    45.000000  35.000000  2.000000   2.000000
     0.500000   0.000000   0.000000
     1     17    45.000000  35.000000  2.000000   2.000000
     0.500000   0.000000   0.000000
     1     18    45.000000  35.000000  2.000000   2.000000
     0.500000   0.000000   0.000000
     1     19    45.000000  35.000000  2.000000   2.000000
     0.500000   0.000000   0.000000
     1     20    45.000000  35.000000  2.000000   2.000000
     0.000000   0.000000   0.000000
     1     21    45.000000  35.000000  2.000000   2.000000
     0.500000   0.000000   0.000000
c-----------------------------------------------------------------
-------------------------
c130 pwat-parm4
c
c    defid   parameter group id
c    deluid  landuse id
c    cepsc   interception storage capacity (inches)
c    uzsn    upper zone nominal storage (inches)
c    nsur    Manning's n for the assumed overland flow plane
(none)
c    intfw   interflow inflow parameter (none)
c    irc     interflow recession parameter (none)
c    lzetp   lower zone e-t parameter (none)
c
c     defid deluid   cepsc      uzsn     nsur       intfw
irc         lzetp
     1     1     0.050000   0.000000   0.011000   0.000000
     0.000000   0.000000
     1     2     0.050000   0.000000   0.011000   0.000000
     0.000000   0.000000
     1     3     0.050000   0.000000   0.011000   0.000000
     0.000000   0.000000
     1     4     0.050000   0.000000   0.011000   0.000000
     0.000000   0.000000
     1     5     0.050000   0.000000   0.011000   0.000000
     0.000000   0.000000
     1     6     0.050000   0.000000   0.011000   0.000000
     0.000000   0.000000
     1     7     0.050000   0.000000   0.011000   0.000000
     0.000000   0.000000
     1     8     0.050000   0.000000   0.011000   0.000000
     0.000000   0.000000
     1     9     0.050000   0.000000   0.011000   0.000000
```

```
     0.000000   0.000000
     1     10   0.100000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     11   0.100000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     12   0.100000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     13   0.100000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     14   0.150000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     15   0.150000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     16   0.200000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     17   0.200000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     18   0.200000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     19   0.200000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     20   0.000000   0.500000   0.011000   1.000000
     0.600000   0.700000
     1     21   0.100000   0.500000   0.200000   1.000000
     0.600000   0.700000
c-----------------------------------------------------------------
-----------------------
c140 pwat-state1
c    initial conditions for the simulation
c
c    defid   parameter group id
c    deluid  landuse id
c    ceps    initial interception storage.
c    surs    initial surface (overland flow) storage.
c    uzs     initial upper zone storage.
c    ifws    initial interflow storage.
c    lzs     initial lower zone storage.
c    agws    initial active groundwater storage.
c    gwvs    initial index to groundwater slope.
c
c     defid deluid ceps      surs       uzs      ifws       lzs
agws      gwvs
     1     1    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1     2    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1     3    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1     4    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1     5    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
```

```
     1    6    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    7    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    8    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    9    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    10   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    11   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    12   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    13   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    14   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    15   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    16   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    17   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    18   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    19   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    20   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    21   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
c-----------------------------------------------------------------
--------------------
c150 mon-interception storage (cepscm)
c    only required if vcsfg=1 in pwat-parm1 (see card 100)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec interception storage capacity at start of each month
(inches)
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c160 mon-upper zone nominal storage (uzsnm)
c    only required if vuzfg=1 in pwat-parm1 (see card 100)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec upper zone nominal storage at start of each month
```

```
(inches)
c
c    defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
---------------------
c170 mon-Manning's roughness coefficient (nsurm)
c    only required if vnnfg=1 in pwat-parm1 (see card 100)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec Manning's roughness coefficient at start of each
month (none)
c
c    defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
---------------------
c180 mon-interflow inflow parameter (intfwm)
c    only required if vifwfg=1 in pwat-parm1 (see card 100)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec interflow inflow parameter at start of each month
(none)
c
c    defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
---------------------
c190 mon-interflow recession constant (ircm)
c    only required if vircfg=1 in pwat-parm1 (see card 100)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec interflow recession constant at start of each month
(none)
c
c    defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c200 mon-lower zone evapotranspiration parameter (lzetpm)
c    only required if vlefg=1 in pwat-parm1 (see card 100)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec lower zone evapotranspiration parameter at start of
each month (none)
c
c    defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
```

```
c-------------------------------------------------------------------
--------------------
c201   Irrigation Application Option Flags
cIrrigation flag decide whether to run irrigation
c
c    irrigfg   if = 1 run irrigation option
c    petfg     if = 1 use constant PET rather than time series
from the air file
c    monVaryIrrig   if = 1 use monthly varying ET coefficient
c
c     irrigfg     petfg  monVaryIrrig
      1    0    0
c-------------------------------------------------------------------
-------------------------
c202 Irrigation PET Value
c   defid        Group ID number.
c   petval       Constant PET value to calculate actual ET
(in/hr)
c
c     defid  petval
c-------------------------------------------------------------------
----------------------------
c203 Irrigation Application Options
c   defid        Group ID number.
c   deluid       Landuse ID number
c   startmonth   startmonth of irrigation requirement
c   endmonth     endmonth of irrigation requirement
c   fraction1    fraction of irrigation requirement applied over
the canopy.
c   fraction2    fraction of irrigation water applied directly to
the soil surface.
c   fraction3    fraction of irrigation water applied to the
upper soil zone via buried systems
c   fraction4    fraction of irrigation water likewise applied to
the lower soil zone.
c   fraction5    fraction of irrigation water entering directly
into the local groundwater, such as seepage irrigation.
c   etcoeff      Coefficient to calculate actual ET, based on
PET.
c   etdays       Number of threshold days to calculate irrigation
demand (pet*etcoeff - precip)
c                (if etdays = 0 then irrigation demand = pet *
etcoeff)
c
c     defid deluid     startmonth endmonth   fraction1  fraction2
      fraction3  fraction4  fraction5  etcoeff    etdays
      1     1     1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     2     1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     3     1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
```

```
      1     4     1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     5     1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     6     1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     7     1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     8     1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     9     1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     10    1     12    0.000000   1.000000   0.000000
      0.000000   0.000000   0.706000   1
      1     11    1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     12    1     12    0.000000   1.000000   0.000000
      0.000000   0.000000   1.000000   1
      1     13    1     12    0.000000   1.000000   0.000000
      0.000000   0.000000   1.000000   1
      1     14    1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     15    1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     16    1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     17    1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     18    1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     19    1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     20    1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     21    1     12    0.000000   1.000000   0.000000
      0.000000   0.000000   0.706000   1
c-----------------------------------------------------------------
----------------------------
c204 Monthly-variable ET coefficients
c   defid        Group ID number.
c   deluid       Landuse ID number
c   monetcs      Monthly-variable coefficient to calculate actual
ET for Jan..Dec
c
c     defid deluid     monETCs1   monETCs2   monETCs3   monETCs4
      monETCs5   monETCs6   monETCs7   monETCs8   monETCs9
      monETCs10  monETCs11  monETCs12
c-----------------------------------------------------------------
----------------------------
c205 Irrigation Withdrawal Options
c     Irrigation withdrawal information for each watershed
c    subbasin    subbasin id
```

```
c    rchid       reach id from where water is withdrawn (if reach
does not exist then
c                etdemand is assumed to be satisfied from an
external source)
c    irrigdep    depth of irrigation withdrawal pipe (ft)
c
c     subbasin   rchid
      5046  0     0.000000
      5065  0     0.000000
      5066  0     0.000000
      5079  0     0.000000
      5080  0     0.000000
      5083  0     0.000000
      5173  0     0.000000
      5175  0     0.000000
      5183  0     0.000000
      5189  0     0.000000
c-----------------------------------------------------------------
----------------------------
c250 general quality constituent control
c
c    defid    parameter group id
c    dwqid    general quality id
c    qname    name of qual (must be a continuous string)
c    qunit    units for quality constituent output (mg/l),
(ug/l), or (#/100ml)
c    qsdfg    if = 0 no sediment associated qual
c               if = 1 sediment associated in pervious/impervious
land (qsdfg should be > 0 in card 281)
c               if = 2 sediment associated in pervious/impervious
land
c                      and sediment associated qual is added to
the dissolved part
c    gqsdfg   if = 0 general quality constituent
c             if = 1 general quality constituent simulated as a
sediment (only one qual can be simulated as a sediment in each
group)
c    qsofg    if = 1 then then accumulation and removal occur
daily
c             if = 2 then then accumulation and removal occur
every interval
c    potfcfg  if = 1 then apply background concentration potency
factor (card 260) to only surface output
c             if = 2 then apply background concentration potency
factor (card 260) to total land output
c
c     defid dwqid   qname  qunit  qsdfg  gqsdfg  qsofg  potfcfg
      1     3     TN    (mg/l)     2     0     2     1
      1     7     TP    (mg/l)     2     0     2     1
      1     11    TCu   (ug/l)     2     0     2     1
      1     12    TPb   (ug/l)     2     0     2     1
      1     14    TZn   (ug/l)     2     0     2     1
```

```
     1    16    FECAL (#/100ml)  0     0     2     1
c-----------------------------------------------------------------
-------------------------------------------
C255 subsurface quality control
c
c    (value of 0 = use constant qual-input; 1 = use corresponding
monthly variable card)
c
c    vqofg       if = 1 the accumulation rate and limiting
storage of QUALOF varies monthly   (cards 270, 271)
c    qsowfg      if = 1 the constituent is a QUALSURO (surface
flow associated).
c    vsqcfg      if = 1 the concentration of this constituent in
surface outflow varies monthly   (card 272)= 1 read table 272
c    qifwfg      if = 1 the constituent is a QUALIF (interflow
associated).
c    viqcfg      if = 1 the concentration of this constituent in
interflow outflow varies monthly   (card 273)= 1 read table 273
c    qagwfg      if = 1 the constituent is a QUALGW (groundwater
associated).
c    vaqcfg      if = 1 the concentration of this constituent in
groundwater outflow varies monthly (card 274)
c    adfglnd     if = 1 atmosperic deposition on land
c    maddfglnd   if = 1 atmosperic dry deposition varies monthly
on land (card 275)
c    mawdfglnd   if = 1 atmosperic wet deposition varies monthly
on land (card 276)
c
c     vqofg  qsowfg  vsqcfg  qifwfg  viqcfg  qagwfg  vaqcfg
adfglnd  maddfglnd  mawdfglnd
     0    1    0    1    0    1    0    1    0    0
c-----------------------------------------------------------------
-------------------------------------------
C260  qual-input
c    storage on surface and nonseasonal parameters
c
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    sqo     initial storage of QUALOF on surface (lb or #)
c    potfw   washoff potency factor if qsdfg > 0, card 250 (lb or
#)/ton-sediment
c    potfs   scour potency pactor if qsdfg > 0, card 250 (lb or
#)/ton-sediment
c    potfc   background concentration potency pactor if qsdfg >
0, card 250 (lb or #)/ton-sediment
c    acqop   accumulation rate of QUALOF on surface (lb or
#)/acre/day
c    sqolim  maximum storage of QUALOF on surface (lb or #)/acre
c    wsqop   rate of surface runoff that removes 90% of stored
QUALOF per hour (in/hr)
c    soqc    concentration of constituent in surface outflow
```

```
(mg/l), (ug/l), or (#/100ml)
c    ioqc    concentration of constituent in interflow outflow
(mg/l), (ug/l), or (#/100ml)
c    aoqc    concentration of constituent in groundwater outflow
(mg/l), (ug/l), or (#/100ml)
c    addc    atmospheric dry deposition flux (lb/acre/day or
#/acre/day)
c    awdc    atmospheric wet deposition concentration (mg/l),
(ug/l), or (#/100ml)
c
c     the units of the following parameters are as follow:
c     if in card 250, the unit is mg/l or ug/l, then M is lbs
c     if in card 250, the unit is #/100ml, then M is #, in this
case the unit for
c     soqc, ioqc and aoqc should be #/100ml instead of mg/l
c
c     defid  dwqid  deluid  sqo     potfw     potfs   potfc
acqop   sqolim   wsqop        soqc   ioqc   aoqc   addc  awdc
     1     3     1     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     2     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     3     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     4     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     5     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     6     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     7     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     8     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     9     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     10    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     11    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     12    0.000000   0.000000   0.000000   0.000000
```

```
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     13    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     14    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     15    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     16    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     17    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     18    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     19    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     20    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     21    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     7     1     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.900000   1.900000
0.000000   0.000000   0.000000
1     7     2     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.080000   1.080000
0.000000   0.000000   0.000000
1     7     3     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.080000   1.080000
0.000000   0.000000   0.000000
1     7     4     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.900000   1.900000
0.000000   0.000000   0.000000
1     7     5     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   3.000000   3.000000
0.000000   0.000000   0.000000
1     7     6     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.260000   1.260000
0.000000   0.000000   0.000000
1     7     7     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.260000   1.260000
0.000000   0.000000   0.000000
1     7     8     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
```

```
0.000000   0.000000   0.000000
1     7     9     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
0.000000   0.000000   0.000000
1     7     10    0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.080000   1.080000
0.000000   0.000000   0.000000
1     7     11    0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.080000   1.080000
0.000000   0.000000   0.000000
1     7     12    0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.760000   1.760000
0.000000   0.000000   0.000000
1     7     13    0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.760000   1.760000
0.000000   0.000000   0.000000
1     7     14    0.000000   0.001000   0.001000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
0.000000   0.000000   0.000000
1     7     15    0.000000   0.001000   0.001000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
0.000000   0.000000   0.000000
1     7     16    0.000000   0.001000   0.001000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
0.000000   0.000000   0.000000
1     7     17    0.000000   0.001000   0.001000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
0.000000   0.000000   0.000000
1     7     18    0.000000   0.001000   0.001000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
0.000000   0.000000   0.000000
1     7     19    0.000000   0.001000   0.001000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
0.000000   0.000000   0.000000
1     7     20    0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     7     21    0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
0.000000   0.000000   0.000000
1     11    1     0.000000   0.800000   0.800000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    2     0.000000   0.600000   0.600000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    3     0.000000   0.600000   0.600000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    4     0.000000   0.800000   0.800000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
```

```
1     11    5     0.000000   1.140000   1.140000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    6     0.000000   0.400000   0.400000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    7     0.000000   0.400000   0.400000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    8     0.000000   0.800000   0.800000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    9     0.000000   0.800000   0.800000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    10    0.000000   0.600000   0.600000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    11    0.000000   0.600000   0.600000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    12    0.000000   0.300000   0.300000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    13    0.000000   0.300000   0.300000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    14    0.000000   0.012000   0.012000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    15    0.000000   0.012000   0.012000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    16    0.000000   0.012000   0.012000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    17    0.000000   0.012000   0.012000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    18    0.000000   0.012000   0.012000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    19    0.000000   0.012000   0.012000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    20    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    21    0.000000   0.600000   0.600000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    1     0.000000   0.800000   0.800000   0.000000
```

```
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    2     0.000000   0.200000   0.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    3     0.000000   0.200000   0.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    4     0.000000   0.800000   0.800000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    5     0.000000   1.000000   1.000000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    6     0.000000   0.180000   0.180000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    7     0.000000   0.180000   0.180000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    8     0.000000   0.800000   0.800000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    9     0.000000   0.800000   0.800000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    10    0.000000   0.200000   0.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    11    0.000000   0.200000   0.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    12    0.000000   0.100000   0.100000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    13    0.000000   0.100000   0.100000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    14    0.000000   0.002000   0.002000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    15    0.000000   0.002000   0.002000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    16    0.000000   0.002000   0.002000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    17    0.000000   0.002000   0.002000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    18    0.000000   0.002000   0.002000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
```

```
0.000000   0.000000   0.000000
1     12    19    0.000000   0.002000   0.002000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    20    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    21    0.000000   0.200000   0.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    1     0.000000   7.500000   7.500000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    2     0.000000   1.200000   1.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    3     0.000000   1.200000   1.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    4     0.000000   7.500000   7.500000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    5     0.000000   10.200000  10.200000  0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    6     0.000000   5.080000   5.080000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    7     0.000000   5.080000   5.080000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    8     0.000000   7.500000   7.500000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    9     0.000000   7.500000   7.500000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    10    0.000000   1.200000   1.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    11    0.000000   1.200000   1.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    12    0.000000   2.500000   2.500000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    13    0.000000   2.500000   2.500000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    14    0.000000   0.050000   0.050000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
```

1 14 15 0.000000 0.050000 0.050000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 14 16 0.000000 0.050000 0.050000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 14 17 0.000000 0.050000 0.050000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 14 18 0.000000 0.050000 0.050000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 14 19 0.000000 0.050000 0.050000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 14 20 0.000000 0.000000 0.000000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 14 21 0.000000 1.200000 1.200000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 16 1 0.000000 0.000000 0.000000 0.000000
0.000000 0.000001 1.640000 6600.000000
6600.000000 0.000000 0.000000 0.000000
1 16 2 0.000000 0.000000 0.000000 0.000000
0.000000 0.000001 1.640000 19000.000000
19000.000000 0.000000 0.000000 0.000000
1 16 3 0.000000 0.000000 0.000000 0.000000
0.000000 0.000001 1.640000 19000.000000
19000.000000 0.000000 0.000000 0.000000
1 16 4 0.000000 0.000000 0.000000 0.000000
0.000000 0.000001 1.640000 6600.000000
6600.000000 0.000000 0.000000 0.000000
1 16 5 0.000000 0.000000 0.000000 0.000000
0.000000 0.000001 1.640000 40000.000000
40000.000000 0.000000 0.000000 0.000000
1 16 6 0.000000 0.000000 0.000000 0.000000
0.000000 0.000001 1.640000 2300.000000
2300.000000 0.000000 0.000000 0.000000
1 16 7 0.000000 0.000000 0.000000 0.000000
0.000000 0.000001 1.640000 2300.000000
2300.000000 0.000000 0.000000 0.000000
1 16 8 0.000000 0.000000 0.000000 0.000000
0.000000 0.000001 1.640000 1000.000000
1000.000000 0.000000 0.000000 0.000000
1 16 9 0.000000 0.000000 0.000000 0.000000
0.000000 0.000001 1.640000 1000.000000
1000.000000 0.000000 0.000000 0.000000
1 16 10 0.000000 0.000000 0.000000 0.000000
0.000000 0.000001 1.640000 3500.000000
3500.000000 0.000000 0.000000 0.000000
1 16 11 0.000000 0.000000 0.000000 0.000000

```
      0.000000   0.000001   1.640000   3500.000000
      3500.000000      0.000000   0.000000   0.000000
      1     16    12    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   91000.000000
      91000.000000     0.000000   0.000000   0.000000
      1     16    13    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   91000.000000
      91000.000000     0.000000   0.000000   0.000000
      1     16    14    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   1000.000000
      1000.000000      0.000000   0.000000   0.000000
      1     16    15    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   1000.000000
      1000.000000      0.000000   0.000000   0.000000
      1     16    16    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   1000.000000
      1000.000000      0.000000   0.000000   0.000000
      1     16    17    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   1000.000000
      1000.000000      0.000000   0.000000   0.000000
      1     16    18    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   1000.000000
      1000.000000      0.000000   0.000000   0.000000
      1     16    19    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   1000.000000
      1000.000000      0.000000   0.000000   0.000000
      1     16    20    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   0.000000   0.000000
      0.000000   0.000000   0.000000
      1     16    21    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   3500.000000
      3500.000000      0.000000   0.000000   0.000000
c-----------------------------------------------------------------
----------------------------
c270 mon-accumulation rate (monaccum)
c    only required if vqofg =1 (see card 255)
c
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    jan-dec accumulation rate at start of each month
(lb/acre/day)
c     if in card 250, the unit is #/100ml, the above unit should
be #/acre/day
c
c     defid dwqid   deluid   jan   feb   mar   apr   may   jun
jul   aug   sep   oct   nov   dec
c-----------------------------------------------------------------
-----------------------
c271 mon-storage limit of quality constituent (monsqolim)
c    only required if vqofg = 1 (see card 255)
c
```

```
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    jan-dec maximum storage at start of each month (lb/acre)
c     if in card 250, the unit is #/100ml, the above unit should
be #/acre
c
c     defid dwqid   deluid   jan   feb   mar   apr   may   jun
jul   aug   sep   oct   nov   dec
c--------------------------------------------------------------------
----------------------
c272 mon-surfaceflow concentration (monsuroconc)
c    only required if vsqcfg = 1 (see card 255)
c
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    jan-dec concentration of constituent in surface flow at
start of each month (mg/l), (ug/l), or (#/100ml)
c     if in card 250, the unit is #/100ml, the above unit should
be #/100ml
c
c     defid dwqid   deluid   jan   feb   mar   apr   may   jun
jul   aug   sep   oct   nov   dec
c--------------------------------------------------------------------
----------------------
c273 mon-interflow concentration (moninterconc)
c    only required if viqcfg = 1 (see card 255)
c
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    jan-dec concentration of constituent in interflow at start
of each month (mg/l), (ug/l), or (#/100ml)
c     if in card 250, the unit is #/100ml, the above unit should
be #/100ml
c
c     defid dwqid   deluid   jan   feb   mar   apr   may   jun
jul   aug   sep   oct   nov   dec
c--------------------------------------------------------------------
----------------------
c274 mon-groundwater concentration (mongrndconc)
c    only required if vaqcfg = 1 (see card 255)
c
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    jan-dec concentration of constituent in groundwater at start
of each month (mg/l), (ug/l), or (#/100ml)
c     if in card 250, the unit is #/100ml, the above unit should
be #/100ml
c
```

```
c     defid dwqid   deluid   jan   feb   mar   apr   may   jun   
jul   aug   sep   oct   nov   dec
c-----------------------------------------------------------------
----------------------------
c275 mon-atmospheric dry deposition flux
c    only required if maddfglnd = 1 (see card 255)
c
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    jan-dec flux of constituent in dry deposition at start of 
each month (lb/acre/day or #/acre/day)
c
c     defid dwqid   deluid   jan   feb   mar   apr   may   jun   
jul   aug   sep   oct   nov   dec
c-----------------------------------------------------------------
----------------------------
c276 mon-atmospheric wet deposition concentration
c    only required if mawdfglnd = 1 (see card 255)
c
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    jan-dec concentration of constituent in atmospheric wet 
deposition at start of each month (mg/l), (ug/l), or (#/100ml)
c
c     defid dwqid   deluid   jan   feb   mar   apr   may   jun   
jul   aug   sep   oct   nov   dec
c-----------------------------------------------------------------
----------------------------
C280 stream water quality control
c
c    adfgrch     if = 1 atmosperic deposition on reach (0 for no 
atmospheric deposition)
c    maddfgrch   if = 1 atmosperic dry deposition varies monthly 
on reach (card 282)
c    mawdfgrch   if = 1 atmosperic wet deposition varies monthly 
on reach (card 283)
c
c     adfgrch  maddfgrch  mawdfgrch
      0    0    0
c-----------------------------------------------------------------
-------------------------------------------
c281 general quality constituent control
c
c    rgid     stream parameter group id
c    dwqid    general quality id
c    qsdfg    if = 0 no sediment associated qual
c               if = 1 sediment associated in stream, 
adsorption/desorption of qual is simulated
c    iniCond  initial instream concentration at start of 
simulation by group (mg/l), (ug/l), or (#/100ml)
```

```
c    decay    general first-order instream loss rate of qual by
reach group (1/day)
c    tcdecay  temperature correction coefficient for first-order
decay of qual (min=1, max=2)
c    addc     atmospheric dry deposition flux (lb/acre/day or
#/acre/day)
c    awdc     atmospheric wet deposition concentration (mg/l),
(ug/l), or (#/100ml)
c    potber   scour potency pactor for stream bank erosion if
qsdfg > 0, (lb or #)/ton-sediment
c
c     rgid  dwqid   qsdfg   iniCond  decay  tcdecay   addc   awdc
potber
      1     3     0     0.000000   0.100000   1.000000   0.000000
      0.000000   0.000000
      1     7     0     0.000000   0.100000   1.000000   0.000000
      0.000000   0.000000
      1     11    0     0.000000   0.200000   1.000000   0.000000
      0.000000   0.000000
      1     12    0     0.000000   0.200000   1.000000   0.000000
      0.000000   0.000000
      1     14    0     0.000000   0.200000   1.000000   0.000000
      0.000000   0.000000
      1     16    0     0.000000   0.200000   1.000000   0.000000
      0.000000   0.000000
c-----------------------------------------------------------------
-------------------------------------------
c282 mon-atmospheric dry deposition flux
c    only required if maddfgrch = 1 (see card 280)
c
c    rgid    reach group id
c    dwqid   general quality id
c    jan-dec flux of constituent in dry deposition at start of
each month (lb/acre/day or #/acre/day)
c
c     rgid dwqid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
----------------------------
c283 mon-atmospheric wet deposition concentration
c    only required if mawdfgrch = 1 (see card 280)
c
c    rgid    reach group id
c    dwqid   general quality id
c    jan-dec concentration of constituent in atmospheric wet
deposition at start of each month (mg/l), (ug/l), or (#/100ml)
c
c     rgid dwqid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
----------------------------
c285 parameters for decay of contaminant adsorbed to sediment
```

```
c    only required if qsdfg > 0 (see card 281)
c
c    rgid      reach group id
c    dwqid     general quality id
c    addcpm1   decay rate for qual adsorbed to suspended sediment
(/day)
c    addcpm2   temperature correction coefficient for decay of
qual on suspended sediment (range from 1.0 to 2.0)
c    addcpm3   decay rate for qual adsorbed to bed sediment
(/day)
c    addcpm4   temperature correction coefficient for decay of
qual on bed sediment (range from 1.0 to 2.0)
c
c   rgid  dwqid   addcpm1   addcpm2   addcpm3   addcpm4
     1     3     0.000000   1.070000   0.000000   1.070000
     1     7     0.000000   1.070000   0.000000   1.070000
     1     11    0.000000   1.070000   0.000000   1.070000
     1     12    0.000000   1.070000   0.000000   1.070000
     1     14    0.000000   1.070000   0.000000   1.070000
     1     16    0.000000   1.070000   0.000000   1.070000
c-----------------------------------------------------------------
----------------------------
c286 adsorption coefficients of qual
c    only required if qsdfg > 0 (see card 281)
c
c    rgid      reach group id
c    dwqid     general quality id
c    adpm1     distribution coefficients for qual with suspended
sand (l/mg)
c    adpm2     distribution coefficients for qual with suspended
silt (l/mg)
c    adpm3     distribution coefficients for qual with suspended
clay (l/mg)
c    adpm4     distribution coefficients for qual with bed sand
(l/mg)
c    adpm5     distribution coefficients for qual with bed silt
(l/mg)
c    adpm6     distribution coefficients for qual with bed clay
(l/mg)
c
c   rgid  dwqid   adpm1   adpm2   adpm3   adpm4   adpm5   adpm6
     1     3     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     7     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     11    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     12    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     14    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     16    0.000000   0.000000   0.000000   0.000000
```

```
     0.000000   0.000000
c-----------------------------------------------------------------
----------------------------
c287 adsorption/desorption rate parameters
c    only required if qsdfg > 0 (see card 281)
c
c    rgid      reach group id
c    dwqid     general quality id
c    adpm1     transfer rates between adsorbed and desorbed
states of qual with suspended sand (/day)
c    adpm2     transfer rates between adsorbed and desorbed
states of qual with suspended silt (/day)
c    adpm3     transfer rates between adsorbed and desorbed
states of qual with suspended clay (/day)
c    adpm4     transfer rates between adsorbed and desorbed
states of qual with bed sand (/day)
c    adpm5     transfer rates between adsorbed and desorbed
states of qual with bed silt (/day)
c    adpm6     transfer rates between adsorbed and desorbed
states of qual with bed clay (/day)
c
c   rgid  dwqid   adpm1   adpm2   adpm3   adpm4   adpm5   adpm6
     1     3    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     7    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     11   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     12   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     14   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     16   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
c-----------------------------------------------------------------
----------------------------
c288 adsorption/desorption temperature correction parameters
c    only required if qsdfg > 0 (see card 281)
c
c    rgid      reach group id
c    dwqid     general quality id
c    adpm1     temperature correction coefficients for
adsorption/desorption on suspended sand (range from 1.0 to 2.0)
c    adpm2     temperature correction coefficients for
adsorption/desorption on suspended silt (range from 1.0 to 2.0)
c    adpm3     temperature correction coefficients for
adsorption/desorption on suspended clay (range from 1.0 to 2.0)
c    adpm4     temperature correction coefficients for
adsorption/desorption on bed sand (range from 1.0 to 2.0)
c    adpm5     temperature correction coefficients for
adsorption/desorption on bed silt (range from 1.0 to 2.0)
c    adpm6     temperature correction coefficients for
```

```
adsorption/desorption on bed clay (range from 1.0 to 2.0)
c
c   rgid  dwqid   adpm1   adpm2   adpm3   adpm4   adpm5   adpm6
      1    3    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      1    7    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      1    11   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      1    12   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      1    14   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      1    16   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
c-----------------------------------------------------------------
---------------------------
c289 initial concentrations on sediment
c    only required if qsdfg > 0 (see card 281)
c
c    rgid      reach group id
c    dwqid     general quality id
c    sqal1     initial concentrations of qual on suspended sand
(concu/mg)
c    sqal2     initial concentrations of qual on suspended silt
(concu/mg)
c    sqal3     initial concentrations of qual on suspended clay
(concu/mg)
c    sqal4     initial concentrations of qual on bed sand
(concu/mg)
c    sqal5     initial concentrations of qual on bed silt
(concu/mg)
c    sqal6     initial concentrations of qual on bed clay
(concu/mg)
c
c   rgid  dwqid   sqal1   sqal2   sqal3   sqal4   sqal5   sqal6
      1    3    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      1    7    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      1    11   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      1    12   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      1    14   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      1    16   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
c-----------------------------------------------------------------
---------------------------
C310 soil-data
c    only required if nitrfg = 1 or phosfg = 1 (see card 0)
```

```
c    soil layer depths, bulk densities, and wilting point
c
c    defid     parameter group id
c    deluid    landuse id
c    dep_sl    depth of surface layer (in)
c    dep_ul    depth of upper layer (in)
c    dep_ll    depth of lower layer (in)
c    dep_gwl   depth of groundwater layer (in)
c    bd_sl     bulkdensity of surface layer (lb/ft3)
c    bd_ul     bulkdensity of upper layer (lb/ft3)
c    bd_ll     bulkdensity of lower layer (lb/ft3)
c    bd_gwl    bulkdensity of groundwater layer (lb/ft3)
c    wp_sl     wiltingpoint of surface layer (fraction)
c    wp_ul     wiltingpoint of upper layer (fraction)
c    wp_ll     wiltingpoint of lower layer (fraction)
c    wp_gwl    wiltingpoint of groundwater layer (fraction)
c
c   defid deluid  depth_sl   depth_ul   depth_ll   depth_gwl
bd_sl    bd_ul    bd_ll    bd_gwl    wp_sl    wp_ul    wp_ll
wp_gwl
c-----------------------------------------------------------------
----------------------------
C311  mstlay-parm
c    factors used to adjust solute leaching rates
c
c    defid   parameter group id
c    deluid  landuse id
c    slmpf   factor used to adjust solute percolation rate from
the surface layer storage to the upper layer principal storage
c    ulpf    factor used to adjust solute percolation rate from
the upper layer principal storage to the lower layer storage
c    llpf    factor used to adjust solute percolation rate from
the lower layer storage to the active and inactive groundwater
c
c   defid   deluid  slmpf     ulpf     llpf
c-----------------------------------------------------------------
----------------------------
C312  mst-topstor
c    initial moisture storage in each topsoil layer
c
c    defid   parameter group id
c    deluid  landuse id
c    smstm   initial moisture content in the surface storage
(lb/ac)
c    umstm   initial moisture content in the upper principal
storage (lb/ac)
c    imstm   initial moisture content in the upper transitory
(interflow) storages (lb/ac)
c
c   defid   deluid  smstm     umstm     imstm
c-----------------------------------------------------------------
----------------------------
```

```
C313  mst-topflx
c    initial fractional fluxes in each topsoil layer
c
c    defid   parameter group id
c    deluid  landuse id
c    fso     initial values of the fractional fluxes of soluble
chemicals through the topsoil layers of a PLS (/ivl)
c    fsp     initial values of the fractional fluxes of soluble
chemicals through the topsoil layers of a PLS (/ivl)
c    fii     initial values of the fractional fluxes of soluble
chemicals through the topsoil layers of a PLS (/ivl)
c    fup     initial values of the fractional fluxes of soluble
chemicals through the topsoil layers of a PLS (/ivl)
c    fio     initial values of the fractional fluxes of soluble
chemicals through the topsoil layers of a PLS (/ivl)
c
c   defid   deluid  fso     fsp     fii    fup     fio
c-----------------------------------------------------------------
----------------------------
C314  mst-substor
c    initial moisture storage in each topsoil layer
c
c    defid   parameter group id
c    deluid  landuse id
c    lmstm   initial moisture storages in the lower layer (lb/ac)
c    amstm   initial moisture content in the active groundwater
layers (lb/ac)
c
c   defid   deluid  lmstm     amstm
c-----------------------------------------------------------------
----------------------------
C315  mst-subflx
c    initial fractional fluxes in each topsoil layer
c
c    defid   parameter group id
c    deluid  landuse id
c    flp     initial fractional fluxes of soluble chemicals
through the subsoil layers (/ivl)
c    fldp    initial fractional fluxes of soluble chemicals
through the subsoil layers (/ivl)
c    fao     initial fractional fluxes of soluble chemicals
through the subsoil layers (/ivl)
c
c   defid   deluid  flp     fldp     fao
c-----------------------------------------------------------------
----------------------------
C341 initial storage of nitrogen in the surface layer
c    only required if nitrfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    lorgn   initial storage of labile organic nitrogen (lb/acre)
```

```
c    amad    initial storage of adsorbed ammonium (lb/acre)
c    amsu    initial storage of solution ammonium (lb/acre)
c    no3     initial storage of nitrate (lb/acre)
c    pltn    initial storage of nitrogen stored in plants
(lb/acre)
c    rorgn   initial storage of refractory organic nitrogen
(lb/acre)
c
c   defid  deluid lorgn   amad    amsu    no3    pltn   rorgn
c-----------------------------------------------------------------
----------------------------
C342 initial storage of nitrogen in the upper layer
c    only required if nitrfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    lorgn   initial storage of labile organic nitrogen (lb/acre)
c    amad    initial storage of adsorbed ammonium (lb/acre)
c    amsu    initial storage of solution ammonium (lb/acre)
c    no3     initial storage of nitrate (lb/acre)
c    pltn    initial storage of nitrogen stored in plants
(lb/acre)
c    rorgn   initial storage of refractory organic nitrogen
(lb/acre)
c
c   defid  deluid lorgn   amad    amsu    no3    pltn   rorgn
c-----------------------------------------------------------------
----------------------------
C343 initial storage of nitrogen in the transitory layer
c    only required if nitrfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    iamsu   initial storage of solution ammonium (lb/acre)
c    ino3    initial storage of nitrate (lb/acre)
c    islon   initial storage of solution labile organic nitrogen
(lb/acre)
c    isron   initial storage of solution refractory organic
nitrogen (lb/acre)
c    agpltn  initial storage of above-ground plant nitrogen
(lb/acre)
c    littrn  initial storage of litter nitrogen (lb/acre)
c
c   defid  deluid iamsu   ino3    islon    isron    agpltn
littrn
c-----------------------------------------------------------------
----------------------------
C344 initial storage of nitrogen in the lower layer
c    only required if nitrfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
```

```
c    lorgn   initial storage of labile organic nitrogen (lb/acre)
c    amad    initial storage of adsorbed ammonium (lb/acre)
c    amsu    initial storage of solution ammonium (lb/acre)
c    no3     initial storage of nitrate (lb/acre)
c    pltn    initial storage of nitrogen stored in plants
(lb/acre)
c    rorgn   initial storage of refractory organic nitrogen
(lb/acre)
c
c   defid  deluid lorgn   amad    amsu    no3    pltn   rorgn
c-----------------------------------------------------------------
----------------------------
C345 initial storage of nitrogen in the groundwater layer
c    only required if nitrfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    lorgn   initial storage of labile organic nitrogen (lb/acre)
c    amad    initial storage of adsorbed ammonium (lb/acre)
c    amsu    initial storage of solution ammonium (lb/acre)
c    no3     initial storage of nitrate (lb/acre)
c    pltn    initial storage of nitrogen stored in plants
(lb/acre)
c    rorgn   initial storage of refractory organic nitrogen
(lb/acre)
c
c   defid  deluid lorgn   amad    amsu    no3    pltn   rorgn
c-----------------------------------------------------------------
----------------------------
C361 initial phosphorus storage in the surface layer
c    only required if phosfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    orgp    initial storage of organic phosphorus (lb/acre)
c    p4ad    initial storage of adsorbed phosphate (lb/acre)
c    p4su    initial storage of solution phosphate (lb/acre)
c    pltp    initial storage of phosphorus stored in plants
(lb/acre)
c
c   defid  deluid orgp   p4ad    p4su    pltp
c-----------------------------------------------------------------
----------------------------
C362 initial phosphorus storage in the upper layer
c    only required if phosfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    orgp    initial storage of organic phosphorus (lb/acre)
c    p4ad    initial storage of adsorbed phosphate (lb/acre)
c    p4su    initial storage of solution phosphate (lb/acre)
c    pltp    initial storage of phosphorus stored in plants
```

```
(lb/acre)
c
c   defid  deluid orgp   p4ad    p4su    pltp
c------------------------------------------------------------------
----------------------------
C363 initial phosphorus storage in the transitory layer
c    only required if phosfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    ip4su   initial storage of solution phosphate (lb/acre)
c
c   defid  deluid ip4su
c------------------------------------------------------------------
----------------------------
C364 initial phosphorus storage in the lower layer
c    only required if phosfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    orgp    initial storage of organic phosphorus (lb/acre)
c    p4ad    initial storage of adsorbed phosphate (lb/acre)
c    p4su    initial storage of solution phosphate (lb/acre)
c    pltp    initial storage of phosphorus stored in plants
(lb/acre)
c
c   defid  deluid orgp   p4ad    p4su    pltp
c------------------------------------------------------------------
----------------------------
C365 initial phosphorus storage in the groundwater layer
c    only required if phosfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    orgp    initial storage of organic phosphorus (lb/acre)
c    p4ad    initial storage of adsorbed phosphate (lb/acre)
c    p4su    initial storage of solution phosphate (lb/acre)
c    pltp    initial storage of phosphorus stored in plants
(lb/acre)
c
c   defid  deluid orgp   p4ad    p4su    pltp
c------------------------------------------------------------------
----------------------------
c390 atmosphere to stream mapping (read if mdasfg = 1 and adfgrch
= 1)
c
c    rgid    reach parameter group id
c    dwqid   general quality id
c    OrgN    organic nitrogen fraction in pqual
c    NH4S    ammonium solution fraction in pqual
c    NH4E    ammonium exchange fraction in  pqual
c    NO3     nitrate fraction in pqual
```

```
c    NO2     nitrite fraction in pqual
c    SO4     sulfate fraction in pqual
c
c     defid dwqid   OrgN   NH4S   NH4E   NO3   NO2   SO4
c-----------------------------------------------------------------
----------------------------
c391 land surface to land sub-surface mapping (read if mdasfg =1)
c
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    OrgN    organic nitrogen fraction in pqual
c    NH4S    ammonium solution fraction in pqual
c    NH4E    ammonium exchange fraction in  pqual
c    NO3     nitrate fraction in pqual
c    NO2     nitrite fraction in pqual
c    SO4     sulfate fraction in pqual
c
c     defid dwqid   deluid   OrgN   NH4S   NH4E   NO3   NO2   SO4
c-----------------------------------------------------------------
----------------------------
c392 land to stream mapping (read if mdasfg=1)
c
c    rgid    stream parameters group id
c    dwqid   general quality id
c    lutype  landuse type flow id (1 = impervious surfaceflow,
c            2 = pervious surfaceflow, 3 = pervious interflow, 4
= pervious groundflow)
c    PFe     Particulate iron fraction in pqual
c    DFe     Dissolved iron fraction in pqual
c    PAl     Particulate aluminum fraction in pqual
c    DAl     Dissolved aluminum fraction in pqual
c    CO3     CO3(2-) fraction in pqual
c    SO4     SO4 fraction in pqual
c
c     rgid   dwqid    lutype   PFe   DFe   PAl   DAl   CO3   SO4
c-----------------------------------------------------------------
----------------------------
C393 calibration parameters for the surfcae layer
c    only required if mdasfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    crfg    chemical reaction flag
c            0  = no chemical reaction
c            1  = only nitrogen transformation
c            2  = full chemical reactions
c    kes     nitrogen transformation (NH4E to NH4S) rate (per
day)
c    kse     nitrogen transformation (NH4S to NH4E) rate (per
day)
c    k1      nitrogen transformation (NH4S to NO2) rate (per day)
```

```
c    k2      nitrogen transformation (NO2 to NO3) rate (per day)
c    k3      nitrogen transformation (plant uptake NO3) rate (per
day)
c    k4      nitrogen transformation (plant uptake NH4S) rate
(per day)
c    k6      nitrogen transformation (OrgN to NH4S) rate (per
day)
c    kk6     nitrogen transformation (NH4S to OrgN) rate (per
day)
c    kk8     nitrogen transformation (NO3 to OrgN) rate (per day)
c    K_Al    Aluminum solubility constant
c    Ks      selectivity coefficient
c    CaX     base saturation percentage (fraction)
c    THETA   temperature correction coefficient for nitrogen
transformation for surface layer (range from 1.0 to 2.0)
c    OrgA    Organic acid input to the surface layer (mg/l)
c
c   defid deluid  crfg  kes   kse   k1   k2   k3   k4   k6   kk6
kk8  K_Al  Ks  CaX  theta  OrgA
c-----------------------------------------------------------------
----------------------------
C394 calibration parameters for the upper layer
c    only required if mdasfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    crfg    chemical reaction flag
c            0  = no chemical reaction
c            1  = only nitrogen transformation and sulfate
adsorption
c            2  = full chemical reactions
c    kes     nitrogen transformation (NH4E to NH4S) rate (per
day)
c    kse     nitrogen transformation (NH4S to NH4E) rate (per
day)
c    k1      nitrogen transformation (NH4S to NO2) rate (per day)
c    k2      nitrogen transformation (NO2 to NO3) rate (per day)
c    k3      nitrogen transformation (plant uptake NO3) rate (per
day)
c    k4      nitrogen transformation (plant uptake NH4S) rate
(per day)
c    k6      nitrogen transformation (OrgN to NH4S) rate (per
day)
c    kk6     nitrogen transformation (NH4S to OrgN) rate (per
day)
c    kk8     nitrogen transformation (NO3 to OrgN) rate (per day)
c    Km      maximum adsorbable amount of sulfate(mol/kg)
c    OneH    value to use to determine a half saturation
c    DESORP  desorption rate (per day)
c    K_Al    Aluminum solubility constant (log K_Al)
c    Ks      selectivity coefficient (Log Ks)
c    CaX     base saturation percentage (fraction)
```

```
c    PeakMon growing season peak month
c    THETA   temperature correction coefficient for nitrogen
transformation for upper layer (range from 1.0 to 2.0)
c    OrgA    Organic acid input to the upper layer (mg/l)
c
c   defid deluid  crfg  kes   kse   k1   k2   k3   k4   k6   kk6
kk8   Km   OneH   DESORP  K_Al  Ks  CaX  PeakMon  theta  OrgA
c-------------------------------------------------------------------
----------------------------
C395 calibration parameters for the groundwater layer
c    only required if mdasfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    crfg    chemical reaction flag
c            0  = no chemical reaction
c            1  = only nitrogen transformation and sulfate
adsorption
c            2  = full chemical reactions
c    kes     nitrogen transformation (NH4E to NH4S) rate (per
day)
c    kse     nitrogen transformation (NH4S to NH4E) rate (per
day)
c    k1      nitrogen transformation (NH4S to NO2) rate (per day)
c    k2      nitrogen transformation (NO2 to NO3) rate (per day)
c    k3      nitrogen transformation (plant uptake NO3) rate (per
day)
c    k4      nitrogen transformation (plant uptake NH4S) rate
(per day)
c    k6      nitrogen transformation (OrgN to NH4S) rate (per
day)
c    kk6     nitrogen transformation (NH4S to OrgN) rate (per
day)
c    kk8     nitrogen transformation (NO3 to OrgN) rate (per day)
c    Km      maximum adsorbable amount of sulfate(mol/kg)
c    OneH    value to use to determine a half saturation
c    DESORP  desorption rate (per day)
c    K_Al    Aluminum solubility constant (Log K_Al)
c    Ks      selectivity coefficient (Log Ks)
c    CaX     base saturation percentage (fraction)
c    PeakMon growing season peak month
c    THETA   temperature correction coefficient for nitrogen
transformation for groundwater layer (range from 1.0 to 2.0)
c    OrgA    Organic acid input to the groundwater layer (mg/l)
c
c   defid deluid  crfg  kes   kse   k1   k2   k3   k4   k6   kk6
kk8   Km   OneH   DESORP  K_Al  Ks  CaX  PeakMon  theta  OrgA
c-------------------------------------------------------------------
----------------------------
C396 calibration parameters for the reach
c    only required if mdasfg = 1 (see card 0)
c
```

```
c    rgid    reach group id
c            0  = no chemical reaction
c            1  = only nitrogen transformation and sulfate
adsorption
c            2  = full chemical reactions
c    k1      nitrogen transformation (NH4S to NO2) rate (per day)
c    k2      nitrogen transformation (NO2 to NO3) rate (per day)
c    k3      nitrogen transformation (NO3 to ?) rate (per day)
c    k6      nitrogen transformation (OrgN to NH4S) rate (per
day)
c    kk1     sulfate transformation rate (per day)
c    FEK     metal (iron) dissolution constants
c    AlK     metal (alluminium) dissolution constants
c    PCO     co2 value (per day)
c    FR_3    precipitation rate for Ca(2+) (per day)
c    FR_4    precipitation rate for CO3(2-) (per day)
c    FR_5    precipitation rate for dissolved iron (per day)
c    FRP_5   precipitation rate for particulate iron (per day)
c    FR_8    precipitation rate for dissolved alluminium (per
day)
c    FRP_8   precipitation rate for particulate alluminium (per
day)
c    FR_9    precipitation rate for Org (per day)
c    THETA   temperature correction coefficient for nitrogen
transformation for the stream (range from 1.0 to 2.0)
c    FR_Al   Al load (from soil chemical reaction) reduction
factor in the base flow
c            during the dry days (0 - no reduction,1 - 100%
reduction)
c
c   rgid   crfg  k1   k2   k3   k6   kk1  FEK   AlK  PCO   FR_3
FR_4   FR_5   FRP_5   FR_8   FRP_8   FR_9  theta  FR_Al
c-----------------------------------------------------------------
----------------------------
C397 initial storage in the top layer
c    only required if mdasfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    OrgN_S  initial storage of organic nitrogen in the surface
layer (lb/acre)
c    OrgN_U  initial storage of organic nitrogen in the upper
layer (lb/acre)
c    OrgN_I  initial storage of organic nitrogen in the
transitory layer (lb/acre)
c    NH4S_S  initial storage of solution ammonium in the surface
layer (lb/acre)
c    NH4S_U  initial storage of solution ammonium in the upper
layer (lb/acre)
c    NH4S_I  initial storage of solution ammonium in the
transitory layer (lb/acre)
c    NH4E_S  initial storage of exchange ammonium in the surface
```

```
layer (lb/acre)
c    NH4E_U  initial storage of exchange ammonium in the upper
layer (lb/acre)
c    NH4E_I  initial storage of exchange ammonium in the
transitory layer (lb/acre)
c    NO3_S   initial storage of nitrate in the surface layer
(lb/acre)
c    NO3_U   initial storage of nitrate in the upper layer
(lb/acre)
c    NO3_I   initial storage of nitrate in the transitory layer
(lb/acre)
c    NO2_S   initial storage of nitrite in the surface layer
(lb/acre)
c    NO2_U   initial storage of nitrite in the upper layer
(lb/acre)
c    NO2_I   initial storage of nitrite in the transitory layer
(lb/acre)
c    SO4_S   initial storage of sulfate in the surface layer
(lb/acre)
c    SO4_U   initial storage of sulfate in the upper layer
(lb/acre)
c    SO4_I   initial storage of sulfate in the transitory layer
(lb/acre)
c
c   defid  deluid OrgN_S   OrgN_U   OrgN_I   NH4S_S    NH4S_U
NH4S_I    NH4E_S    NH4E_U    NH4E_I    NO3_S    NO3_U    NO3_I
NO2_S   NO2_U   NO2_I   SO4_S   SO4_U   SO4_I
c-----------------------------------------------------------------
----------------------------
C398 initial storage in the sub layer
c    only required if mdasfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    OrgN_L  initial storage of organic nitrogen in the lower
layer (lb/acre)
c    OrgN_A  initial storage of organic nitrogen in the
groundwater layer (lb/acre)
c    NH4S_L  initial storage of solution ammonium in the lower
layer (lb/acre)
c    NH4S_A  initial storage of solution ammonium in the
groundwater layer (lb/acre)
c    NH4E_L  initial storage of exchange ammonium in the lower
layer (lb/acre)
c    NH4E_A  initial storage of exchange ammonium in the
groundwater layer (lb/acre)
c    NO3_L   initial storage of nitrate in the lower layer
(lb/acre)
c    NO3_A   initial storage of nitrate in the groundwater layer
(lb/acre)
c    NO2_L   initial storage of nitrite in the lower layer
(lb/acre)
```

```
c    NO2_A   initial storage of nitrite in the groundwater layer
(lb/acre)
c    SO4_L   initial storage of sulfate in the lower layer
(lb/acre)
c    SO4_A   initial storage of sulfate in the groundwater layer
(lb/acre)
c
c   defid  deluid OrgN_L   OrgN_A   NH4S_L    NH4S_A    NH4E_L
NH4E_A    NO3_L    NO3_A    NO2_L   NO2_A   SO4_L   SO4_A
c-----------------------------------------------------------------
----------------------------
C399 initial concentration in the stream
c    only required if mdasfg = 1 (see card 0)
c
c    defid parameter group id
c    OrgN  initial conc of organic nitrogen in the stream (mg/l)
c    H2O   initial conc of H2O in the stream (mg/l)
c    H     initial conc of H(+) in the stream (mg/l)
c    Ca    initial conc of Ca(2+) in the stream (mg/l)
c    CO3   initial conc of CO3(2-) in the stream (mg/l)
c    Fe    initial conc of Fe(3+) in the stream (mg/l)
c    NO3   initial conc of nitrate in the stream (mg/l)
c    NH4   initial conc of ammonium in the stream (mg/l)
c    Al    initial conc of aluminum in the stream (mg/l)
c    Org   initial conc of Torg in the stream (mg/l)
c    SO4   initial conc of sulfate in the stream (mg/l)
c    PF    initial conc of ParF in the stream (mg/l)
c    PA    initial conc of ParA in the stream (mg/l)
c    NO2   initial conc of nitrite in the stream (mg/l)
c
c   defid  OrgN   H2O   H    Ca    CO3    Fe    NO3   NH4   Al
Org   SO4   PF   PA   NO2
c-----------------------------------------------------------------
----------------------------
c400 general channel information
c
c    admod   advection method (1 for dynamic mixing same as in
HSPF and 2 for static mixing)
c    kc      crop factor associated with PEVT (used to back-
calculate EVAP; EVAP = PEVT/kc)
c    sedber  stream bank erosion sediment (1 for on and 0 for
off)
c    vconfg  a value of 1 for vconfg means that F(vol) (volume-
dependent) outflow demand components are multiplied by a factor
which is allowed to vary through the year.
c            These monthly adjustment factors are input in Table-
type MON-CONVF in this section (card 401)
c
c     admod    kc   sedber   vconfg
      1     2.000000000000e+000   0    0
c-----------------------------------------------------------------
----------------------------
```

```
c401 monthly F(vol) adjustment factors
c    only required if vconfg = 1 (see card 400)
c
c    rgid     stream parameter group id
c    jan-dec  F(vol) adjustment factors at the start of each
month
c
c  rgid    jan   feb   mar   apr   may   jun   jul   aug   sep
oct   nov   dec
c-----------------------------------------------------------------
----------------------------
c405 channel routing network
c
c    rchid   reach id (same as subbasin id)
c    control output control switch for the corresponding reach
c            0 = will not write general output
c            1 = will write general output
c    NumOutlets number of downstream outlets
c    DSn     downstream outlets  DS1   Ds2  ....  DSn
c
c    rchid   control   NumOutlets   DS1   DS2  .......   DSn
      5046  1     1    5045
      5065  1     1    5064
      5066  1     1    5065
      5079  1     1    5078
      5080  1     1    5078
      5083  1     1    5082
      5173  1     1    5172
      5175  1     1    5172
      5183  1     1    5181
      5189  1     1    5187
c-----------------------------------------------------------------
----------------------------
c410 reach geometry information
c
c    rchid   reach/lake id (same as subbasin id)
c    rgid    reach/lake group id
c    trgid   threshold reach/lake group id
c    lkfg    reach/lake flag (0 for reach otherwise lake)
c            lake flag = 1 (rectangular weir for internal option)
c            lake flag = 2 (triangular weir for internal option)
c            lake flag = 11 (BMP with rectangular weir for
internal option)
c            lake flag = 12 (BMP with triangular weir for
internal option)
c    idepth  reach/lake initial water depth (feet)
c    length  reach/lake length (miles)
c    depth   reach/lake bank full depth (feet)
c    width   reach/lake bankfull width (feet)
c    slope   reach longitudinal slope/lake infiltration rate
(in/hr)
c    Mann    reach Manning's roughness coefficient/lake weir
```

```
width (ft)
c    r1      reach ratio of bottom width to bank full width
(bottom width = r1 * width)/lake orifice height (ft)
c    r2      reach side slope of flood plane/lake orifice
diameter (ft)
c    w1      reach flood plane width factor (total width of flood
plane = w1*Width)/lake median particle size diameter, db50 (ft)
c    crat    ratio of maximum velocity to mean velocity in the
RCHRES cross-section under typical flow conditions (greater than
or equal to 1)
c    ks        the weighting factor for hydraulic routing
(calibration)
c
c     rchid rgid  trgid   lkfg    idepth     length    depth
width    slope     mann    r1    r2    w1    crrat  ks
      5046  1     0     0     0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5065  1     0     0     0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5066  1     0     0     0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5079  1     0     0     0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5080  1     0     0     0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5083  1     0     0     0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5173  1     0     0     0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5175  1     0     0     0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5183  1     0     0     0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5189  1     0     0     0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
c-----------------------------------------------------------------
----------------------------
c413 reach cross-section information
c
c    rchid   x1 y1   x2   y2...
c    rchid   reach id (same as subbasin id)
c    x       distance from the left reach bank (ft)
```

```
c            it should not be greater than bank full width in
card 410 (ft)
c    y       elevation from the reach bed (ft)
c            it should not be greater than bank full depth in
card 410 (ft)
c
c-----------------------------------------------------------------
----------------------------
c415 reach discharge-volume relationship
c
c    rchid   reach id
c    depth   water depth (feet)
c    area    water surface area (acres)
c    vol     water volume (ac-ft)
c    disch(1, 2, 3, ....noutflows)  outflows (cfs)
c
c     rchid  depth   area    vol    disch1    disch2   .......
dischN
c-----------------------------------------------------------------
----------------------------
c420 general point source information
c
c    nPtSource   number of individual point sources
c    nPtQuals    number of point source quals
c
c  nPtSource  nPtQuals
      0    0
c-----------------------------------------------------------------
----------------------------
c425 point source
c    Qualindex  point source qual index
c    Qualname   point source qual name
c    Qualid         point source qual id
c    sqalfr         point source sediment associated qual fraction
(0-1)
c
c  Qualindex  Qualname  qualid
c-----------------------------------------------------------------
----------------------------
c430 point source withdrawal
c    subbasin  point source reach id
c    permit    point source permit
c    pipe      point source pipe
c    wd_target point source withdrawal target reach id
c
c  subbasin  permit  pipe   wd_target
c-----------------------------------------------------------------
----------------------------
c440 sediment parameters controls
c
c    crvfg   if crvfg = 1, erosion-related cover may vary
throughout the year.
```

```
c            values are supplied in Table-type MON-COVER (card
453)
c    vsivfg  if vsivfg = 1, the rate of net vertical sediment
input may vary throughout the year.
c            if vsivfg = 2, the vertical sediment input is added
to the detached sediment storage only on days when no rainfall
occurred during the previous day.
c            values are supplied in Table-type MON-NVSI (card
454)
c    sandfg  if sandfg = 0, the sand is not simulated.
c            if sandfg = 1, the sand transport capacity is
calculated using the Toffaleti method.
c            if sandfg = 2, the sand transport capacity is
calculated using the Colby method.
c            if sandfg = 3, the sand transport capacity is
calculated using the power function of velocity.
c    sweepfg if sweepfg = 0, the street sweeping is not
simulated.
c
c     crvfg    vsivfg    sandfg    sweepfg
      0    0    3    0
c-----------------------------------------------------------------
----------------------------
c445 street sweeping (read if sweepfg =1, see card 440)
c
c    defid          parameter group id
c    deluid         landuse id
c    deluname       landuse name
c    start_month    start month of street sweeping requirement
c    end_month      end month of street sweeping requirement
c    frequency      days between street sweeping within the
landuse (0 for no sweeping)
c    percent_area   fraction of land surface which is available
for street sweeping (0 for no sweeping)
c    effic_sand     fraction of sand in solids storage that is
available for removal by sweeping (0-1)
c    effic_silt     fraction of silt in solids storage that is
available for removal by sweeping (0-1)
c    effic_clay     fraction of clay in solids storage that is
available for removal by sweeping (0-1)
c
c     defid   deluid   deluname   start_month   end_month
frequency   percent_area   effic_sand   effic_silt   effic_clay
c-----------------------------------------------------------------
----------------------------
c450 sediment parameter group 1 (read if sedfg =1)
c
c    defid   parameter group id
c    deluid  landuse id
c    smpf    supporting management practice factor
c    krer    coefficient in the soil detachment equation
c    jrer    exponent in the soil detachment equation
```

```
c    affix   fraction by which detached sediment storage
decreases each day as a result of
c            soil compaction. (/day)
c    cover   fraction of land surface which is shielded from
rainfall erosion
c    nvsi    rate at which sediment enters detached storage from
the atmosphere (lb/ac/day)
c            negative value may be used to simulate removal by
human activity or wind
c    kser    coefficient in the detached sediment washoff
equation
c    jser    exponent in the detached sediment washoff equation
c    kger    coefficient in the matrix soil scour equation, which
simulates gully erosion
c    jger    exponent in the matrix soil scour equation, which
simulates gully erosion
c    accsdp  rate at which solids accumulate on the land surface
(used in impervious land)
c    remsdp  fraction of solids storage which is removed each day
when there is no runoff,
c            for example, because of street sweeping (used in
impervious land)
c
c     defid deluid  smpf   krer   jrer  affix  cover    nvsi  kser
jser  kger  jger   accsdp remsdp
      1     1    1.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.035000   2.000000   0.000000
      2.000000   0.001000   0.025000
      1     2    1.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.030000   2.000000   0.000000
      2.000000   0.001000   0.025000
      1     3    1.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.030000   2.000000   0.000000
      2.000000   0.001000   0.025000
      1     4    1.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.035000   2.000000   0.000000
      2.000000   0.001000   0.025000
      1     5    1.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.070000   2.000000   0.000000
      2.000000   0.001000   0.025000
      1     6    1.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.065000   2.000000   0.000000
      2.000000   0.001000   0.025000
      1     7    1.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.065000   2.000000   0.000000
      2.000000   0.001000   0.025000
      1     8    1.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.085000   2.000000   0.000000
      2.000000   0.001000   0.025000
      1     9    1.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.085000   2.000000   0.000000
      2.000000   0.001000   0.025000
```

```
     1    10   1.000000   0.100000   1.810000   0.003000
     0.270000   0.000000   0.001000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1    11   1.000000   0.100000   1.810000   0.003000
     0.270000   0.000000   0.100000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1    12   1.000000   0.100000   1.810000   0.003000
     0.270000   0.000000   0.100000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1    13   1.000000   0.100000   1.810000   0.003000
     0.270000   0.000000   0.100000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1    14   1.000000   0.100000   1.810000   0.003000
     0.270000   0.000000   0.100000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1    15   1.000000   0.100000   1.810000   0.003000
     0.270000   0.000000   0.100000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1    16   1.000000   0.350000   1.810000   0.003000
     0.270000   0.000000   0.150000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1    17   1.000000   0.350000   1.810000   0.003000
     0.270000   0.000000   0.150000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1    18   1.000000   0.350000   1.810000   0.003000
     0.270000   0.000000   0.150000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1    19   1.000000   0.350000   1.810000   0.003000
     0.270000   0.000000   0.150000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1    20   1.000000   0.000000   1.810000   0.003000
     0.000000   0.000000   0.000000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1    21   1.000000   0.100000   1.810000   0.003000
     0.000000   0.000000   0.100000   2.000000   0.000000
     2.000000   0.000000   0.000000
c-----------------------------------------------------------------
----------------------------
c451 sediment parameter group 2 (read if sedfg =1)
c
c    defid     parameter group id
c    deluid    landuse id
c    sed-suro  background concentration associated with surface
flow (mg/l)
c    sed-ifwo  background concentration associated with interflow
outflow (mg/l)
c    sed-agwo  background concentration associated with
groundwater outflow (mg/l)
c    sed_i     fraction of sediment class_i (sand, silt, and
clay)
c
c    (sand + silt + clay = 1)
```

```
c    Background sediment load is added to total sediment from
LAND prior to applying fractions
c
c     defid   deluid    sed_suro   sed_ifwo   sed_agwo   sed_1
sed_2   sed_3 ........sed_n
     1     1    0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     2    0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     3    0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     4    0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     5    0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     6    0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     7    0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     8    0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     9    0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     10   0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     11   0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     12   0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     13   0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     14   0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     15   0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     16   0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     17   0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     18   0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     19   0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     20   0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
     1     21   0.000000   0.000000   0.000000   0.050000
     0.550000   0.400000
c-----------------------------------------------------------------
----------------------------
c452 GQUAL-sediment to stream mapping (read if sediment as gqual)
c
c    defid   parameter group id
```

```
c    dwqid   general quality id
c    lutype  landuse type flow id (1 = impervious surfaceflow,
c            2 = pervious surfaceflow, 3 = pervious interflow, 4
= pervious groundflow)
c    sed_i   fraction of sediment class_i (sand, silt, and clay)
c
c     defid dwqid    lutype   sed_1   sed_2   sed_3 ........sed_n
c-----------------------------------------------------------------
----------------------------
c453 monthly erosion-related cover values
c    only required if crvfg = 1 (see card 440)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec erosion-related cover values at start of each month
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c454 monthly net vertical sediment input
c    only required if vsivfg = 1 (see card 440)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec net vertical sediment input at start of each month
(lb/acre/day)
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c455 sediment general parameters group 3 (read if sedfg = 1)
c    general sediment related parameters for instream transport
c
c    rgid     stream parameter group id
c    bedwid   bed width (ft) - this is constant for the entire
simulation period
c    beddep   initial bed depth (ft)
c    por      porosity
c    burial   burial rate of aggregated sediment layer (in/day)
c             if burial = 0 then burial rate in card 456 is used
c
c
c     rgid  bedwid  beddep  por  burial
      1    1.000000   0.000000   0.300000   0.000000
c-----------------------------------------------------------------
----------------------------
c456 sediment parameters group 4 (read if sedfg = 1)
c    cohesive suspended sediment variables for instream transport
c
c    rgid           stream parameter group id
```

```
c    sed_id         sediment class id
c    sedflg         sediment flag indicating sediment class (0
for sand, 1 for silt, and 2 for clay)
c    sedo           initial sediment conc in fluid phase
(mg/liter)
c    sedfrac        initial sediment fractions (by weight) in the
bed material
c    db50/d         median diameter of the non-cohesive sediment
(sand) (in) (sandfg = 1 or 2)
c                   / effective diameter of the cohesive
particles (silt and clay) (in)
c    w              corresponding fall velocity of the particle
in still water (in/s)
c    rho            density of the particles (gm/cm^3)
c    ksand/taucd    coefficient in the sandload power function
formula (sandfg = 3)
c                   / critical bed shear stress for deposition of
the cohesive particle - generally taucd <= taucs (lb/ft^2)
c                   if tau > taucd then no deposition
c                   if tau < taucd then deposition rate
approaches settling velocity, w
c    expsnd/taucs   exponent in the sandload power function
formula (sandfg = 3)
c                   / critical bed shear stress for scour of the
cohesive particle (lb/ft^2)
c                   if tau < taucs then no scour
c                   if tau > taucs then scour steadily increases
c    m              erodibility coefficient of the cohesive
particle (lb/ft^2/day)
c    burial         burial rate of the sediment particle (in/day)
c                   it is used if burial rate in card 455 is zero
c
c
c     rgid  sed_id  sedflg  sedo  sedfrac  db50/d   w  rho
ksand/taucd  expsnd/taucs  m   burial
     1    1    0    0.000000   0.100000   0.005000   0.020000
     2.500000   0.350000   3.200000   0.000000   0.000000
     1    2    1    0.000000   0.450000   0.000600   0.010000
     2.200000   0.150000   0.900000   3.000000   0.000000
     1    3    2    0.000000   0.450000   0.000060   0.000100
     2.000000   0.080000   0.800000   5.000000   0.000000
c-----------------------------------------------------------------
----------------------------
c457 Streambank erosion sediment parameters (read if sedfg = 1
and sedber = 1)
c
c    rchid   reach id
c    kber    coefficient for scour of the bank matrix soil
(calibration)
c    jber    exponent for scour of the bank matrix soil
(calibration)
c    qber    bank erosion flow threshold causing channel bank
```

```
soil erosion (cfs)
c            if = negative then threshold flow is at the bank
full depth (cfs)
c    sed_i   fraction of sediment class_i (sand, silt, and clay)
c
c     rchid    kber    jber    qber   sed_1   sed_2   sed_3
....sed_n
c-----------------------------------------------------------------
----------------------------
c460 soil temperature control   (read if tempfg = 1)
c
c    msltfg  if = 1 monthly vary aslt and bslt parameters in
surface flow temperature calculation
c    miftfg  if = 1 monthly vary aift and bift parameters in
interflow temperature calculation
c    mgwtfg  if = 1 monthly vary agwt and bgwt parameters in
ground water temperature calculation
c
c     msltfg     miftfg      mgwtfg
c-----------------------------------------------------------------
----------------------------
c461 Soil Temperature   (read if tempfg =1)
c
c    defid   parameter group id
c    deluid  landuse id
c    tsopfg  if = 0 compute subsurface temperatures using a mean
departure from air temperature plus a smoothing factor
c            if = 1 compute subsurface temperature using
regression
c            if = 2 the lower/gw layer temperature is a function
of upper layer temperature instead of air temperature
c    aslt    surface layer temperature when the air temperature 0
degrees C
c    bslt    slope of the surface layer temperature regression
equation
c    aift    mean difference between interflow temperature and
air temperature (C)
c    bift    smoothing factor in the interflow temperature
calculation
c    agwt    mean difference between groundwater temperature and
air temperature (C)
c    bgwt    smoothing factor in the groundwater temperature
calculation
c    islt    initial surface flow temperature (C)
c    iift    initial interflow temperature (C)
c    igwt    initial groundwater temperature (C)
c
c            y = a + b * x
c     defid deluid   tsopfg    aslt     bslt     aift     bift
agwt   bgwt  islt   iift   igwt
c-----------------------------------------------------------------
----------------------------
```

```
c462 mon-aslt
c    only required if tempfg = 1 and msltfg = 1 (see card 460)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec surface layer temperature when the air temperature 0
degrees C at start of each month (C)
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c------------------------------------------------------------------
--------------------
c463 mon-bslt
c    only required if tempfg = 1 and msltfg = 1 (see card 460)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec slope of the surface layer temperature regression
equation at start of each month
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c------------------------------------------------------------------
--------------------
c464 mon-aift
c    only required if tempfg = 1 and miftfg = 1 (see card 460)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec mean difference between interflow temperature and
air temperature at start of each month (C)
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c------------------------------------------------------------------
--------------------
c465 mon-bift
c    only required if tempfg = 1 and miftfg = 1 (see card 460)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec smoothing factor in the interflow temperature
calculation at start of each month
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c------------------------------------------------------------------
--------------------
c466 mon-agwt
c    only required if tempfg = 1 and mgwtfg = 1 (see card 460)
c
c    defid   parameter group id
```

```
c    deluid  landuse id
c    jan-dec mean difference between groundwater temperature and
air temperature at start of each month (C)
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c467 mon-bgwt
c    only required if tempfg = 1 and mgwtfg = 1 (see card 460)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec smoothing factor in the groundwater temperature
calculation at start of each month
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c470 Temperature Parameters for Land Groups  (read if tempfg =1)
c
c    subbasin    subbasin id
c    melev     the mean watershed elevation (ft)
c    eldat       difference in elevation between watershed and
the air temperature gage (ft)
c    rmelev      the mean RCHRES elevation (ft)
c    reldat      difference in elevation between the RCHRES and
the air temperature gage (ft)
c                (positive if RCHRES is higher than the gage).
c
c     subbasin   melev     eldat   rmelev     reldat
c-----------------------------------------------------------------
----------------------------
c475 Temperature Parameters for Stream Groups  (read if tempfg =
1)
c
c    rgid    stream parameters group id
c    cfsaex  correction factor for solar radiation; fraction of
RCHRES surface exposed to radiation
c    katrad  longwave radiation coefficient
c    kcond   conduction-convection heat transport coefficient
c    kevap   evaporation coefficient
c
c     rgid   cfsaex    katrad     kcond     kevap
c-----------------------------------------------------------------
----------------------------
c480 Bed Heat Conduction Parameters for Stream Groups  (read if
tempfg=1)
c
c    rgid    stream parameters group id
c    preflg  flag for heat transfer rates for water surface (0 =
```

```
off)
c    bedflg  bed conduction flag
c            0 - bed conduction is not simulated
c            1 - single interface (water-mud) heat transfer
method
c            2 - two-interface (water-mud and mud-ground) heat
transfer method
c            3 - Jobson method (not supported)
c    tgflg   source of the ground temperature for the bed
conduction (used when bedflg is 1 or 2)
c            1 - time series (not supported)
c            2 - single value
c            3 - monthly values (card 485)
c    muddep  depth of the mud layer in the two-interface model
(bedflg = 2) (m)
c    tgrnd   constant (tgflg = 2) ground temperature (bedflg = 1
or 2) (degree C)
c    kmud    heat conduction coefficient between water and the
mud/ground (bedflg = 1 or 2) (kcal/m2/degC/hr)
c    kgrnd   heat conduction coefficient between ground and mud
in the two-interface model (bedflg = 2) (kcal/m2/degC/hr)
c
c     rgid   preflg   bedflg   tgflg   muddep   tgrnd   kmud
kgrnd
c-------------------------------------------------------------
----------------------------
c485 monthly ground temperatures for bed heat conduction
algorithms
c    only required if tgflg = 3 (see card 480)
c
c    rgid     stream parameter group id
c    jan-dec  tgrndm - monthly ground temperatures for use in the
bed heat conduction models (degree C)
c
c  rgid    jan   feb   mar   apr   may   jun   jul   aug   sep
oct   nov   dec
c-------------------------------------------------------------
----------------------------
c500 land to stream mapping (read if oxfg =1)
c
c    rgid    stream parameters group id
c    dwqid   general quality id
c    lutype  landuse type flow id (1 = impervious surfaceflow,
c            2 = pervious surfaceflow, 3 = pervious interflow, 4
= pervious groundflow)
c    bod     bod fraction in pqual
c    nox     nitrate fraction in pqual
c    tam     total ammonia fraction in  pqual
c    snh4    particulate NH4-N fraction in pqual
c    po4     ortho-phosphorus fraction in pqual
c    spo4    particulate PO4-P fraction in pqual
c    orn     organic-nitrogen fraction in pqual
```

```
c    orp     organic-phosphorus fraction in pqual
c    orc     organic-carbon fraction in pqual
c
c     rgid   dwqid    lutype   bod   nox   tam   snh4   po4   spo4
orn   orp   orc
c-----------------------------------------------------------------
----------------------------
c502 gases control   (read if oxfg =1)
c
c    midofg  if = 1 monthly very DO concentration in interflow
c    mico2fg if = 1 monthly very CO2 concentration in interflow
c    madofg  if = 1 monthly very DO concentration in ground water
c    maco2fg if = 1 monthly very CO2 concentration in ground
water
c
c     midofg     mico2fg      madofg      maco2fg
c-----------------------------------------------------------------
----------------------------
c503   DO-CO2 Control constant values (read if oxfg =1)
c
c    defid   parameter group id
c    deluid  landuse id
c    sdoxp   concentration of dissolved oxygen in surface flow
(mg/l)
c    sco2p   concentration of dissolved CO2 in surface flow
(mg/l)
c    idoxp   concentration of dissolved oxygen in interflow
outflow (mg/l)
c    ico2p   concentration of dissolved CO2 in interflow outflow
(mg/l)
c    adoxp   concentration of dissolved oxygen in active
groundwater outflow (mg/l)
c    aco2p   concentration of dissolved CO2 in active groundwater
outflow (mg/l)
c
c     defid deluid   sdoxp    sco2p     idoxp    ico2p     adoxp
aco2p
c-----------------------------------------------------------------
----------------------------
c504 mon-DO (interflow)  mg C/l
c    only required if oxfg = 1 and midofg = 1 (see card 502)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec interflow dissolved oxygen concentration at start of
each month (mg/l)
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c505 mon-DO (groundwater)
```

```
c    only required if oxfg = 1 and madofg = 1 (see card 502)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec groundwater dissolved oxygen concentration at start
of each month (mg/l)
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c------------------------------------------------------------------
--------------------
c506 mon-CO2 (interflow)  mg C/l
c    only required if oxfg = 1 and mico2fg = 1 (see card 502)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec interflow carbon dioxide concentration at start of
each month (mg/l)
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c------------------------------------------------------------------
----------------------------
c507 mon-CO2 (groundwater)
c    only required if oxfg = 1 and maco2fg = 1 (see card 502)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec groundwater carbon dioxide concentration at start of
each month (mg/l)
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c------------------------------------------------------------------
----------------------------
c510 DO/BOD control
c
c    benrfg   benthic release flag (for benthic related
parameters)
c    reamfg reaeration flag (indicates the method used to
calculate the reaeration coefficient for free-flowing streams)
c    if = 1 then Tsivoglou method is used
c    if = 2 then Owens, Churchill, or O'Connor-Dobbins method is
used depending on velocity and depth of water
c    if = 3 then Coefficient is calculated as a power function of
velocity and/or depth
c
c     benrfg     reamfg
c------------------------------------------------------------------
----------------------------
c511 ox-parm1
c
```

```
c    rgid    stream parameter group id
c    kbod20  bod decay rate at 20oC (1/hr)
c    tcbod   temperature adjustment coefficient for bod decay
c    kodset  bod settling rate (m/hr)
c    supsat  maximum allowable dissolved oxygen supersaturation
(expressed as a multiple of the dissolved oxygen saturation
concentration)
c    tcginv  temperature correction coefficient for surface gas
invasion
c    reak    empirical constant in the equation
c            if reamfg = 1 then it is an escape coefficient
(1/ft)
c            if reamfg = 3 then it is used to calculate the
reaeration coefficient (1/hr)
c    expred  exponent to depth in the reaeration coefficient
equation (for reamfg = 3)
c    exprev  exponent to velocity in the reaeration coefficient
equation (for reamfg = 3)
c    cforea  correction factor in the lake reaeration equation;
it accounts for good or poor circulation characteristics
c
c     rgid   kbod20   tcbod   kodset   supsat   tcginv   reak
expred   exprev   cforea
c-----------------------------------------------------------------
----------------------------
c512 ox-parm2
c
c    rgid       stream parameter group id
c    benod      benthal oxygen demand at 20 degrees C (with
unlimited DO concentration) (mg/m2/hr)
c    tcben      temperature correction coefficient for benthal
oxygen demand
c    expod      exponential factor in the dissolved oxygen term
of the benthal oxygen demand equation
c    brbod      benthal release rate of BOD under aerobic
conditions.(mg/m2/hr)
c    brbod_inc  increment to benthal release of BOD under
anaerobic conditions. (mg/m2/hr)
c    expre1     the exponent in the DO term of the benthal BOD
release equation
c
c     rgid   benod   tcben   expod   brbod   brbod_inc   exprel
c-----------------------------------------------------------------
--------------------
c513 oxrx-initial conditions
c
c    rgid   stream parameter group id
c    dox    DO initial condition. (mg/l)
c    bod    BOD initial condition in water column. (mg/l)
c    satdo  Initial DO saturation concentration. (mg/l)
c
c     rgid   dox   bod   satdo
```

```
c--------------------------------------------------------------------
--------------------
c514 ox-scour parms
c
c    rgid   stream parameter group id
c    scrvel threshold velocity above which the effect of scouring
on benthal release rates is considered. (m/s)
c    scrmul multiplier by which benthal releases are increased
during scouring.
c
c     rgid   scrvel   scrmul
c--------------------------------------------------------------------
--------------------
c520 nutrients control
c
c    tamfg    total ammonia flag
c    no2fg    nitrite flag
c    po4fg    ortho-phosphorus flag
c    amvfg    ammonia volatilization flag
c    denfg    denitrification flag
c    adnhfg   NH4 adsorption flag
c    adpofg   PO4 adsorption flag
c    mphfg    monthly pH flag (not supported in this version)
c
c     tamfg   no2fg   po4fg   amvfg   denfg   adnhfg   adpofg
mphfg
c--------------------------------------------------------------------
----------------------------
c521 nut-parm1
c
c    rgid    stream parameter group id
c    cvbo    conversion from milligrams biomass to milligrams
oxygen (mg/mg)
c    cvbpc   conversion from biomass expressed as phosphorus to
carbon (mols/mol)
c    cvbpn   conversion from biomass expressed as phosphorus to
nitrogen (mols/mol)
c    bpcntc  percentage of biomass which is carbon (by weight)
c    ktam20  nitrification rate of ammonia at 20 degrees C (1/hr)
c    kno220  nitrification rate of nitrite at 20 degrees C (1/hr)
c    tcnit   temperature correction coefficient for nitrification
c    kno320  nitrate denitrification rate at 20 degrees C (1/hr)
c    tcden   temperature correction coefficient for
denitrification
c    denoxt  dissolved oxygen concentration threshold for
denitrification (mg/l)
c
c     rgid   cvbo   cvbpc   cvbpn  bpcntc   ktam20  kno220  tcnit
kno320  tcden  denoxt
c--------------------------------------------------------------------
----------------------------
c522 nut-parm2
```

```
c
c    rgid         stream parameter group id
c    brtam_1      benthal release rate of ammonia under aerobic
condition (mg/m2/hr)
c    brtam_2      benthal release rates of ammonia under
anaerobic conditions (mg/m2/hr)
c    brpo4_1      benthal release rate of ortho-phosphorus under
aerobic condition (mg/m2/hr)
c    brpo4_2      benthal release rate of ortho-phosphorus under
anaerobic condition (mg/m2/hr)
c    bnh4(1-3)    constant bed concentrations of ammonia-N
adsorbed to sand, silt, and clay (mg/kg)
c    bpo4(1-3)    constant bed concentrations of ortho-
phosphorus-P adsorbed to sand, silt, and clay (mg/kg)
c
c     rgid   brtam_1   brtam_2   brpo4_1   brpo4_2   bnh4_1   bnh4
_2   bnh4_3    bpo4_1   bpo4_2   bpo4_3
c-----------------------------------------------------------------
--------------------
c523 nut-parm3
c
c    rgid         stream parameter group id
c    anaer        concentration of dissolved oxygen below which
anaerobic conditions are assumed to exist (mg/l)
c    adnhpm(1-3)  adsorption coefficients (Kd) for ammonia-N
adsorbed to sand, silt, and clay (cm3/g)
c    adpopm(1-3)  adsorption coefficients for ortho-phosphorus-P
adsorbed to sand, silt, and clay (cm3/g)
c    expnvg       exponent in the gas layer mass transfer
coefficient equation for NH3 volatilization
c    expnvl       exponent in the liquid layer mass transfer
coefficient equation for NH3 volatilization
c
c     rgid  anaer    adnhpm_1   adnhpm_2   adnhpm_3   adpopm_1
adpopm_2   adpopm_3   expnvg   expnvl
c-----------------------------------------------------------------
--------------------
c524 nut-initial conditions
c
c    rgid       stream parameter group id
c    no3        initial concentration of nitrate (mg/l)
c    tam        initial concentration of total ammonia (mg/l)
c    no2        initial concentration of nitrite (as N) (mg/l)
c    po4        initial concentration of ortho-phosphorus (as P)
(mg/l)
c    snh4(1-3)  initial suspended concentrations of ammonia-N
adsorbed to sand, silt, and clay (mg/kg)
c    spo4(1-3)  initial suspended concentrations of ortho-
phosphorus-P adsorbed to sand, silt, and clay (mg/kg)
c
c     rgid   no3   tam   no2   po4   snh4_1   snh4_2   snh4_3
spo4_1   spo4_2   spo4_3
```

```
c-----------------------------------------------------------------
--------------------
c530 plank flags
c
c    phyfg    phytoplankton flag
c    zoofg    zooplankton flag
c    balfg    benthic algae flag
c    sdltfg   influence of sediment washload on light extinction
flag
c    amrfg    ammonia retardation of nitrogen-limited growth flag
c    decfg    linkage between carbon dioxide and phytoplankton
growth flag (if on, the linkage is decoupled)
c    nsfg     ammonia is included as part of available nitrogen
supply in nitrogen limited growth calculations
c    orefg    indicates the oref parameter in card 534 as a
flowrate (if = 0) otherwise velocity
c
c     phyfg   zoofg   balfg   sdltfg   amrfg   decfg   nsfg
orefg
c-----------------------------------------------------------------
----------------------------
c531 plank-parm1
c
c    rgid    stream parameter group id
c    ratclp  ratio of chlorophyll A content of biomass to
phosphorus content
c    nonref  non-refractory fraction of algae and zooplankton
biomass
c    litsed  multiplication factor to total sediment
concentration to determine sediment contribution to light
extinction (l/mg/ft)
c    alnpr   fraction of nitrogen requirements for phytoplankton
growth that is satisfied by nitrate
c    extb    base extinction coefficient for light (1/m)
c    malgr   maximum unit algal growth rate (1/hr)
c
c     rgid    ratclp   nonref   litsed   alnpr   extb    malgr
c-----------------------------------------------------------------
----------------------------
c532 plank-parm2
c
c    rgid    stream parameter group id
c    cmmlt   Michaelis-Menten constant for light limited growth
(lay/min)
c    cmmn    nitrate Michaelis-Menten constant for nitrogen
limited growth (mg/l)
c    cmmnp   nitrate Michaelis-Menten constant for phosphorus
limited growth (mg/l)
c    cmmp    phosphate Michaelis-Menten constant for phosphorus
limited growth (mg/l)
c    talgrh  temperature above which algal growth ceases (C)
c    talgrl  temperature below which algal growth ceases (C)
```

```
c    talgrm  temperature below which algal growth is retarded (C)
c
c     rgid    cmmlt    cmmn    cmmnp    cmmp    talgrh   talgrl
talgrm
c-----------------------------------------------------------------
--------------------
c533 plank-parm3
c
c    rgid   stream parameter group id
c    alr20  algal unit respiration rate at 20 degrees C (1/hr)
c    aldh   high algal unit death rate (1/hr)
c    aldl   low algal unit death rate (1/hr)
c    oxald  increment to phytoplankton unit death rate due to
anaerobic conditions (1/hr)
c    naldh  inorganic nitrogen concentration below which high
algal death rate occurs (as nitrogen) (mg/l)
c    paldh  inorganic phosphorus concentration below which high
algal death rate occurs (as phosphorus) (mg/l)
c
c     rgid     alr20      aldh      aldl     oxald     naldh
paldh
c-----------------------------------------------------------------
--------------------
c534 plank-parm4
c
c    rgid    stream parameter group id
c    phycon  constant inflow concentration of plankton from land
to reach (mg/l)
c    seed    minimum concentration of plankton not subject to
advection (i.e., at high flow) (mg/l)
c    mxstay  concentration of plankton not subject to advection
at very low flow (mg/l)
c    oref    velocity/outflow at which the concentration of
plankton not subject to advection is midway between SEED and
MXSTAY, see card 530 (m/s or m3/s)
c    claldh  chlorophyll a concentration above which high algal
death rate occurs (ug/l)
c    physet  phytoplankton settling rate (m/hr)
c    refset  settling rate for dead refractory organics (m/hr)
c    cfsaex  This factor is used to adjust the input solar
radiation to make it applicable to the RCHRES;
c            for example, to account for shading of the surface
by trees or buildings
c    mbal    maximum benthic algae density (as biomass) (mg/m2)
c    cfbalr  ratio of benthic algal to phytoplankton respiration
rate
c    cfbalg  ratio of benthic algal to phytoplankton growth rate
c
c     rgid   phycon   seed   mxstay   oref   claldh   physet
refset  cfsaex  mbal   cfbalr   cfbalg
c-----------------------------------------------------------------
--------------------
```

```
c535 plank-initial conditions
c
c    rgid   stream parameter group id
c    phyto  initial phytoplankton concentration, as biomass
(mg/l)
c    benal  initial benthic algae density, as biomass (mg/m2)
c    orn    initial dead refractory organic nitrogen
concentration (mg/l)
c    orp    initial dead refractory organic phosphorus
concentration (mg/l)
c    orc    initial dead refractory organic carbon concentration
(mg/l)
c
c     rgid    phyto    benal   orn    orp    orc
c-----------------------------------------------------------------
--------------------
c540 pH controls
c
c    phffg1   value of 0 indicates that the removal factor for
total inorganic carbon is constant, given as phfrc1
c                 a value of 1 indicates the monthly removal
factors
c    phffg2   value of 0 indicates that the removal factor for
dissolved carbon dioxide is constant, given as phfrc2
c             a value of 1 indicates the monthly removal factors
c    phfrc1   removal fraction for total inorganic carbon
c    phfrc2   removal fraction for dissolved carbon dioxide
c
c     phffg1   phffg2   phfrc1   phfrc2
c-----------------------------------------------------------------
----------------------------
c541 pH-parm
c
c    rgid    stream parameter group id
c    phcnt maximum number of iterations used to solve for the pH
c    alkcon      number of the conservative substance which is
used to simulate alkalinity
c            Alkalinity must be simulated in order to obtain
valid results
c    cfcinv      ratio of the carbon dioxide invasion rate to the
oxygen reaeration rate
c    brco2_1    benthal release rate of CO2 (as carbon) for
aerobic conditions (mg/m2/hr)
c    brco2_2 benthal release rate of CO2 (as carbon) for
anaerobic conditions (mg/m2/hr)
c
c     rgid    phcnt   alkcon   cfcinv   brco2_1   brco2_2
c-----------------------------------------------------------------
----------------------------
c542 pH-initial conditions
c
c    rgid  stream parameter group id
```

```
c    tic         initial total inorganic carbon (mg/l)
c    co2         initial carbon dioxide (as carbon) (mg/l)
c    ph          initial pH
c
c     rgid    tic    co2   ph
c-----------------------------------------------------------------
--------------------
c543 mon-tic (monthly removal fraction for total inorganic
carbon)
c    only required if phfg = 1 and phffg1 = 1 (see card 502 and
card 540)
c
c    rgid    stream parameter group id
c    jan-dec total inorganic carbon removal fraction at the start
of each month
c
c  rgid    jan   feb   mar   apr   may   jun   jul   aug   sep
oct   nov   dec
c-----------------------------------------------------------------
----------------------------
c544 mon-co2 (monthly removal fraction for dissolved carbon
dioxide)
c    only required if phfg = 1 and phffg2 = 1 (see card 502 and
card 540)
c
c    rgid    stream parameter group id
c    jan-dec dissolved carbon dioxide removal fraction at the
start of each month
c
c  rgid    jan   feb   mar   apr   may   jun   jul   aug   sep
oct   nov   dec
c-----------------------------------------------------------------
----------------------------
c600 TMDL control flags
c
c    ncpt        if > 0 then use point sources control card 660
c    ncland      if > 0 then use landuse control card 670
c                if = 1 then apply reduction to only surface
output
c                if = 2 then apply reduction to total land output
c    ncrch       if > 0 then use reach control card 685 and 690
c    ntrgp       number of threshold groups in Card 410 and 610
c    ntnum       number of defined thresholds for analysis
c                if > 0 then use threshold control cards 605 and
610
c
c   ncpt  ncland  ncrch  ntrgp  ntnum
      0    2    0    0    0
c-----------------------------------------------------------------
----------------------------
c605 TMDL threshold mapping (used if ntnum > 0 in card 600)
c
```

```
c    tnum       threshold ordinal number
c    tqsd       threshold qual (1 for dissolved only and 2 for
total)
c    tcount     number of water quality constituent to aggregate
c    tqid       list of tqid to aggregate - number of tqid in
list = tcount (GQUAL/RQUAL IDs)
c
c    tnum   tqsd    tcount   tqid1   tqid2   .......   tqidn
c-----------------------------------------------------------------
----------------------------
c610 TMDL threshold definitions (used if ntnum > 0 in card 600)
c
c    trgid      threshold reach group ID (corresponds to trgid on
Card 410)
c    tnum       threshold number (corresponds to tnum on Card
605)
c    ttype      threshold type (possible values: 0, 1, 2, 3 or -
1, -2, -3)
c                0 = no standard to be applied for the trgid
c                1 = instantaneous values > threshold
c                2 = arithmetic mean > threshold
c                3 = geometric mean > threshold
c               -1 = instantaneous values < threshold
c               -2 = arithmetic mean < threshold
c               -3 = geometric mean < threshold
c    tdays      number of days over model output is aggregated
and/or is compared
c               if tdays = 0 then threshold becomes percent of
time
c    jan-dec    twelve monthly values for threshold (for
constant, use same value 12 times)
c               (units are same as in card 250)
c
c    examples: ttype  tdays  description/interpretation
c                 1      1  at least one instantaneous value
within a 1-day running period > threshold
c                -1      1  at least one instantaneous value
within a 1-day running period < threshold
c                 1      0  percent of time that instantaneous
value > threshold
c                 2      4  4-day running arithmetic mean >
threshold
c                 3     30  30-day running geometric mean >
threshold (for previous 30-days)
c
c  trgid  tnum   ttype  tdays   jan   feb   mar   apr   may   jun
jul   aug   sep   oct   nov   dec
c-----------------------------------------------------------------
-----------------------
c660 TMDL point source control (used if ncpt > 0 on card 600)
c
c    rchid         reach id
```

```
c    permit        point source index (level1)
c    pipe          point source index qualifier (level2)
c    reduction     reduction of pollutant from point source (in
fraction)
c
c   rchid   permit   pipe
reduction_flow...reduction_qual1...reduction_qual2...reduction_qu
aln
c-----------------------------------------------------------------
----------------------------
c670 TMDL land-based control (used if ncland > 0 on card 600)
c
c    subbasin   subwatershed id
c    deluid     land use id
c    luname     land use name
c    reduction  reduction of pollutant from corresponding landuse
and subwatershed
c
c     subbasin  deluid pluname  reduction
      5046  1     HD_SF_Residential     0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000
      5046  2     LD_SF_Res_Moderate    0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000
      5046  3     LD_SF_Res_Steep 0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5046  4     MF_Res     0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5046  5     Commercial 0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5046  6     Institutional   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5046  7     Industrial 0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5046  8     Transportation  0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5046  9     Secondary_Roads 0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5046  10    Urban_Grass_Irrigated 0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000
      5046  11    Urban_Grass_NonIrrigated   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000
```

5046 12 Agriculture_Moderate_B 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5046 13 Agriculture_Moderate_D 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5046 14 Vacant_Moderate_B 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5046 15 Vacant_Moderate_D 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5046 16 Vacant_Steep_A 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5046 17 Vacant_Steep_B 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5046 18 Vacant_Steep_C 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5046 19 Vacant_Steep_D 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5046 20 Water 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000
5046 21 Water_Reuse 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5065 1 HD_SF_Residential 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5065 2 LD_SF_Res_Moderate 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5065 3 LD_SF_Res_Steep 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5065 4 MF_Res 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5065 5 Commercial 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5065 6 Institutional 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5065 7 Industrial 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5065 8 Transportation 0.000000 0.000000 0.000000

0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5065	9	Secondary_Roads	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5065	10	Urban_Grass_Irrigated	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5065	11	Urban_Grass_NonIrrigated	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5065	12	Agriculture_Moderate_B	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5065	13	Agriculture_Moderate_D	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5065	14	Vacant_Moderate_B	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5065	15	Vacant_Moderate_D	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5065	16	Vacant_Steep_A	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5065	17	Vacant_Steep_B	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5065	18	Vacant_Steep_C	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5065	19	Vacant_Steep_D	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5065	20	Water	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000
5065	21	Water_Reuse	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5066	1	HD_SF_Residential	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5066	2	LD_SF_Res_Moderate	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5066	3	LD_SF_Res_Steep	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5066	4	MF_Res	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000

0.000000 0.000000
5066 5 Commercial 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5066 6 Institutional 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5066 7 Industrial 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5066 8 Transportation 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5066 9 Secondary_Roads 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5066 10 Urban_Grass_Irrigated 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5066 11 Urban_Grass_NonIrrigated 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5066 12 Agriculture_Moderate_B 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5066 13 Agriculture_Moderate_D 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5066 14 Vacant_Moderate_B 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5066 15 Vacant_Moderate_D 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5066 16 Vacant_Steep_A 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5066 17 Vacant_Steep_B 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5066 18 Vacant_Steep_C 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5066 19 Vacant_Steep_D 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5066 20 Water 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000
5066 21 Water_Reuse 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000

```
5079 1    HD_SF_Residential    0.000000   0.000000
0.000000   0.000000   0.000000   0.000000   0.000000
0.000000   0.000000   0.000000
5079 2    LD_SF_Res_Moderate   0.000000   0.000000
0.000000   0.000000   0.000000   0.000000   0.000000
0.000000   0.000000   0.000000
5079 3    LD_SF_Res_Steep 0.000000   0.000000   0.000000
0.000000   0.000000   0.000000   0.000000   0.000000
0.000000   0.000000
5079 4    MF_Res     0.000000   0.000000   0.000000
0.000000   0.000000   0.000000   0.000000   0.000000
0.000000   0.000000
5079 5    Commercial 0.000000   0.000000   0.000000
0.000000   0.000000   0.000000   0.000000   0.000000
0.000000   0.000000
5079 6    Institutional   0.000000   0.000000   0.000000
0.000000   0.000000   0.000000   0.000000   0.000000
0.000000   0.000000
5079 7    Industrial 0.000000   0.000000   0.000000
0.000000   0.000000   0.000000   0.000000   0.000000
0.000000   0.000000
5079 8    Transportation  0.000000   0.000000   0.000000
0.000000   0.000000   0.000000   0.000000   0.000000
0.000000   0.000000
5079 9    Secondary_Roads 0.000000   0.000000   0.000000
0.000000   0.000000   0.000000   0.000000   0.000000
0.000000   0.000000
5079 10   Urban_Grass_Irrigated 0.000000   0.000000
0.000000   0.000000   0.000000   0.000000   0.000000
0.000000   0.000000   0.000000
5079 11   Urban_Grass_NonIrrigated   0.000000   0.000000
0.000000   0.000000   0.000000   0.000000   0.000000
0.000000   0.000000   0.000000
5079 12   Agriculture_Moderate_B     0.000000   0.000000
0.000000   0.000000   0.000000   0.000000   0.000000
0.000000   0.000000   0.000000
5079 13   Agriculture_Moderate_D     0.000000   0.000000
0.000000   0.000000   0.000000   0.000000   0.000000
0.000000   0.000000   0.000000
5079 14   Vacant_Moderate_B    0.000000   0.000000
0.000000   0.000000   0.000000   0.000000   0.000000
0.000000   0.000000   0.000000
5079 15   Vacant_Moderate_D    0.000000   0.000000
0.000000   0.000000   0.000000   0.000000   0.000000
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5079 16   Vacant_Steep_A  0.000000   0.000000   0.000000
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5079 17   Vacant_Steep_B  0.000000   0.000000   0.000000
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5079 18   Vacant_Steep_C  0.000000   0.000000   0.000000
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5079 19 Vacant_Steep_D 0.000000 0.000000 0.000000
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5079 20 Water 0.000000 0.000000 0.000000 0.000000
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5079 21 Water_Reuse 0.000000 0.000000 0.000000
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5080 1 HD_SF_Residential 0.000000 0.000000
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5080 2 LD_SF_Res_Moderate 0.000000 0.000000
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5080 3 LD_SF_Res_Steep 0.000000 0.000000 0.000000
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5080 4 MF_Res 0.000000 0.000000 0.000000
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5080 5 Commercial 0.000000 0.000000 0.000000
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5080 7 Industrial 0.000000 0.000000 0.000000
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5080 8 Transportation 0.000000 0.000000 0.000000
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5080 10 Urban_Grass_Irrigated 0.000000 0.000000
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5080 11 Urban_Grass_NonIrrigated 0.000000 0.000000
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5080 12 Agriculture_Moderate_B 0.000000 0.000000
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5080 13 Agriculture_Moderate_D 0.000000 0.000000
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5080 14 Vacant_Moderate_B 0.000000 0.000000
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5080 15 Vacant_Moderate_D 0.000000 0.000000
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5080 17 Vacant_Steep_B 0.000000 0.000000 0.000000
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5080 19 Vacant_Steep_D 0.000000 0.000000 0.000000
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5080 20 Water 0.000000 0.000000 0.000000 0.000000
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5080 21 Water_Reuse 0.000000 0.000000 0.000000
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5083 3 LD_SF_Res_Steep 0.000000 0.000000 0.000000
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5083 4 MF_Res 0.000000 0.000000 0.000000
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5083 5 Commercial 0.000000 0.000000 0.000000
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5083 11 Urban_Grass_NonIrrigated 0.000000 0.000000
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5083 12 Agriculture_Moderate_B 0.000000 0.000000
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5083 13 Agriculture_Moderate_D 0.000000 0.000000
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5083 17 Vacant_Steep_B 0.000000 0.000000 0.000000
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5083 19 Vacant_Steep_D 0.000000 0.000000 0.000000
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5083 21 Water_Reuse 0.000000 0.000000 0.000000
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5173 3 LD_SF_Res_Steep 0.000000 0.000000 0.000000
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5173 12 Agriculture_Moderate_B 0.000000 0.000000
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5173 17 Vacant_Steep_B 0.000000 0.000000 0.000000
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5173 18 Vacant_Steep_C 0.000000 0.000000 0.000000
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5173 19 Vacant_Steep_D 0.000000 0.000000 0.000000
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5173 20 Water 0.000000 0.000000 0.000000 0.000000
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5173 21 Water_Reuse 0.000000 0.000000 0.000000
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5175 3 LD_SF_Res_Steep 0.000000 0.000000 0.000000
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5175 19 Vacant_Steep_D 0.000000 0.000000 0.000000
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5175 20 Water 0.000000 0.000000 0.000000 0.000000
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5175 21 Water_Reuse 0.000000 0.000000 0.000000
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5183 1 HD_SF_Residential 0.000000 0.000000
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5183 2 LD_SF_Res_Moderate 0.000000 0.000000
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5183 3 LD_SF_Res_Steep 0.000000 0.000000 0.000000
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5183 4 MF_Res 0.000000 0.000000 0.000000
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5183 5 Commercial 0.000000 0.000000 0.000000
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5183 11 Urban_Grass_NonIrrigated 0.000000 0.000000
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5183 12 Agriculture_Moderate_B 0.000000 0.000000
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5183 13 Agriculture_Moderate_D 0.000000 0.000000
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5183 14 Vacant_Moderate_B 0.000000 0.000000
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5183 15 Vacant_Moderate_D 0.000000 0.000000
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5183 16 Vacant_Steep_A 0.000000 0.000000 0.000000
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5183 17 Vacant_Steep_B 0.000000 0.000000 0.000000

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5183 18 Vacant_Steep_C 0.000000 0.000000 0.000000
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5183 19 Vacant_Steep_D 0.000000 0.000000 0.000000
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5183 20 Water 0.000000 0.000000 0.000000 0.000000
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5183 21 Water_Reuse 0.000000 0.000000 0.000000
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5189 1 HD_SF_Residential 0.000000 0.000000
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5189 2 LD_SF_Res_Moderate 0.000000 0.000000
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5189 3 LD_SF_Res_Steep 0.000000 0.000000 0.000000
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5189 4 MF_Res 0.000000 0.000000 0.000000
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5189 5 Commercial 0.000000 0.000000 0.000000
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5189 6 Institutional 0.000000 0.000000 0.000000
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5189 9 Secondary_Roads 0.000000 0.000000 0.000000
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5189 10 Urban_Grass_Irrigated 0.000000 0.000000
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5189 11 Urban_Grass_NonIrrigated 0.000000 0.000000
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5189 12 Agriculture_Moderate_B 0.000000 0.000000
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5189 13 Agriculture_Moderate_D 0.000000 0.000000
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      0.000000   0.000000   0.000000
      5189  14   Vacant_Moderate_B     0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000
      5189  15   Vacant_Moderate_D     0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000
      5189  16   Vacant_Steep_A  0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5189  17   Vacant_Steep_B  0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5189  18   Vacant_Steep_C  0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5189  19   Vacant_Steep_D  0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5189  20   Water 0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000
      5189  21   Water_Reuse      0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
c-----------------------------------------------------------------
----------------------------
c680 TMDL reach control (used if ncrch > 0 on card 600)
c
c    rchid          controlled reach id
c    outlet         controlled reach outlet id
c    switch_mon     monthly switch to control conc limit or
reduction of pollutant from the corresponding reach (0-off, 1-on)
c
c   rchid   outlet   switch_1   switch_2......switch_12
c-----------------------------------------------------------------
----------------------------
c685 TMDL reach control (used if ncrch > 0 on card 600)
c
c    rchid          controlled reach id
c    outlet         controlled reach outlet id
c    limit-flow     flow limit from the corresponding reach (cfs)
c    limit_pol      concentration limit of pollutant from the
corresponding reach (mg/l or ug/l or #/100ml)
c
c   rchid   outlet   limit_flow
limit_qual1...limit_qual2...limit_qualn
c-----------------------------------------------------------------
----------------------------
c690 TMDL reach control (used if ncrch > 0 on card 600)
c
c    rchid          controlled reach id
```

```
c    outlet         controlled reach outlet id
c    reduction      reduction of pollutant from the corresponding
reach (fraction)
c                   reduction in outflow will also reduce the
pollutant mass from the outflow and
c                   any defined reduction to pollutant will be the
additional
c
c   rchid   outlet
reduction_flow...reduction_qual1...reduction_qual2...reduction_qu
aln
c-----------------------------------------------------------------
----------------------------
```

```
c-----------------------------------------------------------------
-------------------------
c LSPC -- Loading Simulation Program, C++
c Version 4.1.0 - April 11, 2011
c
c Designed and maintained by:
c     Tetra Tech, Inc.
c     10306 Eaton Place, Suite 340
c     Fairfax, VA 22030
c     (703) 385-6000
c-----------------------------------------------------------------
-------------------------
c LSPC MODEL INPUT FILE
c This input file was created at 00:25:48am on 09/08/2014
c-----------------------------------------------------------------
-------------------------
c0   general control
c
c    snowfg   if = 1 run snow module
c    pwatfg   if = 1 run pwater
c    sedfg    if = 1 run sediment
c    pqalfg   if = 1 run general quality
c    tempfg   if = 1 run temperature module
c    oxfg     if = 1 run DO-BOD module
c    nutfg    if = 1 run nutrients module
c    plkfg    if = 1 run plank module
c    phfg     if = 1 run pH-CO2 module
c    mstlfg   if = 1 run mstlay module
c    pestfg   if = 1 run pest module
c    nitrfg   if = 1 run nitr module
c    phosfg   if = 1 run phos module
c    tracfg   if = 1 run tracer module
c    mdasfg   if = 1 run mdas module
c
c     snowfg     pwatfg     sedfg pqalfg     tempfg     oxfg  nutfg
      plkfg phfg  mstlfg     pestfg   nitrfg   phosfg   tracfg
mdasfg
      0    1    1    1    0    0    0    0    0    0    0
      0    0    0    0
c-----------------------------------------------------------------
-------------------------
c10  weather file definition (name and parameters)
c
c    wfileid    weather file id
c    wfilename  weather file name
c    wparamnum  number of parameters in the weather file
c    wparamid   weather paramter id
c               1-precipitation (in/ivl)
c               2-potential evaporation (in/ivl)
c               3-air temperature (degree F)
c               4-wind speed (mile/ivl)
c               5-solar radiation (ly/ivl)
```

```
c               6-dew point (degree F)
c               7-cloud cover (tenth)
c
c    wfileid   wfilename   wparamnum   wparamid...
     1    23129.air  1    2
     17   D96.air    1    2
     1014 D106.pre   1    1
     1021 D1088.pre  1    1
c-----------------------------------------------------------------
-------------------------
c15  weather station definition (station id and associated
weather files)
c
c    wstationid  weather station id
c    wfilenum    number of files for the weather station
c    wfileid     weather file id (card 10)
c
c   wstationid   wfilenum   wfileid...
     14   2     1014  1
     21   2     1021  17
c-----------------------------------------------------------------
-------------------------
c20  weather parameter multiplier
c
c    wstationid  weather station id (card 15)
c    wparmmult   multiplier for each weather parameter
c                1- multiplier for precipitation
c                2- multiplier for potential evaporation
c                3- multiplier for air temperature
c                4- multiplier for wind speed
c                5- multiplier for solar radiation
c                6- multiplier for dew point
c                7- multiplier for cloud cover
c
c  wstationid  wparmmult1...
     14   1.000000   1.000000
     21   1.000000   1.000000
c-----------------------------------------------------------------
-------------------------
c30   output file path     input (weather) file path  (each must
be a continuous string)
     C:\LA_Mapwindow\DATA\Output\     C:\LA_MapWindow\Weather\
c-----------------------------------------------------------------
-------------------------
c40   general watershed controls
c
c    nsubbasin   number of subwatersheds
c    nrchid      number of stream channels (corresponds with
number of subwatersheds)
c    nrgid       number of stream groups to assign parameters
c    ndefid      number of land groups to assign parameters
c    ndeluid     maximum number of land use
```

```
c
c     nsws   nrch    nrgroup    nlgroup    nlandp
      10    10    1     1     21
c-----------------------------------------------------------------------------------------
c45  general output controls
c
c    Standard    Output standard model parameters
c    Snow        Output snow related parameters
c    Hydrology  Output hydrology related parameters
c    Sediment    Output sediment related parameters
c    GQUAL      Output general water quality related parameters
c    AGCHEM          Output agricultural water quality related
parameters
c    RQUAL      Output biochemical water quality related
parameters
c    Custom      Output user specified parameters
c    Landuse     Output landuse summary
c                    if = 0 no output
c                    if = 1 average annual output
c                    if = 2 yearly output
c                    if = 3 monthly output
c    Stream      Output stream summary
c                    if = 0 no output
c                    if = 1 average annual output
c                    if = 2 yearly output
c                    if = 3 monthly output
c    Threshold   Output threshold analysis summary
c                    if = 0 no output
c                    if = 1 average monthly output
c
c     Standard  Snow  Hydrology  Sediment  GQUAL  AGCHEM   RQUAL
Custom  Landuse  Stream  Threshold
      1     0     0     0     0     0     0     0     1     1     1
c-----------------------------------------------------------------------------------------
c46  user specified output parameter list
c
c   PRECP   AIRTMP  SNOTMP  SNOWF   RAINF   PRAIN   MELT   SNOWE
WYIELD  PACK    PACKF   PACKW   PACKI   PDEPTH  COVINDX   NEGHTS
XLNMELT     RDENPKF     SKYCLEAR    SNOCOV  DULLNESS    ALBEDO
PAKTEMP     DEWTMP  SURS    UZS     LZS     AGWS    SURO    IFWO
AGWO    PERO    TAET    PERC    INFIL   GWI     IGWI    AGWI
DEP     AVDEP   HRAD    AVVEL   SAREA   VOLUME   RO  TAU   WSSD
SCRSD   SOSED  SOBER   SSEDC  LSSED   LRSED  LBEDDEP  LDEPSCR
LROSED  SQO     WASHQS  SCRQS   SOQO    POQUAL  SOQUAL  IOQUAL
GOQUAL  POQC  CONC  CONCOUT  CONCSQAL   MATSQAL  MATIN   MATOUT
MATOSQAL  DOX   DOXMIN  DOXMAX   DOXAV   DOXX   BOD   BODX  NO3
NO3X   TAM    TAMX    NO2    NO2X    PO4    PO4X   SNH4   SNH4X
SPO4   SPO4X    PHYTO   PHYTOX   PHYCLA   BENAL   ORN     ORNX
ORP     ORPX   ORC   ORCX   PH    ALK   TIC   TICX   CO2   CO2X
TEMP   MDASNH4   MDASNO3   MDASSO4   MDASDFe  MDASTFe  MDASDAl
```

```
MDASTAl    MDASpH    MDASACID    MDASALK    MDASOrgN   MDASH2O
MDASH   MDASCa   MDASCO3   MDASOrg   MDASNO2
c-----------------------------------------------------------------
-------------------------
c50  model simulation time period
c
c    mstart   model start day.
c    mend     model end day.
c    delt     time step in minutes.
c    mostart  model output start day.
c    moend    model output end day.
c    optlevel  if = 1 general output (daily)
c              if = 2 output per time interval (min)
c
c     mstart   mend    delt mostart    moend   optlevel
      10/1/1998  3/31/2012  60   1/1/2000   3/31/2012  1
c-----------------------------------------------------------------
-------------------------
c60  group information
c
c    subbasin  subbasin id
c    defid     group parameter id
c    nwst      number of weather stations assigned to the
watershed  (<=5)
c    wsti = station id
c    wti = weighting to calculate input
c
c     subbasin   defid   nwst  wst1   wt1   wst2   wt2   ...
      5046  1     1     21    1.000000
      5065  1     1     21    1.000000
      5066  1     1     21    1.000000
      5079  1     1     21    1.000000
      5080  1     1     21    1.000000
      5083  1     1     14    1.000000
      5173  1     1     21    1.000000
      5175  1     1     21    1.000000
      5183  1     1     21    1.000000
      5189  1     1     21    1.000000
c-----------------------------------------------------------------
-------------------------
c70  modeled land use names
c
c    deluid     landuse id
c    deluname   landuse name
c
c     deluid    deluname
      1     HD_SF_Residential
      2     LD_SF_Res_Moderate
      3     LD_SF_Res_Steep
      4     MF_Res
      5     Commercial
      6     Institutional
```

```
     7     Industrial
     8     Transportation
     9     Secondary_Roads
     10    Urban_Grass_Irrigated
     11    Urban_Grass_NonIrrigated
     12    Agriculture_Moderate_B
     13    Agriculture_Moderate_D
     14    Vacant_Moderate_B
     15    Vacant_Moderate_D
     16    Vacant_Steep_A
     17    Vacant_Steep_B
     18    Vacant_Steep_C
     19    Vacant_Steep_D
     20    Water
     21    Water_Reuse
c-----------------------------------------------------------------
------------------------
c80  land use to stream routing
c
c    defid       landuse default group id
c    deluid      land use id
c    route_suro  fraction of surface runoff that routes to the
stream (0-1)
c    route_ifwo  fraction of interflow outflow that routes to the
stream (0-1)
c    route_agwo  fraction of groundwater outflow that routes to
the stream (0-1)
c
c    Note: The remaining fraction is routed directly to the next
downstream reach segment(s)
c
c  defid  deluid  route_suro  route_ifwo  route_agwo
     1     1     1.000000   1.000000   1.000000
     1     2     1.000000   1.000000   1.000000
     1     3     1.000000   1.000000   1.000000
     1     4     1.000000   1.000000   1.000000
     1     5     1.000000   1.000000   1.000000
     1     6     1.000000   1.000000   1.000000
     1     7     1.000000   1.000000   1.000000
     1     8     1.000000   1.000000   1.000000
     1     9     1.000000   1.000000   1.000000
     1     10    1.000000   1.000000   1.000000
     1     11    1.000000   1.000000   1.000000
     1     12    1.000000   1.000000   1.000000
     1     13    1.000000   1.000000   1.000000
     1     14    1.000000   1.000000   1.000000
     1     15    1.000000   1.000000   1.000000
     1     16    1.000000   1.000000   1.000000
     1     17    1.000000   1.000000   1.000000
     1     18    1.000000   1.000000   1.000000
     1     19    1.000000   1.000000   1.000000
     1     20    1.000000   1.000000   1.000000
```

```
     1    21   1.000000   1.000000   1.000000
c-----------------------------------------------------------------
-------------------------
c90  land use information
c
c    subbasin   subbasin id
c    deluid     land use id
c    deluname   land use name
c    perimp     1 imperivous land (subsurface processes disabled)
c               2 pervious  land (subsurface processes activated)
c    area_ac    area (acres)
c    slsur      slope of overland flow plane (none)
c    lsur       length of overland flow plane (feet)
c
c  subbasin  deluid  deluname  perimp  area_ac  slsur  lsur
     5046  1     HD_SF_Residential     1     0.000000   0.040000
     300.000000
     5046  2     LD_SF_Res_Moderate    1     0.000000   0.040000
     300.000000
     5046  3     LD_SF_Res_Steep  1     176.109395 0.040000
     300.000000
     5046  4     MF_Res     1     0.000000   0.040000   300.000000
     5046  5     Commercial 1     0.000000   0.040000   300.000000
     5046  6     Institutional    1     5.131054   0.040000
     300.000000
     5046  7     Industrial 1     0.022494   0.040000   300.000000
     5046  8     Transportation   1     0.000000   0.040000
     300.000000
     5046  9     Secondary_Roads  1     12.781862  0.040000
     300.000000
     5046  10    Urban_Grass_Irrigated 2     58.703132  0.040000
     300.000000
     5046  11    Urban_Grass_NonIrrigated   2     16.905039
     0.040000   300.000000
     5046  12    Agriculture_Moderate_B     2     0.000000
     0.040000   300.000000
     5046  13    Agriculture_Moderate_D     2     16.772323
     0.040000   300.000000
     5046  14    Vacant_Moderate_B     2     0.000000   0.050000
     300.000000
     5046  15    Vacant_Moderate_D     2     0.000000   0.050000
     300.000000
     5046  16    Vacant_Steep_A   2     0.000000   0.300000
     300.000000
     5046  17    Vacant_Steep_B   2     0.000000   0.300000
     300.000000
     5046  18    Vacant_Steep_C   2     614.883128 0.300000
     300.000000
     5046  19    Vacant_Steep_D   2     0.000000   0.300000
     300.000000
     5046  20    Water 2     0.000000   0.050000   300.000000
     5046  21    Water_Reuse      2     0.000000   0.050000
```

300.000000
5065 1 HD_SF_Residential 1 0.000000 0.040000
300.000000
5065 2 LD_SF_Res_Moderate 1 0.000000 0.040000
300.000000
5065 3 LD_SF_Res_Steep 1 132.647989 0.040000
300.000000
5065 4 MF_Res 1 0.000000 0.040000 300.000000
5065 5 Commercial 1 0.000000 0.040000 300.000000
5065 6 Institutional 1 10.780515 0.040000
300.000000
5065 7 Industrial 1 2.512259 0.040000 300.000000
5065 8 Transportation 1 0.000000 0.040000
300.000000
5065 9 Secondary_Roads 1 10.480644 0.040000
300.000000
5065 10 Urban_Grass_Irrigated 2 44.215996 0.040000
300.000000
5065 11 Urban_Grass_NonIrrigated 2 15.504804
0.040000 300.000000
5065 12 Agriculture_Moderate_B 2 0.000000
0.040000 300.000000
5065 13 Agriculture_Moderate_D 2 12.633142
0.040000 300.000000
5065 14 Vacant_Moderate_B 2 0.000000 0.050000
300.000000
5065 15 Vacant_Moderate_D 2 0.000000 0.050000
300.000000
5065 16 Vacant_Steep_A 2 0.000000 0.300000
300.000000
5065 17 Vacant_Steep_B 2 0.000000 0.300000
300.000000
5065 18 Vacant_Steep_C 2 522.691290 0.300000
300.000000
5065 19 Vacant_Steep_D 2 0.000000 0.300000
300.000000
5065 20 Water 2 0.000000 0.050000 300.000000
5065 21 Water_Reuse 2 0.000000 0.050000
300.000000
5066 1 HD_SF_Residential 1 0.000000 0.040000
300.000000
5066 2 LD_SF_Res_Moderate 1 0.000000 0.040000
300.000000
5066 3 LD_SF_Res_Steep 1 154.120284 0.040000
300.000000
5066 4 MF_Res 1 0.000000 0.040000 300.000000
5066 5 Commercial 1 0.000000 0.040000 300.000000
5066 6 Institutional 1 9.135998 0.040000
300.000000
5066 7 Industrial 1 2.331311 0.040000 300.000000
5066 8 Transportation 1 0.000000 0.040000
300.000000

5066 9 Secondary_Roads 1 12.540831 0.040000
300.000000
5066 10 Urban_Grass_Irrigated 2 227.221577 0.040000
300.000000
5066 11 Urban_Grass_NonIrrigated 2 17.611682
0.040000 300.000000
5066 12 Agriculture_Moderate_B 2 0.000000
0.040000 300.000000
5066 13 Agriculture_Moderate_D 2 14.678122
0.040000 300.000000
5066 14 Vacant_Moderate_B 2 0.000000 0.050000
300.000000
5066 15 Vacant_Moderate_D 2 0.000000 0.050000
300.000000
5066 16 Vacant_Steep_A 2 0.000000 0.300000
300.000000
5066 17 Vacant_Steep_B 2 0.000000 0.300000
300.000000
5066 18 Vacant_Steep_C 2 732.393154 0.300000
300.000000
5066 19 Vacant_Steep_D 2 0.000000 0.300000
300.000000
5066 20 Water 2 0.000000 0.050000 300.000000
5066 21 Water_Reuse 2 0.000000 0.050000
300.000000
5079 1 HD_SF_Residential 1 0.000000 0.040000
300.000000
5079 2 LD_SF_Res_Moderate 1 0.000000 0.040000
300.000000
5079 3 LD_SF_Res_Steep 1 9.265989 0.040000
300.000000
5079 4 MF_Res 1 0.000000 0.040000 300.000000
5079 5 Commercial 1 0.000000 0.040000 300.000000
5079 6 Institutional 1 1.158242 0.040000
300.000000
5079 7 Industrial 1 6.558462 0.040000 300.000000
5079 8 Transportation 1 0.000000 0.040000
300.000000
5079 9 Secondary_Roads 1 0.445738 0.040000
300.000000
5079 10 Urban_Grass_Irrigated 2 3.088663 0.040000
300.000000
5079 11 Urban_Grass_NonIrrigated 2 0.834351
0.040000 300.000000
5079 12 Agriculture_Moderate_B 2 0.000000
0.040000 300.000000
5079 13 Agriculture_Moderate_D 2 0.882475
0.040000 300.000000
5079 14 Vacant_Moderate_B 2 0.000000 0.050000
300.000000
5079 15 Vacant_Moderate_D 2 0.000000 0.050000
300.000000

5079	16	Vacant_Steep_A	2	0.000000	0.300000	300.000000
5079	17	Vacant_Steep_B	2	0.000000	0.300000	300.000000
5079	18	Vacant_Steep_C	2	0.000000	0.300000	300.000000
5079	19	Vacant_Steep_D	2	118.184315	0.300000	300.000000
5079	20	Water	2	0.000000	0.050000	300.000000
5079	21	Water_Reuse	2	0.000000	0.050000	300.000000
5080	1	HD_SF_Residential	1	0.000000	0.040000	300.000000
5080	2	LD_SF_Res_Moderate	1	0.000000	0.040000	300.000000
5080	3	LD_SF_Res_Steep	1	54.482587	0.040000	300.000000
5080	4	MF_Res	1	0.000000	0.040000	300.000000
5080	5	Commercial	1	0.000000	0.040000	300.000000
5080	6	Institutional	1	0.790729	0.040000	300.000000
5080	7	Industrial	1	0.000000	0.040000	300.000000
5080	8	Transportation	1	0.000000	0.040000	300.000000
5080	9	Secondary_Roads	1	4.025620	0.040000	300.000000
5080	10	Urban_Grass_Irrigated	2	18.160862	0.040000	300.000000
5080	11	Urban_Grass_NonIrrigated	2	5.117885	0.040000	300.000000
5080	12	Agriculture_Moderate_B	2	0.000000	0.040000	300.000000
5080	13	Agriculture_Moderate_D	2	5.188818	0.040000	300.000000
5080	14	Vacant_Moderate_B	2	0.000000	0.050000	300.000000
5080	15	Vacant_Moderate_D	2	0.000000	0.050000	300.000000
5080	16	Vacant_Steep_A	2	0.000000	0.300000	300.000000
5080	17	Vacant_Steep_B	2	0.000000	0.300000	300.000000
5080	18	Vacant_Steep_C	2	182.550651	0.300000	300.000000
5080	19	Vacant_Steep_D	2	0.000000	0.300000	300.000000
5080	20	Water	2	0.000000	0.050000	300.000000
5080	21	Water_Reuse	2	0.000000	0.050000	300.000000
5083	1	HD_SF_Residential	1	0.000000	0.040000	300.000000
5083	2	LD_SF_Res_Moderate	1	0.000000	0.040000	

300.000000
5083 3 LD_SF_Res_Steep 1 1.552663 0.040000
300.000000
5083 4 MF_Res 1 0.000000 0.040000 300.000000
5083 5 Commercial 1 0.000000 0.040000 300.000000
5083 6 Institutional 1 0.000000 0.040000
300.000000
5083 7 Industrial 1 0.000000 0.040000 300.000000
5083 8 Transportation 1 0.000000 0.040000
300.000000
5083 9 Secondary_Roads 1 0.000000 0.040000
300.000000
5083 10 Urban_Grass_Irrigated 2 0.517554 0.040000
300.000000
5083 11 Urban_Grass_NonIrrigated 2 0.000000
0.040000 300.000000
5083 12 Agriculture_Moderate_B 2 0.000000
0.040000 300.000000
5083 13 Agriculture_Moderate_D 2 0.147873
0.040000 300.000000
5083 14 Vacant_Moderate_B 2 0.000000 0.050000
300.000000
5083 15 Vacant_Moderate_D 2 0.000000 0.050000
300.000000
5083 16 Vacant_Steep_A 2 0.000000 0.300000
300.000000
5083 17 Vacant_Steep_B 2 0.000000 0.300000
300.000000
5083 18 Vacant_Steep_C 2 6.289888 0.300000
300.000000
5083 19 Vacant_Steep_D 2 0.000000 0.300000
300.000000
5083 20 Water 2 0.000000 0.050000 300.000000
5083 21 Water_Reuse 2 0.000000 0.050000
300.000000
5173 1 HD_SF_Residential 1 0.000000 0.040000
300.000000
5173 2 LD_SF_Res_Moderate 1 0.000000 0.040000
300.000000
5173 3 LD_SF_Res_Steep 1 23.500071 0.040000
300.000000
5173 4 MF_Res 1 0.000000 0.040000 300.000000
5173 5 Commercial 1 0.000000 0.040000 300.000000
5173 6 Institutional 1 0.964665 0.040000
300.000000
5173 7 Industrial 1 0.000000 0.040000 300.000000
5173 8 Transportation 1 0.000000 0.040000
300.000000
5173 9 Secondary_Roads 1 3.066195 0.040000
300.000000
5173 10 Urban_Grass_Irrigated 2 7.833357 0.040000
300.000000

5173 11 Urban_Grass_NonIrrigated 2 3.988738 0.040000 300.000000
5173 12 Agriculture_Moderate_B 2 0.000000 0.040000 300.000000
5173 13 Agriculture_Moderate_D 2 2.238102 0.040000 300.000000
5173 14 Vacant_Moderate_B 2 0.000000 0.050000 300.000000
5173 15 Vacant_Moderate_D 2 0.000000 0.050000 300.000000
5173 16 Vacant_Steep_A 2 0.000000 0.300000 300.000000
5173 17 Vacant_Steep_B 2 0.000000 0.300000 300.000000
5173 18 Vacant_Steep_C 2 115.297776 0.300000 300.000000
5173 19 Vacant_Steep_D 2 0.000000 0.300000 300.000000
5173 20 Water 2 0.000000 0.050000 300.000000
5173 21 Water_Reuse 2 0.000000 0.050000 300.000000
5175 1 HD_SF_Residential 1 0.000000 0.040000 300.000000
5175 2 LD_SF_Res_Moderate 1 0.000000 0.040000 300.000000
5175 3 LD_SF_Res_Steep 1 3.565438 0.040000 300.000000
5175 4 MF_Res 1 0.000000 0.040000 300.000000
5175 5 Commercial 1 0.000000 0.040000 300.000000
5175 6 Institutional 1 0.483839 0.040000 300.000000
5175 7 Industrial 1 0.000000 0.040000 300.000000
5175 8 Transportation 1 0.000000 0.040000 300.000000
5175 9 Secondary_Roads 1 0.000000 0.040000 300.000000
5175 10 Urban_Grass_Irrigated 2 1.188479 0.040000 300.000000
5175 11 Urban_Grass_NonIrrigated 2 0.120960 0.040000 300.000000
5175 12 Agriculture_Moderate_B 2 0.000000 0.040000 300.000000
5175 13 Agriculture_Moderate_D 2 0.339566 0.040000 300.000000
5175 14 Vacant_Moderate_B 2 0.000000 0.050000 300.000000
5175 15 Vacant_Moderate_D 2 0.000000 0.050000 300.000000
5175 16 Vacant_Steep_A 2 0.000000 0.300000 300.000000
5175 17 Vacant_Steep_B 2 0.000000 0.300000 300.000000

5175	18	Vacant_Steep_C	2	75.422245	0.300000	300.000000
5175	19	Vacant_Steep_D	2	0.000000	0.300000	300.000000
5175	20	Water	2	0.000000	0.050000	300.000000
5175	21	Water_Reuse	2	0.000000	0.050000	300.000000
5183	1	HD_SF_Residential	1	0.000000	0.040000	300.000000
5183	2	LD_SF_Res_Moderate	1	0.000000	0.040000	300.000000
5183	3	LD_SF_Res_Steep	1	0.000000	0.040000	300.000000
5183	4	MF_Res	1	0.000000	0.040000	300.000000
5183	5	Commercial	1	0.000000	0.040000	300.000000
5183	6	Institutional	1	0.009194	0.040000	300.000000
5183	7	Industrial	1	0.000000	0.040000	300.000000
5183	8	Transportation	1	0.000000	0.040000	300.000000
5183	9	Secondary_Roads	1	0.000000	0.040000	300.000000
5183	10	Urban_Grass_Irrigated	2	0.000000	0.040000	300.000000
5183	11	Urban_Grass_NonIrrigated	2	0.002298	0.040000	300.000000
5183	12	Agriculture_Moderate_B	2	0.000000	0.040000	300.000000
5183	13	Agriculture_Moderate_D	2	0.000000	0.040000	300.000000
5183	14	Vacant_Moderate_B	2	0.000000	0.050000	300.000000
5183	15	Vacant_Moderate_D	2	0.000000	0.050000	300.000000
5183	16	Vacant_Steep_A	2	0.000000	0.300000	300.000000
5183	17	Vacant_Steep_B	2	0.000000	0.300000	300.000000
5183	18	Vacant_Steep_C	2	78.131778	0.300000	300.000000
5183	19	Vacant_Steep_D	2	0.000000	0.300000	300.000000
5183	20	Water	2	0.000000	0.050000	300.000000
5183	21	Water_Reuse	2	0.000000	0.050000	300.000000
5189	1	HD_SF_Residential	1	0.000000	0.040000	300.000000
5189	2	LD_SF_Res_Moderate	1	0.000000	0.040000	300.000000
5189	3	LD_SF_Res_Steep	1	14.925257	0.040000	300.000000
5189	4	MF_Res	1	0.000000	0.040000	300.000000

```
      5189  5     Commercial 1     0.000000   0.040000   300.000000
      5189  6     Institutional   1     0.066601   0.040000
      300.000000
      5189  7     Industrial 1     0.000000   0.040000   300.000000
      5189  8     Transportation  1     0.000000   0.040000
      300.000000
      5189  9     Secondary_Roads 1     1.958248   0.040000
      300.000000
      5189  10    Urban_Grass_Irrigated 2     4.975086   0.040000
      300.000000
      5189  11    Urban_Grass_NonIrrigated   2     2.410065
      0.040000   300.000000
      5189  12    Agriculture_Moderate_B     2     0.000000
      0.040000   300.000000
      5189  13    Agriculture_Moderate_D     2     1.421453
      0.040000   300.000000
      5189  14    Vacant_Moderate_B     2     0.000000   0.050000
      300.000000
      5189  15    Vacant_Moderate_D     2     0.000000   0.050000
      300.000000
      5189  16    Vacant_Steep_A   2     0.000000   0.300000
      300.000000
      5189  17    Vacant_Steep_B   2     0.000000   0.300000
      300.000000
      5189  18    Vacant_Steep_C   2     357.890613 0.300000
      300.000000
      5189  19    Vacant_Steep_D   2     0.000000   0.300000
      300.000000
      5189  20    Water 2     0.000000   0.050000   300.000000
      5189  21    Water_Reuse     2     0.000000   0.050000
      300.000000
c-----------------------------------------------------------------
-------------------------
c92  SNOW-FLAGS
c defid     parameter group id
c deluid    landuse id
c iceflag   0 = Ice formation in the snow pack is not simulated
c           1 = Ice formation is simulated
c forest    0.0 - 1.0  Fraction of LAND covered by Forest (winter
transpiration)
c     defid LUID ICEFLAG FOREST
c-----------------------------------------------------------------
----------------------------
c93  SNOW-PARM
c LAT      Latitude of the pervious land segment (PLS) - ENERGY
BALANCE METHOD ONLY (degree)
c          Positive for the northern hemisphere, negative for
southern
c MELEV    Mean elevation of LAND above sea level - ENERGY
BALANCE METHOD ONLY (ft)
c SHADE    Fraction of LAND shaded from solar radiation (i.e. by
trees) - ENERGY BALANCE METHOD ONLY
```

```
c SNOWCF   Precipitation-to-snow multiplier (accounts for poor
gage-catch efficiency during snow)
c COVIND   Maximum snowpack (water equivalent) at which the
entire LAND is covered with snow (in)
c    defid LUID       LAT     MELEV     SHADE    SNOWCF    COVIND
c-----------------------------------------------------------------
----------------------------
c94  SNOW-PARM2
c RDCSN    Density of cold, new snow relative to water (For snow
falling at temps below freezing.
c          At higher temperatures the density of snow is
adjusted)
c TSNOW    Air temperature below which precipitation will be
snow, under saturated conditions (deg F)
c          Under non-saturated conditions the temperature is
adjusted slightly.
c SNOEVP   Adapts sublimation equation to field conditions -
ENERGY BALANCE METHOD ONLY
c CCFACT   Adapts snow condensation/convection melt equation to
field conditions - ENERGY BALANCE METHOD ONLY
c MWATER   Maximum water content of the snow pack, in depth of
water per depth of water.
c MGMELT   Maximum rate of snowmelt by ground heat, in depth of
water per day (in/day)
c         This is the value which applies when the pack
temperature is at the freezing point.
c    defid LUID     RDCSN     TSNOW    SNOEVP    CCFACT    MWATER
MGMELT
c-----------------------------------------------------------------
----------------------------
c96  SNOW-INIT
c   Pack-snow   Initial quantity of snow in the pack (water
equivalent).
c   Pack-ice    Initial quantity of ice in the pack (water
equivalent).
c   Pack-watr   Initial quantity of liquid water in the pack.
c   RDENPF      Density of the frozen contents (snow and ice) of
the pack, relative to water.
c   DULL        Index of the dullness of the snow pack surface,
from which albedo is estimated - ENERGY BALANCE METHOD ONLY
c   PAKTMP      Mean temperature of the frozen contents of the
snow pack.
c
c   COVINX      Current snow pack depth (water equivalent)
required to obtain complete areal coverage of LAND.
c               If the pack is less than this amount, areal
coverage is prorated (PACKF/COVINX).
c   XLNMLT      Current remaining possible increment to ice
storage in the pack.
c               Relevant when Ice formation is simulated (iceflag
= 1)
c   SKYCLR      Fraction of sky which is assumed to be clear at
```

```
the present time.
c     defid LUID Pack-snow  Pack-ice Pack-watr    RDENPF      DULL
PAKTMP
c------------------------------------------------------------------
----------------------------
c100 pwat-parm1
c    pervious and impervious land hydrology control
c
c    (value of 0 = use constant pwat-parm4; 1 = use corresponding
monthly variable card)
c
c    vcsfg    interception storage capacity
     (card 150)
c    vuzfg    upper zone nominal storage
     (card 160)
c    vnnfg    manning's n for the overland flow plane       (card
170)
c    vifwfg   interflow inflow parameter
     (card 180)
c    vircfg   interflow recession constant
     (card 190)
c    vlefg    lower zone evapotranspiration (e-t) parameter (card
200)
c
c     vcsfg  vuzfg  vnnfg  vifwfg  vircfg  vlefg
      0     0     0     0     0     0
c------------------------------------------------------------------
-------------------------
c110 pwat-parm2
c
c    defid   parameter group id
c    deluid  landuse id
c    lzsn    lower zone nominal soil moisture storage (inches)
c    infilt  infiltration capacity of the soil (in/hr)
c    kvary   variable groundwater recession (1/inches)
c    agwrc   base groundwater recession (none)
c
c     defid deluid lzsn      infilt      kvary      agwrc
      1     1     0.000000   0.000000   0.000000   0.000000
      1     2     0.000000   0.000000   0.000000   0.000000
      1     3     0.000000   0.000000   0.000000   0.000000
      1     4     0.000000   0.000000   0.000000   0.000000
      1     5     0.000000   0.000000   0.000000   0.000000
      1     6     0.000000   0.000000   0.000000   0.000000
      1     7     0.000000   0.000000   0.000000   0.000000
      1     8     0.000000   0.000000   0.000000   0.000000
      1     9     0.000000   0.000000   0.000000   0.000000
      1     10    7.000000   0.100000   0.000000   0.800000
      1     11    7.000000   0.100000   0.000000   0.800000
      1     12    7.000000   0.400000   0.000000   0.800000
      1     13    7.000000   0.100000   0.000000   0.800000
      1     14    7.000000   0.400000   0.000000   0.800000
```

```
      1     15    7.000000   0.100000   0.000000   0.800000
      1     16    7.000000   1.000000   0.000000   0.980000
      1     17    7.000000   0.400000   0.000000   0.960000
      1     18    7.000000   0.200000   0.000000   0.950000
      1     19    7.000000   0.100000   0.000000   0.940000
      1     20    7.000000   0.100000   0.000000   0.940000
      1     21    7.000000   0.100000   0.000000   0.800000
c-----------------------------------------------------------------
-------------------------
c120 pwat-parm3
c
c    defid   parameter group id
c    deluid  landuse id
c    petmax  air temperature below which e-t will is reduced (deg
F)
c    petmin  air temperature below which e-t is set to zero (deg
F)
c    infexp  exponent in the infiltration equation (none)
c    INFILD  ratio between the maximum and mean infiltration
capacities over the PLS (none)
c    deepfr  fraction of groundwater inflow that will enter deep
groundwater (none)
c    basetp  fraction of remaining potential e-t that can be
satisfied from baseflow (none)
c    agwetp  fraction of remaining potential e-t that can be
satisfied from active groundwater (none)
c
c     defid deluid   petmax     petmin     infexp     infild
deepfr     basetp     agwetp
      1     1     45.000000  35.000000  0.000000   0.000000
      0.000000   0.000000   0.000000
      1     2     45.000000  35.000000  0.000000   0.000000
      0.000000   0.000000   0.000000
      1     3     45.000000  35.000000  0.000000   0.000000
      0.000000   0.000000   0.000000
      1     4     45.000000  35.000000  0.000000   0.000000
      0.000000   0.000000   0.000000
      1     5     45.000000  35.000000  0.000000   0.000000
      0.000000   0.000000   0.000000
      1     6     45.000000  35.000000  0.000000   0.000000
      0.000000   0.000000   0.000000
      1     7     45.000000  35.000000  0.000000   0.000000
      0.000000   0.000000   0.000000
      1     8     45.000000  35.000000  0.000000   0.000000
      0.000000   0.000000   0.000000
      1     9     45.000000  35.000000  0.000000   0.000000
      0.000000   0.000000   0.000000
      1     10    45.000000  35.000000  2.000000   2.000000
      0.500000   0.000000   0.000000
      1     11    45.000000  35.000000  2.000000   2.000000
      0.500000   0.000000   0.000000
      1     12    45.000000  35.000000  2.000000   2.000000
```

```
      0.500000   0.000000   0.000000
      1     13   45.000000  35.000000  2.000000   2.000000
      0.500000   0.000000   0.000000
      1     14   45.000000  35.000000  2.000000   2.000000
      0.500000   0.000000   0.000000
      1     15   45.000000  35.000000  2.000000   2.000000
      0.500000   0.000000   0.000000
      1     16   45.000000  35.000000  2.000000   2.000000
      0.500000   0.000000   0.000000
      1     17   45.000000  35.000000  2.000000   2.000000
      0.500000   0.000000   0.000000
      1     18   45.000000  35.000000  2.000000   2.000000
      0.500000   0.000000   0.000000
      1     19   45.000000  35.000000  2.000000   2.000000
      0.500000   0.000000   0.000000
      1     20   45.000000  35.000000  2.000000   2.000000
      0.000000   0.000000   0.000000
      1     21   45.000000  35.000000  2.000000   2.000000
      0.500000   0.000000   0.000000
c-----------------------------------------------------------------
-------------------------
c130 pwat-parm4
c
c    defid   parameter group id
c    deluid  landuse id
c    cepsc   interception storage capacity (inches)
c    uzsn    upper zone nominal storage (inches)
c    nsur    Manning's n for the assumed overland flow plane
(none)
c    intfw   interflow inflow parameter (none)
c    irc     interflow recession parameter (none)
c    lzetp   lower zone e-t parameter (none)
c
c     defid deluid   cepsc      uzsn     nsur       intfw
irc        lzetp
      1     1    0.050000   0.000000   0.011000   0.000000
      0.000000   0.000000
      1     2    0.050000   0.000000   0.011000   0.000000
      0.000000   0.000000
      1     3    0.050000   0.000000   0.011000   0.000000
      0.000000   0.000000
      1     4    0.050000   0.000000   0.011000   0.000000
      0.000000   0.000000
      1     5    0.050000   0.000000   0.011000   0.000000
      0.000000   0.000000
      1     6    0.050000   0.000000   0.011000   0.000000
      0.000000   0.000000
      1     7    0.050000   0.000000   0.011000   0.000000
      0.000000   0.000000
      1     8    0.050000   0.000000   0.011000   0.000000
      0.000000   0.000000
      1     9    0.050000   0.000000   0.011000   0.000000
```

```
     0.000000   0.000000
     1     10   0.100000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     11   0.100000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     12   0.100000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     13   0.100000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     14   0.150000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     15   0.150000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     16   0.200000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     17   0.200000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     18   0.200000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     19   0.200000   0.500000   0.200000   1.000000
     0.600000   0.700000
     1     20   0.000000   0.500000   0.011000   1.000000
     0.600000   0.700000
     1     21   0.100000   0.500000   0.200000   1.000000
     0.600000   0.700000
c-----------------------------------------------------------------
------------------------
c140 pwat-state1
c    initial conditions for the simulation
c
c    defid   parameter group id
c    deluid  landuse id
c    ceps    initial interception storage.
c    surs    initial surface (overland flow) storage.
c    uzs     initial upper zone storage.
c    ifws    initial interflow storage.
c    lzs     initial lower zone storage.
c    agws    initial active groundwater storage.
c    gwvs    initial index to groundwater slope.
c
c     defid deluid ceps      surs       uzs      ifws       lzs
agws      gwvs
     1     1    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1     2    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1     3    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1     4    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1     5    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
```

```
     1    6    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    7    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    8    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    9    0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    10   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    11   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    12   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    13   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    14   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    15   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    16   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    17   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    18   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    19   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    20   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
     1    21   0.000000   0.000000   0.400000   0.000000
     9.000000   2.000000   0.500000
c-----------------------------------------------------------------
--------------------
c150 mon-interception storage (cepscm)
c    only required if vcsfg=1 in pwat-parm1 (see card 100)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec interception storage capacity at start of each month
(inches)
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c160 mon-upper zone nominal storage (uzsnm)
c    only required if vuzfg=1 in pwat-parm1 (see card 100)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec upper zone nominal storage at start of each month
```

```
(inches)
c
c    defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
----------------------
c170 mon-Manning's roughness coefficient (nsurm)
c    only required if vnnfg=1 in pwat-parm1 (see card 100)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec Manning's roughness coefficient at start of each
month (none)
c
c    defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
----------------------
c180 mon-interflow inflow parameter (intfwm)
c    only required if vifwfg=1 in pwat-parm1 (see card 100)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec interflow inflow parameter at start of each month
(none)
c
c    defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
----------------------
c190 mon-interflow recession constant (ircm)
c    only required if vircfg=1 in pwat-parm1 (see card 100)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec interflow recession constant at start of each month
(none)
c
c    defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c200 mon-lower zone evapotranspiration parameter (lzetpm)
c    only required if vlefg=1 in pwat-parm1 (see card 100)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec lower zone evapotranspiration parameter at start of
each month (none)
c
c    defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
```

```
c-----------------------------------------------------------------
--------------------
c201   Irrigation Application Option Flags
cIrrigation flag decide whether to run irrigation
c
c    irrigfg   if = 1 run irrigation option
c    petfg     if = 1 use constant PET rather than time series
from the air file
c    monVaryIrrig   if = 1 use monthly varying ET coefficient
c
c     irrigfg     petfg  monVaryIrrig
      1    0    0
c-----------------------------------------------------------------
-------------------------
c202 Irrigation PET Value
c   defid        Group ID number.
c   petval       Constant PET value to calculate actual ET
(in/hr)
c
c     defid  petval
c-----------------------------------------------------------------
----------------------------
c203 Irrigation Application Options
c   defid        Group ID number.
c   deluid       Landuse ID number
c   startmonth   startmonth of irrigation requirement
c   endmonth     endmonth of irrigation requirement
c   fraction1    fraction of irrigation requirement applied over
the canopy.
c   fraction2    fraction of irrigation water applied directly to
the soil surface.
c   fraction3    fraction of irrigation water applied to the
upper soil zone via buried systems
c   fraction4    fraction of irrigation water likewise applied to
the lower soil zone.
c   fraction5    fraction of irrigation water entering directly
into the local groundwater, such as seepage irrigation.
c   etcoeff      Coefficient to calculate actual ET, based on
PET.
c   etdays       Number of threshold days to calculate irrigation
demand (pet*etcoeff - precip)
c                (if etdays = 0 then irrigation demand = pet *
etcoeff)
c
c     defid deluid     startmonth endmonth   fraction1  fraction2
      fraction3  fraction4  fraction5  etcoeff    etdays
      1     1     1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     2     1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1     3     1     12    0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
```

```
      1    4    1    12   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1    5    1    12   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1    6    1    12   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1    7    1    12   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1    8    1    12   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1    9    1    12   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1    10   1    12   0.000000   1.000000   0.000000
      0.000000   0.000000   0.706000   1
      1    11   1    12   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1    12   1    12   0.000000   1.000000   0.000000
      0.000000   0.000000   1.000000   1
      1    13   1    12   0.000000   1.000000   0.000000
      0.000000   0.000000   1.000000   1
      1    14   1    12   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1    15   1    12   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1    16   1    12   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1    17   1    12   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1    18   1    12   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1    19   1    12   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1    20   1    12   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   1
      1    21   1    12   0.000000   1.000000   0.000000
      0.000000   0.000000   0.706000   1
c-----------------------------------------------------------------
----------------------------
c204 Monthly-variable ET coefficients
c   defid        Group ID number.
c   deluid       Landuse ID number
c   monetcs      Monthly-variable coefficient to calculate actual
ET for Jan..Dec
c
c     defid deluid     monETCs1   monETCs2   monETCs3   monETCs4
      monETCs5   monETCs6   monETCs7   monETCs8   monETCs9
      monETCs10  monETCs11  monETCs12
c-----------------------------------------------------------------
----------------------------
c205 Irrigation Withdrawal Options
c     Irrigation withdrawal information for each watershed
c    subbasin    subbasin id
```

```
c    rchid       reach id from where water is withdrawn (if reach
does not exist then
c                etdemand is assumed to be satisfied from an
external source)
c    irrigdep    depth of irrigation withdrawal pipe (ft)
c
c     subbasin   rchid
      5046  0     0.000000
      5065  0     0.000000
      5066  0     0.000000
      5079  0     0.000000
      5080  0     0.000000
      5083  0     0.000000
      5173  0     0.000000
      5175  0     0.000000
      5183  0     0.000000
      5189  0     0.000000
c-----------------------------------------------------------------
----------------------------
c250 general quality constituent control
c
c    defid    parameter group id
c    dwqid    general quality id
c    qname    name of qual (must be a continuous string)
c    qunit    units for quality constituent output (mg/l),
(ug/l), or (#/100ml)
c    qsdfg    if = 0 no sediment associated qual
c               if = 1 sediment associated in pervious/impervious
land (qsdfg should be > 0 in card 281)
c               if = 2 sediment associated in pervious/impervious
land
c                      and sediment associated qual is added to
the dissolved part
c    gqsdfg   if = 0 general quality constituent
c             if = 1 general quality constituent simulated as a
sediment (only one qual can be simulated as a sediment in each
group)
c    qsofg    if = 1 then then accumulation and removal occur
daily
c             if = 2 then then accumulation and removal occur
every interval
c    potfcfg  if = 1 then apply background concentration potency
factor (card 260) to only surface output
c             if = 2 then apply background concentration potency
factor (card 260) to total land output
c
c     defid dwqid   qname  qunit  qsdfg  gqsdfg  qsofg  potfcfg
      1     3     TN    (mg/l)     2     0     2     1
      1     7     TP    (mg/l)     2     0     2     1
      1     11    TCu   (ug/l)     2     0     2     1
      1     12    TPb   (ug/l)     2     0     2     1
      1     14    TZn   (ug/l)     2     0     2     1
```

```
     1    16    TSe   (ug/l)     0     0     2     1
c-----------------------------------------------------------------
-------------------------------------------
C255 subsurface quality control
c
c    (value of 0 = use constant qual-input; 1 = use corresponding
monthly variable card)
c
c    vqofg       if = 1 the accumulation rate and limiting
storage of QUALOF varies monthly   (cards 270, 271)
c    qsowfg      if = 1 the constituent is a QUALSURO (surface
flow associated).
c    vsqcfg      if = 1 the concentration of this constituent in
surface outflow varies monthly   (card 272)= 1 read table 272
c    qifwfg      if = 1 the constituent is a QUALIF (interflow
associated).
c    viqcfg      if = 1 the concentration of this constituent in
interflow outflow varies monthly   (card 273)= 1 read table 273
c    qagwfg      if = 1 the constituent is a QUALGW (groundwater
associated).
c    vaqcfg      if = 1 the concentration of this constituent in
groundwater outflow varies monthly (card 274)
c    adfglnd     if = 1 atmosperic deposition on land
c    maddfglnd   if = 1 atmosperic dry deposition varies monthly
on land (card 275)
c    mawdfglnd   if = 1 atmosperic wet deposition varies monthly
on land (card 276)
c
c     vqofg  qsowfg  vsqcfg  qifwfg  viqcfg  qagwfg  vaqcfg
adfglnd  maddfglnd  mawdfglnd
     0    1    0    1    0    1    0    1    0    0
c-----------------------------------------------------------------
-------------------------------------------
C260  qual-input
c    storage on surface and nonseasonal parameters
c
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    sqo     initial storage of QUALOF on surface (lb or #)
c    potfw   washoff potency factor if qsdfg > 0, card 250 (lb or
#)/ton-sediment
c    potfs   scour potency pactor if qsdfg > 0, card 250 (lb or
#)/ton-sediment
c    potfc   background concentration potency pactor if qsdfg >
0, card 250 (lb or #)/ton-sediment
c    acqop   accumulation rate of QUALOF on surface (lb or
#)/acre/day
c    sqolim  maximum storage of QUALOF on surface (lb or #)/acre
c    wsqop   rate of surface runoff that removes 90% of stored
QUALOF per hour (in/hr)
c    soqc    concentration of constituent in surface outflow
```

```
(mg/l), (ug/l), or (#/100ml)
c    ioqc    concentration of constituent in interflow outflow
(mg/l), (ug/l), or (#/100ml)
c    aoqc    concentration of constituent in groundwater outflow
(mg/l), (ug/l), or (#/100ml)
c    addc    atmospheric dry deposition flux (lb/acre/day or
#/acre/day)
c    awdc    atmospheric wet deposition concentration (mg/l),
(ug/l), or (#/100ml)
c
c     the units of the following parameters are as follow:
c     if in card 250, the unit is mg/l or ug/l, then M is lbs
c     if in card 250, the unit is #/100ml, then M is #, in this
case the unit for
c     soqc, ioqc and aoqc should be #/100ml instead of mg/l
c
c     defid  dwqid  deluid  sqo     potfw     potfs   potfc
acqop   sqolim   wsqop        soqc   ioqc   aoqc   addc  awdc
     1     3     1     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     2     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     3     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     4     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     5     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     6     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     7     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     8     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     9     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     10    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     11    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000001   1.640000   2.000000   2.000000
     0.000000   0.000000   0.000000
     1     3     12    0.000000   0.000000   0.000000   0.000000
```

```
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     13    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     14    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     15    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     16    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     17    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     18    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     19    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     20    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     3     21    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   2.000000   2.000000
0.000000   0.000000   0.000000
1     7     1     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.900000   1.900000
0.000000   0.000000   0.000000
1     7     2     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.080000   1.080000
0.000000   0.000000   0.000000
1     7     3     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.080000   1.080000
0.000000   0.000000   0.000000
1     7     4     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.900000   1.900000
0.000000   0.000000   0.000000
1     7     5     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   3.000000   3.000000
0.000000   0.000000   0.000000
1     7     6     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.260000   1.260000
0.000000   0.000000   0.000000
1     7     7     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.260000   1.260000
0.000000   0.000000   0.000000
1     7     8     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
```

```
0.000000   0.000000   0.000000
1     7     9     0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
0.000000   0.000000   0.000000
1     7     10    0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.080000   1.080000
0.000000   0.000000   0.000000
1     7     11    0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.080000   1.080000
0.000000   0.000000   0.000000
1     7     12    0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.760000   1.760000
0.000000   0.000000   0.000000
1     7     13    0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.760000   1.760000
0.000000   0.000000   0.000000
1     7     14    0.000000   0.001000   0.001000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
0.000000   0.000000   0.000000
1     7     15    0.000000   0.001000   0.001000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
0.000000   0.000000   0.000000
1     7     16    0.000000   0.001000   0.001000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
0.000000   0.000000   0.000000
1     7     17    0.000000   0.001000   0.001000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
0.000000   0.000000   0.000000
1     7     18    0.000000   0.001000   0.001000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
0.000000   0.000000   0.000000
1     7     19    0.000000   0.001000   0.001000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
0.000000   0.000000   0.000000
1     7     20    0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     7     21    0.000000   0.010000   0.010000   0.000000
0.000000   0.000001   1.640000   1.000000   1.000000
0.000000   0.000000   0.000000
1     11    1     0.000000   0.800000   0.800000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    2     0.000000   0.600000   0.600000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    3     0.000000   0.600000   0.600000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     11    4     0.000000   0.800000   0.800000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
```

1 11 5 0.000000 1.140000 1.140000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 11 6 0.000000 0.400000 0.400000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 11 7 0.000000 0.400000 0.400000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 11 8 0.000000 0.800000 0.800000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 11 9 0.000000 0.800000 0.800000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 11 10 0.000000 0.600000 0.600000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 11 11 0.000000 0.600000 0.600000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 11 12 0.000000 0.300000 0.300000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 11 13 0.000000 0.300000 0.300000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 11 14 0.000000 0.012000 0.012000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 11 15 0.000000 0.012000 0.012000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 11 16 0.000000 0.012000 0.012000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 11 17 0.000000 0.012000 0.012000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 11 18 0.000000 0.012000 0.012000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 11 19 0.000000 0.012000 0.012000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 11 20 0.000000 0.000000 0.000000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 11 21 0.000000 0.600000 0.600000 0.000000
0.000000 0.000001 1.640000 0.000000 0.000000
0.000000 0.000000 0.000000
1 12 1 0.000000 0.800000 0.800000 0.000000

```
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    2     0.000000   0.200000   0.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    3     0.000000   0.200000   0.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    4     0.000000   0.800000   0.800000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    5     0.000000   1.000000   1.000000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    6     0.000000   0.180000   0.180000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    7     0.000000   0.180000   0.180000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    8     0.000000   0.800000   0.800000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    9     0.000000   0.800000   0.800000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    10    0.000000   0.200000   0.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    11    0.000000   0.200000   0.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    12    0.000000   0.100000   0.100000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    13    0.000000   0.100000   0.100000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    14    0.000000   0.002000   0.002000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    15    0.000000   0.002000   0.002000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    16    0.000000   0.002000   0.002000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    17    0.000000   0.002000   0.002000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    18    0.000000   0.002000   0.002000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
```

```
0.000000   0.000000   0.000000
1     12    19    0.000000   0.002000   0.002000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    20    0.000000   0.000000   0.000000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     12    21    0.000000   0.200000   0.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    1     0.000000   7.500000   7.500000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    2     0.000000   1.200000   1.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    3     0.000000   1.200000   1.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    4     0.000000   7.500000   7.500000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    5     0.000000   10.200000  10.200000  0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    6     0.000000   5.080000   5.080000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    7     0.000000   5.080000   5.080000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    8     0.000000   7.500000   7.500000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    9     0.000000   7.500000   7.500000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    10    0.000000   1.200000   1.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    11    0.000000   1.200000   1.200000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    12    0.000000   2.500000   2.500000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    13    0.000000   2.500000   2.500000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
1     14    14    0.000000   0.050000   0.050000   0.000000
0.000000   0.000001   1.640000   0.000000   0.000000
0.000000   0.000000   0.000000
```

```
1     14    15    0.000000    0.050000    0.050000    0.000000
0.000000    0.000001    1.640000    0.000000    0.000000
0.000000    0.000000    0.000000
1     14    16    0.000000    0.050000    0.050000    0.000000
0.000000    0.000001    1.640000    0.000000    0.000000
0.000000    0.000000    0.000000
1     14    17    0.000000    0.050000    0.050000    0.000000
0.000000    0.000001    1.640000    0.000000    0.000000
0.000000    0.000000    0.000000
1     14    18    0.000000    0.050000    0.050000    0.000000
0.000000    0.000001    1.640000    0.000000    0.000000
0.000000    0.000000    0.000000
1     14    19    0.000000    0.050000    0.050000    0.000000
0.000000    0.000001    1.640000    0.000000    0.000000
0.000000    0.000000    0.000000
1     14    20    0.000000    0.000000    0.000000    0.000000
0.000000    0.000001    1.640000    0.000000    0.000000
0.000000    0.000000    0.000000
1     14    21    0.000000    1.200000    1.200000    0.000000
0.000000    0.000001    1.640000    0.000000    0.000000
0.000000    0.000000    0.000000
1     16    1     0.000000    0.000000    0.000000    0.000000
0.000000    0.000001    1.640000    0.470000    0.470000
0.000000    0.000000    0.000000
1     16    2     0.000000    0.000000    0.000000    0.000000
0.000000    0.000001    1.640000    0.470000    0.470000
0.000000    0.000000    0.000000
1     16    3     0.000000    0.000000    0.000000    0.000000
0.000000    0.000001    1.640000    0.470000    0.470000
0.000000    0.000000    0.000000
1     16    4     0.000000    0.000000    0.000000    0.000000
0.000000    0.000001    1.640000    0.470000    0.470000
0.000000    0.000000    0.000000
1     16    5     0.000000    0.000000    0.000000    0.000000
0.000000    0.000001    1.640000    0.350000    0.350000
0.000000    0.000000    0.000000
1     16    6     0.000000    0.000000    0.000000    0.000000
0.000000    0.000001    1.640000    0.350000    0.350000
0.000000    0.000000    0.000000
1     16    7     0.000000    0.000000    0.000000    0.000000
0.000000    0.000001    1.640000    0.590000    0.590000
0.000000    0.000000    0.000000
1     16    8     0.000000    0.000000    0.000000    0.000000
0.000000    0.000001    1.640000    0.000000    0.000000
0.000000    0.000000    0.000000
1     16    9     0.000000    0.000000    0.000000    0.000000
0.000000    0.000001    1.640000    0.000000    0.000000
0.000000    0.000000    0.000000
1     16    10    0.000000    0.000000    0.000000    0.000000
0.000000    0.000001    1.640000    0.350000    0.350000
0.000000    0.000000    0.000000
1     16    11    0.000000    0.000000    0.000000    0.000000
```

```
      0.000000   0.000001   1.640000   0.350000   0.350000
      0.000000   0.000000   0.000000
      1     16    12    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   1.860000   1.860000
      0.000000   0.000000   0.000000
      1     16    13    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   1.860000   1.860000
      0.000000   0.000000   0.000000
      1     16    14    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   0.350000   0.350000
      0.000000   0.000000   0.000000
      1     16    15    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   0.350000   0.350000
      0.000000   0.000000   0.000000
      1     16    16    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   0.350000   0.350000
      0.000000   0.000000   0.000000
      1     16    17    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   0.350000   0.350000
      0.000000   0.000000   0.000000
      1     16    18    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   0.350000   0.350000
      0.000000   0.000000   0.000000
      1     16    19    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   0.350000   0.350000
      0.000000   0.000000   0.000000
      1     16    20    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   0.000000   0.000000
      0.000000   0.000000   0.000000
      1     16    21    0.000000   0.000000   0.000000   0.000000
      0.000000   0.000001   1.640000   0.000000   0.000000
      0.000000   0.000000   0.000000
c-----------------------------------------------------------------
----------------------------
c270 mon-accumulation rate (monaccum)
c    only required if vqofg =1 (see card 255)
c
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    jan-dec accumulation rate at start of each month
(lb/acre/day)
c     if in card 250, the unit is #/100ml, the above unit should
be #/acre/day
c
c     defid dwqid   deluid   jan   feb   mar   apr   may   jun
jul   aug   sep   oct   nov   dec
c-----------------------------------------------------------------
-----------------------
c271 mon-storage limit of quality constituent (monsqolim)
c    only required if vqofg = 1 (see card 255)
c
```

```
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    jan-dec maximum storage at start of each month (lb/acre)
c     if in card 250, the unit is #/100ml, the above unit should
be #/acre
c
c     defid dwqid   deluid   jan   feb   mar   apr   may   jun
jul   aug   sep   oct   nov   dec
c-----------------------------------------------------------------
-----------------------
c272 mon-surfaceflow concentration (monsuroconc)
c    only required if vsqcfg = 1 (see card 255)
c
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    jan-dec concentration of constituent in surface flow at
start of each month (mg/l), (ug/l), or (#/100ml)
c     if in card 250, the unit is #/100ml, the above unit should
be #/100ml
c
c     defid dwqid   deluid   jan   feb   mar   apr   may   jun
jul   aug   sep   oct   nov   dec
c-----------------------------------------------------------------
-----------------------
c273 mon-interflow concentration (moninterconc)
c    only required if viqcfg = 1 (see card 255)
c
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    jan-dec concentration of constituent in interflow at start
of each month (mg/l), (ug/l), or (#/100ml)
c     if in card 250, the unit is #/100ml, the above unit should
be #/100ml
c
c     defid dwqid   deluid   jan   feb   mar   apr   may   jun
jul   aug   sep   oct   nov   dec
c-----------------------------------------------------------------
-----------------------
c274 mon-groundwater concentration (mongrndconc)
c    only required if vaqcfg = 1 (see card 255)
c
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    jan-dec concentration of constituent in groundwater at start
of each month (mg/l), (ug/l), or (#/100ml)
c     if in card 250, the unit is #/100ml, the above unit should
be #/100ml
c
```

```
c     defid dwqid   deluid   jan   feb   mar   apr   may   jun
jul   aug   sep   oct   nov   dec
c-----------------------------------------------------------------
----------------------------
c275 mon-atmospheric dry deposition flux
c    only required if maddfglnd = 1 (see card 255)
c
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    jan-dec flux of constituent in dry deposition at start of
each month (lb/acre/day or #/acre/day)
c
c     defid dwqid   deluid   jan   feb   mar   apr   may   jun
jul   aug   sep   oct   nov   dec
c-----------------------------------------------------------------
----------------------------
c276 mon-atmospheric wet deposition concentration
c    only required if mawdfglnd = 1 (see card 255)
c
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    jan-dec concentration of constituent in atmospheric wet
deposition at start of each month (mg/l), (ug/l), or (#/100ml)
c
c     defid dwqid   deluid   jan   feb   mar   apr   may   jun
jul   aug   sep   oct   nov   dec
c-----------------------------------------------------------------
----------------------------
C280 stream water quality control
c
c    adfgrch     if = 1 atmosperic deposition on reach (0 for no
atmospheric deposition)
c    maddfgrch   if = 1 atmosperic dry deposition varies monthly
on reach (card 282)
c    mawdfgrch   if = 1 atmosperic wet deposition varies monthly
on reach (card 283)
c
c     adfgrch  maddfgrch  mawdfgrch
      0    0    0
c-----------------------------------------------------------------
-------------------------------------------
c281 general quality constituent control
c
c    rgid     stream parameter group id
c    dwqid    general quality id
c    qsdfg    if = 0 no sediment associated qual
c               if = 1 sediment associated in stream,
adsorption/desorption of qual is simulated
c    iniCond  initial instream concentration at start of
simulation by group (mg/l), (ug/l), or (#/100ml)
```

```
c    decay    general first-order instream loss rate of qual by
reach group (1/day)
c    tcdecay  temperature correction coefficient for first-order
decay of qual (min=1, max=2)
c    addc     atmospheric dry deposition flux (lb/acre/day or
#/acre/day)
c    awdc     atmospheric wet deposition concentration (mg/l),
(ug/l), or (#/100ml)
c    potber   scour potency pactor for stream bank erosion if
qsdfg > 0, (lb or #)/ton-sediment
c
c     rgid  dwqid   qsdfg   iniCond  decay  tcdecay   addc   awdc
potber
      1     3     0     0.000000   0.100000   1.000000   0.000000
      0.000000   0.000000
      1     7     0     0.000000   0.100000   1.000000   0.000000
      0.000000   0.000000
      1     11    0     0.000000   0.200000   1.000000   0.000000
      0.000000   0.000000
      1     12    0     0.000000   0.200000   1.000000   0.000000
      0.000000   0.000000
      1     14    0     0.000000   0.200000   1.000000   0.000000
      0.000000   0.000000
      1     16    0     0.000000   0.200000   1.000000   0.000000
      0.000000   0.000000
c-----------------------------------------------------------------
-------------------------------------------
c282 mon-atmospheric dry deposition flux
c    only required if maddfgrch = 1 (see card 280)
c
c    rgid    reach group id
c    dwqid   general quality id
c    jan-dec flux of constituent in dry deposition at start of
each month (lb/acre/day or #/acre/day)
c
c     rgid dwqid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
----------------------------
c283 mon-atmospheric wet deposition concentration
c    only required if mawdfgrch = 1 (see card 280)
c
c    rgid    reach group id
c    dwqid   general quality id
c    jan-dec concentration of constituent in atmospheric wet
deposition at start of each month (mg/l), (ug/l), or (#/100ml)
c
c     rgid dwqid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
----------------------------
c285 parameters for decay of contaminant adsorbed to sediment
```

```
c    only required if qsdfg > 0 (see card 281)
c
c    rgid      reach group id
c    dwqid     general quality id
c    addcpm1   decay rate for qual adsorbed to suspended sediment
(/day)
c    addcpm2   temperature correction coefficient for decay of
qual on suspended sediment (range from 1.0 to 2.0)
c    addcpm3   decay rate for qual adsorbed to bed sediment
(/day)
c    addcpm4   temperature correction coefficient for decay of
qual on bed sediment (range from 1.0 to 2.0)
c
c   rgid  dwqid   addcpm1   addcpm2   addcpm3   addcpm4
     1     3     0.000000   1.070000   0.000000   1.070000
     1     7     0.000000   1.070000   0.000000   1.070000
     1     11    0.000000   1.070000   0.000000   1.070000
     1     12    0.000000   1.070000   0.000000   1.070000
     1     14    0.000000   1.070000   0.000000   1.070000
     1     16    0.000000   1.070000   0.000000   1.070000
c-----------------------------------------------------------------
----------------------------
c286 adsorption coefficients of qual
c    only required if qsdfg > 0 (see card 281)
c
c    rgid      reach group id
c    dwqid     general quality id
c    adpm1     distribution coefficients for qual with suspended
sand (l/mg)
c    adpm2     distribution coefficients for qual with suspended
silt (l/mg)
c    adpm3     distribution coefficients for qual with suspended
clay (l/mg)
c    adpm4     distribution coefficients for qual with bed sand
(l/mg)
c    adpm5     distribution coefficients for qual with bed silt
(l/mg)
c    adpm6     distribution coefficients for qual with bed clay
(l/mg)
c
c   rgid  dwqid   adpm1   adpm2   adpm3   adpm4   adpm5   adpm6
     1     3     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     7     0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     11    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     12    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     14    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     16    0.000000   0.000000   0.000000   0.000000
```

```
     0.000000   0.000000
c-----------------------------------------------------------------
----------------------------
c287 adsorption/desorption rate parameters
c    only required if qsdfg > 0 (see card 281)
c
c    rgid      reach group id
c    dwqid     general quality id
c    adpm1     transfer rates between adsorbed and desorbed
states of qual with suspended sand (/day)
c    adpm2     transfer rates between adsorbed and desorbed
states of qual with suspended silt (/day)
c    adpm3     transfer rates between adsorbed and desorbed
states of qual with suspended clay (/day)
c    adpm4     transfer rates between adsorbed and desorbed
states of qual with bed sand (/day)
c    adpm5     transfer rates between adsorbed and desorbed
states of qual with bed silt (/day)
c    adpm6     transfer rates between adsorbed and desorbed
states of qual with bed clay (/day)
c
c   rgid  dwqid   adpm1   adpm2   adpm3   adpm4   adpm5   adpm6
     1     3    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     7    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     11   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     12   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     14   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1     16   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
c-----------------------------------------------------------------
----------------------------
c288 adsorption/desorption temperature correction parameters
c    only required if qsdfg > 0 (see card 281)
c
c    rgid      reach group id
c    dwqid     general quality id
c    adpm1     temperature correction coefficients for
adsorption/desorption on suspended sand (range from 1.0 to 2.0)
c    adpm2     temperature correction coefficients for
adsorption/desorption on suspended silt (range from 1.0 to 2.0)
c    adpm3     temperature correction coefficients for
adsorption/desorption on suspended clay (range from 1.0 to 2.0)
c    adpm4     temperature correction coefficients for
adsorption/desorption on bed sand (range from 1.0 to 2.0)
c    adpm5     temperature correction coefficients for
adsorption/desorption on bed silt (range from 1.0 to 2.0)
c    adpm6     temperature correction coefficients for
```

```
adsorption/desorption on bed clay (range from 1.0 to 2.0)
c
c   rgid  dwqid   adpm1   adpm2   adpm3   adpm4   adpm5   adpm6
     1    3    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1    7    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1    11   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1    12   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1    14   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1    16   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
c-----------------------------------------------------------------
----------------------------
c289 initial concentrations on sediment
c    only required if qsdfg > 0 (see card 281)
c
c    rgid      reach group id
c    dwqid     general quality id
c    sqal1     initial concentrations of qual on suspended sand
(concu/mg)
c    sqal2     initial concentrations of qual on suspended silt
(concu/mg)
c    sqal3     initial concentrations of qual on suspended clay
(concu/mg)
c    sqal4     initial concentrations of qual on bed sand
(concu/mg)
c    sqal5     initial concentrations of qual on bed silt
(concu/mg)
c    sqal6     initial concentrations of qual on bed clay
(concu/mg)
c
c   rgid  dwqid   sqal1   sqal2   sqal3   sqal4   sqal5   sqal6
     1    3    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1    7    0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1    11   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1    12   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1    14   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     1    16   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
c-----------------------------------------------------------------
----------------------------
C310 soil-data
c    only required if nitrfg = 1 or phosfg = 1 (see card 0)
```

```
c    soil layer depths, bulk densities, and wilting point
c
c    defid     parameter group id
c    deluid    landuse id
c    dep_sl    depth of surface layer (in)
c    dep_ul    depth of upper layer (in)
c    dep_ll    depth of lower layer (in)
c    dep_gwl   depth of groundwater layer (in)
c    bd_sl     bulkdensity of surface layer (lb/ft3)
c    bd_ul     bulkdensity of upper layer (lb/ft3)
c    bd_ll     bulkdensity of lower layer (lb/ft3)
c    bd_gwl    bulkdensity of groundwater layer (lb/ft3)
c    wp_sl     wiltingpoint of surface layer (fraction)
c    wp_ul     wiltingpoint of upper layer (fraction)
c    wp_ll     wiltingpoint of lower layer (fraction)
c    wp_gwl    wiltingpoint of groundwater layer (fraction)
c
c   defid deluid  depth_sl   depth_ul   depth_ll   depth_gwl
bd_sl    bd_ul    bd_ll    bd_gwl    wp_sl    wp_ul    wp_ll
wp_gwl
c-----------------------------------------------------------------
----------------------------
C311  mstlay-parm
c    factors used to adjust solute leaching rates
c
c    defid   parameter group id
c    deluid  landuse id
c    slmpf   factor used to adjust solute percolation rate from
the surface layer storage to the upper layer principal storage
c    ulpf    factor used to adjust solute percolation rate from
the upper layer principal storage to the lower layer storage
c    llpf    factor used to adjust solute percolation rate from
the lower layer storage to the active and inactive groundwater
c
c   defid   deluid  slmpf     ulpf     llpf
c-----------------------------------------------------------------
----------------------------
C312  mst-topstor
c    initial moisture storage in each topsoil layer
c
c    defid   parameter group id
c    deluid  landuse id
c    smstm   initial moisture content in the surface storage
(lb/ac)
c    umstm   initial moisture content in the upper principal
storage (lb/ac)
c    imstm   initial moisture content in the upper transitory
(interflow) storages (lb/ac)
c
c   defid   deluid  smstm     umstm     imstm
c-----------------------------------------------------------------
----------------------------
```

```
C313  mst-topflx
c    initial fractional fluxes in each topsoil layer
c
c    defid   parameter group id
c    deluid  landuse id
c    fso     initial values of the fractional fluxes of soluble
chemicals through the topsoil layers of a PLS (/ivl)
c    fsp     initial values of the fractional fluxes of soluble
chemicals through the topsoil layers of a PLS (/ivl)
c    fii     initial values of the fractional fluxes of soluble
chemicals through the topsoil layers of a PLS (/ivl)
c    fup     initial values of the fractional fluxes of soluble
chemicals through the topsoil layers of a PLS (/ivl)
c    fio     initial values of the fractional fluxes of soluble
chemicals through the topsoil layers of a PLS (/ivl)
c
c   defid   deluid  fso     fsp     fii    fup     fio
c-----------------------------------------------------------------
----------------------------
C314  mst-substor
c    initial moisture storage in each topsoil layer
c
c    defid   parameter group id
c    deluid  landuse id
c    lmstm   initial moisture storages in the lower layer (lb/ac)
c    amstm   initial moisture content in the active groundwater
layers (lb/ac)
c
c   defid   deluid  lmstm     amstm
c-----------------------------------------------------------------
----------------------------
C315  mst-subflx
c    initial fractional fluxes in each topsoil layer
c
c    defid   parameter group id
c    deluid  landuse id
c    flp     initial fractional fluxes of soluble chemicals
through the subsoil layers (/ivl)
c    fldp    initial fractional fluxes of soluble chemicals
through the subsoil layers (/ivl)
c    fao     initial fractional fluxes of soluble chemicals
through the subsoil layers (/ivl)
c
c   defid   deluid  flp     fldp     fao
c-----------------------------------------------------------------
----------------------------
C341 initial storage of nitrogen in the surface layer
c    only required if nitrfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    lorgn   initial storage of labile organic nitrogen (lb/acre)
```

```
c    amad    initial storage of adsorbed ammonium (lb/acre)
c    amsu    initial storage of solution ammonium (lb/acre)
c    no3     initial storage of nitrate (lb/acre)
c    pltn    initial storage of nitrogen stored in plants
(lb/acre)
c    rorgn   initial storage of refractory organic nitrogen
(lb/acre)
c
c   defid  deluid lorgn   amad    amsu    no3    pltn   rorgn
c-----------------------------------------------------------------
----------------------------
C342 initial storage of nitrogen in the upper layer
c    only required if nitrfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    lorgn   initial storage of labile organic nitrogen (lb/acre)
c    amad    initial storage of adsorbed ammonium (lb/acre)
c    amsu    initial storage of solution ammonium (lb/acre)
c    no3     initial storage of nitrate (lb/acre)
c    pltn    initial storage of nitrogen stored in plants
(lb/acre)
c    rorgn   initial storage of refractory organic nitrogen
(lb/acre)
c
c   defid  deluid lorgn   amad    amsu    no3    pltn   rorgn
c-----------------------------------------------------------------
----------------------------
C343 initial storage of nitrogen in the transitory layer
c    only required if nitrfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    iamsu   initial storage of solution ammonium (lb/acre)
c    ino3    initial storage of nitrate (lb/acre)
c    islon   initial storage of solution labile organic nitrogen
(lb/acre)
c    isron   initial storage of solution refractory organic
nitrogen (lb/acre)
c    agpltn  initial storage of above-ground plant nitrogen
(lb/acre)
c    littrn  initial storage of litter nitrogen (lb/acre)
c
c   defid  deluid iamsu   ino3    islon    isron    agpltn
littrn
c-----------------------------------------------------------------
----------------------------
C344 initial storage of nitrogen in the lower layer
c    only required if nitrfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
```

```
c    lorgn   initial storage of labile organic nitrogen (lb/acre)
c    amad    initial storage of adsorbed ammonium (lb/acre)
c    amsu    initial storage of solution ammonium (lb/acre)
c    no3     initial storage of nitrate (lb/acre)
c    pltn    initial storage of nitrogen stored in plants
(lb/acre)
c    rorgn   initial storage of refractory organic nitrogen
(lb/acre)
c
c   defid  deluid lorgn   amad    amsu    no3    pltn   rorgn
c-----------------------------------------------------------------
----------------------------
C345 initial storage of nitrogen in the groundwater layer
c    only required if nitrfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    lorgn   initial storage of labile organic nitrogen (lb/acre)
c    amad    initial storage of adsorbed ammonium (lb/acre)
c    amsu    initial storage of solution ammonium (lb/acre)
c    no3     initial storage of nitrate (lb/acre)
c    pltn    initial storage of nitrogen stored in plants
(lb/acre)
c    rorgn   initial storage of refractory organic nitrogen
(lb/acre)
c
c   defid  deluid lorgn   amad    amsu    no3    pltn   rorgn
c-----------------------------------------------------------------
----------------------------
C361 initial phosphorus storage in the surface layer
c    only required if phosfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    orgp    initial storage of organic phosphorus (lb/acre)
c    p4ad    initial storage of adsorbed phosphate (lb/acre)
c    p4su    initial storage of solution phosphate (lb/acre)
c    pltp    initial storage of phosphorus stored in plants
(lb/acre)
c
c   defid  deluid orgp   p4ad    p4su    pltp
c-----------------------------------------------------------------
----------------------------
C362 initial phosphorus storage in the upper layer
c    only required if phosfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    orgp    initial storage of organic phosphorus (lb/acre)
c    p4ad    initial storage of adsorbed phosphate (lb/acre)
c    p4su    initial storage of solution phosphate (lb/acre)
c    pltp    initial storage of phosphorus stored in plants
```

```
(lb/acre)
c
c   defid  deluid orgp   p4ad    p4su    pltp
c-----------------------------------------------------------------
----------------------------
C363 initial phosphorus storage in the transitory layer
c    only required if phosfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    ip4su   initial storage of solution phosphate (lb/acre)
c
c   defid  deluid ip4su
c-----------------------------------------------------------------
----------------------------
C364 initial phosphorus storage in the lower layer
c    only required if phosfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    orgp    initial storage of organic phosphorus (lb/acre)
c    p4ad    initial storage of adsorbed phosphate (lb/acre)
c    p4su    initial storage of solution phosphate (lb/acre)
c    pltp    initial storage of phosphorus stored in plants
(lb/acre)
c
c   defid  deluid orgp   p4ad    p4su    pltp
c-----------------------------------------------------------------
----------------------------
C365 initial phosphorus storage in the groundwater layer
c    only required if phosfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    orgp    initial storage of organic phosphorus (lb/acre)
c    p4ad    initial storage of adsorbed phosphate (lb/acre)
c    p4su    initial storage of solution phosphate (lb/acre)
c    pltp    initial storage of phosphorus stored in plants
(lb/acre)
c
c   defid  deluid orgp   p4ad    p4su    pltp
c-----------------------------------------------------------------
----------------------------
c390 atmosphere to stream mapping (read if mdasfg = 1 and adfgrch
= 1)
c
c    rgid    reach parameter group id
c    dwqid   general quality id
c    OrgN    organic nitrogen fraction in pqual
c    NH4S    ammonium solution fraction in pqual
c    NH4E    ammonium exchange fraction in  pqual
c    NO3     nitrate fraction in pqual
```

```
c    NO2     nitrite fraction in pqual
c    SO4     sulfate fraction in pqual
c
c     defid dwqid   OrgN   NH4S   NH4E   NO3   NO2   SO4
c-----------------------------------------------------------------
----------------------------
c391 land surface to land sub-surface mapping (read if mdasfg =1)
c
c    defid   parameter group id
c    dwqid   general quality id
c    deluid  landuse id
c    OrgN    organic nitrogen fraction in pqual
c    NH4S    ammonium solution fraction in pqual
c    NH4E    ammonium exchange fraction in  pqual
c    NO3     nitrate fraction in pqual
c    NO2     nitrite fraction in pqual
c    SO4     sulfate fraction in pqual
c
c     defid dwqid   deluid   OrgN   NH4S   NH4E   NO3   NO2   SO4
c-----------------------------------------------------------------
----------------------------
c392 land to stream mapping (read if mdasfg=1)
c
c    rgid    stream parameters group id
c    dwqid   general quality id
c    lutype  landuse type flow id (1 = impervious surfaceflow,
c            2 = pervious surfaceflow, 3 = pervious interflow, 4
= pervious groundflow)
c    PFe     Particulate iron fraction in pqual
c    DFe     Dissolved iron fraction in pqual
c    PAl     Particulate aluminum fraction in pqual
c    DAl     Dissolved aluminum fraction in pqual
c    CO3     CO3(2-) fraction in pqual
c    SO4     SO4 fraction in pqual
c
c     rgid   dwqid    lutype   PFe   DFe   PAl   DAl   CO3   SO4
c-----------------------------------------------------------------
----------------------------
C393 calibration parameters for the surfcae layer
c    only required if mdasfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    crfg    chemical reaction flag
c            0  = no chemical reaction
c            1  = only nitrogen transformation
c            2  = full chemical reactions
c    kes     nitrogen transformation (NH4E to NH4S) rate (per
day)
c    kse     nitrogen transformation (NH4S to NH4E) rate (per
day)
c    k1      nitrogen transformation (NH4S to NO2) rate (per day)
```

```
c    k2      nitrogen transformation (NO2 to NO3) rate (per day)
c    k3      nitrogen transformation (plant uptake NO3) rate (per
day)
c    k4      nitrogen transformation (plant uptake NH4S) rate
(per day)
c    k6      nitrogen transformation (OrgN to NH4S) rate (per
day)
c    kk6     nitrogen transformation (NH4S to OrgN) rate (per
day)
c    kk8     nitrogen transformation (NO3 to OrgN) rate (per day)
c    K_Al    Aluminum solubility constant
c    Ks      selectivity coefficient
c    CaX     base saturation percentage (fraction)
c    THETA   temperature correction coefficient for nitrogen
transformation for surface layer (range from 1.0 to 2.0)
c    OrgA    Organic acid input to the surface layer (mg/l)
c
c   defid deluid  crfg  kes   kse   k1   k2   k3   k4   k6   kk6
kk8  K_Al  Ks  CaX  theta  OrgA
c-----------------------------------------------------------------
----------------------------
C394 calibration parameters for the upper layer
c    only required if mdasfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    crfg    chemical reaction flag
c            0  = no chemical reaction
c            1  = only nitrogen transformation and sulfate
adsorption
c            2  = full chemical reactions
c    kes     nitrogen transformation (NH4E to NH4S) rate (per
day)
c    kse     nitrogen transformation (NH4S to NH4E) rate (per
day)
c    k1      nitrogen transformation (NH4S to NO2) rate (per day)
c    k2      nitrogen transformation (NO2 to NO3) rate (per day)
c    k3      nitrogen transformation (plant uptake NO3) rate (per
day)
c    k4      nitrogen transformation (plant uptake NH4S) rate
(per day)
c    k6      nitrogen transformation (OrgN to NH4S) rate (per
day)
c    kk6     nitrogen transformation (NH4S to OrgN) rate (per
day)
c    kk8     nitrogen transformation (NO3 to OrgN) rate (per day)
c    Km      maximum adsorbable amount of sulfate(mol/kg)
c    OneH    value to use to determine a half saturation
c    DESORP  desorption rate (per day)
c    K_Al    Aluminum solubility constant (log K_Al)
c    Ks      selectivity coefficient (Log Ks)
c    CaX     base saturation percentage (fraction)
```

```
c    PeakMon growing season peak month
c    THETA   temperature correction coefficient for nitrogen
transformation for upper layer (range from 1.0 to 2.0)
c    OrgA    Organic acid input to the upper layer (mg/l)
c
c   defid deluid  crfg  kes   kse   k1   k2   k3   k4   k6   kk6
kk8   Km   OneH   DESORP  K_Al  Ks  CaX  PeakMon  theta  OrgA
c-----------------------------------------------------------------
----------------------------
C395 calibration parameters for the groundwater layer
c    only required if mdasfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    crfg    chemical reaction flag
c            0  = no chemical reaction
c            1  = only nitrogen transformation and sulfate
adsorption
c            2  = full chemical reactions
c    kes     nitrogen transformation (NH4E to NH4S) rate (per
day)
c    kse     nitrogen transformation (NH4S to NH4E) rate (per
day)
c    k1      nitrogen transformation (NH4S to NO2) rate (per day)
c    k2      nitrogen transformation (NO2 to NO3) rate (per day)
c    k3      nitrogen transformation (plant uptake NO3) rate (per
day)
c    k4      nitrogen transformation (plant uptake NH4S) rate
(per day)
c    k6      nitrogen transformation (OrgN to NH4S) rate (per
day)
c    kk6     nitrogen transformation (NH4S to OrgN) rate (per
day)
c    kk8     nitrogen transformation (NO3 to OrgN) rate (per day)
c    Km      maximum adsorbable amount of sulfate(mol/kg)
c    OneH    value to use to determine a half saturation
c    DESORP  desorption rate (per day)
c    K_Al    Aluminum solubility constant (Log K_Al)
c    Ks      selectivity coefficient (Log Ks)
c    CaX     base saturation percentage (fraction)
c    PeakMon growing season peak month
c    THETA   temperature correction coefficient for nitrogen
transformation for groundwater layer (range from 1.0 to 2.0)
c    OrgA    Organic acid input to the groundwater layer (mg/l)
c
c   defid deluid  crfg  kes   kse   k1   k2   k3   k4   k6   kk6
kk8   Km   OneH   DESORP  K_Al  Ks  CaX  PeakMon  theta  OrgA
c-----------------------------------------------------------------
----------------------------
C396 calibration parameters for the reach
c    only required if mdasfg = 1 (see card 0)
c
```

```
c    rgid    reach group id
c            0  = no chemical reaction
c            1  = only nitrogen transformation and sulfate
adsorption
c            2  = full chemical reactions
c    k1      nitrogen transformation (NH4S to NO2) rate (per day)
c    k2      nitrogen transformation (NO2 to NO3) rate (per day)
c    k3      nitrogen transformation (NO3 to ?) rate (per day)
c    k6      nitrogen transformation (OrgN to NH4S) rate (per
day)
c    kk1     sulfate transformation rate (per day)
c    FEK     metal (iron) dissolution constants
c    AlK     metal (alluminium) dissolution constants
c    PCO     co2 value (per day)
c    FR_3    precipitation rate for Ca(2+) (per day)
c    FR_4    precipitation rate for CO3(2-) (per day)
c    FR_5    precipitation rate for dissolved iron (per day)
c    FRP_5   precipitation rate for particulate iron (per day)
c    FR_8    precipitation rate for dissolved alluminium (per
day)
c    FRP_8   precipitation rate for particulate alluminium (per
day)
c    FR_9    precipitation rate for Org (per day)
c    THETA   temperature correction coefficient for nitrogen
transformation for the stream (range from 1.0 to 2.0)
c    FR_Al   Al load (from soil chemical reaction) reduction
factor in the base flow
c            during the dry days (0 - no reduction,1 - 100%
reduction)
c
c   rgid   crfg  k1   k2   k3   k6   kk1  FEK   AlK  PCO   FR_3
FR_4   FR_5   FRP_5   FR_8   FRP_8   FR_9  theta  FR_Al
c-----------------------------------------------------------------
----------------------------
C397 initial storage in the top layer
c    only required if mdasfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    OrgN_S  initial storage of organic nitrogen in the surface
layer (lb/acre)
c    OrgN_U  initial storage of organic nitrogen in the upper
layer (lb/acre)
c    OrgN_I  initial storage of organic nitrogen in the
transitory layer (lb/acre)
c    NH4S_S  initial storage of solution ammonium in the surface
layer (lb/acre)
c    NH4S_U  initial storage of solution ammonium in the upper
layer (lb/acre)
c    NH4S_I  initial storage of solution ammonium in the
transitory layer (lb/acre)
c    NH4E_S  initial storage of exchange ammonium in the surface
```

```
layer (lb/acre)
c    NH4E_U  initial storage of exchange ammonium in the upper
layer (lb/acre)
c    NH4E_I  initial storage of exchange ammonium in the
transitory layer (lb/acre)
c    NO3_S   initial storage of nitrate in the surface layer
(lb/acre)
c    NO3_U   initial storage of nitrate in the upper layer
(lb/acre)
c    NO3_I   initial storage of nitrate in the transitory layer
(lb/acre)
c    NO2_S   initial storage of nitrite in the surface layer
(lb/acre)
c    NO2_U   initial storage of nitrite in the upper layer
(lb/acre)
c    NO2_I   initial storage of nitrite in the transitory layer
(lb/acre)
c    SO4_S   initial storage of sulfate in the surface layer
(lb/acre)
c    SO4_U   initial storage of sulfate in the upper layer
(lb/acre)
c    SO4_I   initial storage of sulfate in the transitory layer
(lb/acre)
c
c   defid  deluid OrgN_S   OrgN_U   OrgN_I   NH4S_S    NH4S_U
NH4S_I    NH4E_S    NH4E_U    NH4E_I    NO3_S    NO3_U    NO3_I
NO2_S   NO2_U   NO2_I   SO4_S   SO4_U   SO4_I
c-----------------------------------------------------------------
----------------------------
C398 initial storage in the sub layer
c    only required if mdasfg = 1 (see card 0)
c
c    defid   parameter group id
c    deluid  landuse id
c    OrgN_L  initial storage of organic nitrogen in the lower
layer (lb/acre)
c    OrgN_A  initial storage of organic nitrogen in the
groundwater layer (lb/acre)
c    NH4S_L  initial storage of solution ammonium in the lower
layer (lb/acre)
c    NH4S_A  initial storage of solution ammonium in the
groundwater layer (lb/acre)
c    NH4E_L  initial storage of exchange ammonium in the lower
layer (lb/acre)
c    NH4E_A  initial storage of exchange ammonium in the
groundwater layer (lb/acre)
c    NO3_L   initial storage of nitrate in the lower layer
(lb/acre)
c    NO3_A   initial storage of nitrate in the groundwater layer
(lb/acre)
c    NO2_L   initial storage of nitrite in the lower layer
(lb/acre)
```

```
c    NO2_A   initial storage of nitrite in the groundwater layer
(lb/acre)
c    SO4_L   initial storage of sulfate in the lower layer
(lb/acre)
c    SO4_A   initial storage of sulfate in the groundwater layer
(lb/acre)
c
c   defid  deluid OrgN_L   OrgN_A   NH4S_L    NH4S_A    NH4E_L
NH4E_A    NO3_L    NO3_A    NO2_L   NO2_A   SO4_L   SO4_A
c-----------------------------------------------------------------
----------------------------
C399 initial concentration in the stream
c    only required if mdasfg = 1 (see card 0)
c
c    defid parameter group id
c    OrgN  initial conc of organic nitrogen in the stream (mg/l)
c    H2O   initial conc of H2O in the stream (mg/l)
c    H     initial conc of H(+) in the stream (mg/l)
c    Ca    initial conc of Ca(2+) in the stream (mg/l)
c    CO3   initial conc of CO3(2-) in the stream (mg/l)
c    Fe    initial conc of Fe(3+) in the stream (mg/l)
c    NO3   initial conc of nitrate in the stream (mg/l)
c    NH4   initial conc of ammonium in the stream (mg/l)
c    Al    initial conc of aluminum in the stream (mg/l)
c    Org   initial conc of Torg in the stream (mg/l)
c    SO4   initial conc of sulfate in the stream (mg/l)
c    PF    initial conc of ParF in the stream (mg/l)
c    PA    initial conc of ParA in the stream (mg/l)
c    NO2   initial conc of nitrite in the stream (mg/l)
c
c   defid  OrgN   H2O   H    Ca    CO3    Fe    NO3   NH4   Al
Org   SO4   PF   PA   NO2
c-----------------------------------------------------------------
----------------------------
c400 general channel information
c
c    admod   advection method (1 for dynamic mixing same as in
HSPF and 2 for static mixing)
c    kc      crop factor associated with PEVT (used to back-
calculate EVAP; EVAP = PEVT/kc)
c    sedber  stream bank erosion sediment (1 for on and 0 for
off)
c    vconfg  a value of 1 for vconfg means that F(vol) (volume-
dependent) outflow demand components are multiplied by a factor
which is allowed to vary through the year.
c            These monthly adjustment factors are input in Table-
type MON-CONVF in this section (card 401)
c
c     admod    kc   sedber   vconfg
      1     2.000000000000e+000   0    0
c-----------------------------------------------------------------
----------------------------
```

```
c401 monthly F(vol) adjustment factors
c    only required if vconfg = 1 (see card 400)
c
c    rgid     stream parameter group id
c    jan-dec  F(vol) adjustment factors at the start of each
month
c
c  rgid    jan   feb   mar   apr   may   jun   jul   aug   sep
oct   nov   dec
c-----------------------------------------------------------------
----------------------------
c405 channel routing network
c
c    rchid   reach id (same as subbasin id)
c    control output control switch for the corresponding reach
c            0 = will not write general output
c            1 = will write general output
c    NumOutlets number of downstream outlets
c    DSn     downstream outlets  DS1   Ds2  ....  DSn
c
c    rchid   control   NumOutlets   DS1   DS2  .......   DSn
      5046 1     1    5045
      5065 1     1    5064
      5066 1     1    5065
      5079 1     1    5078
      5080 1     1    5078
      5083 1     1    5082
      5173 1     1    5172
      5175 1     1    5172
      5183 1     1    5181
      5189 1     1    5187
c-----------------------------------------------------------------
----------------------------
c410 reach geometry information
c
c    rchid   reach/lake id (same as subbasin id)
c    rgid    reach/lake group id
c    trgid   threshold reach/lake group id
c    lkfg    reach/lake flag (0 for reach otherwise lake)
c            lake flag = 1 (rectangular weir for internal option)
c            lake flag = 2 (triangular weir for internal option)
c            lake flag = 11 (BMP with rectangular weir for
internal option)
c            lake flag = 12 (BMP with triangular weir for
internal option)
c    idepth  reach/lake initial water depth (feet)
c    length  reach/lake length (miles)
c    depth   reach/lake bank full depth (feet)
c    width   reach/lake bankfull width (feet)
c    slope   reach longitudinal slope/lake infiltration rate
(in/hr)
c    Mann    reach Manning's roughness coefficient/lake weir
```

```
width (ft)
c    r1      reach ratio of bottom width to bank full width
(bottom width = r1 * width)/lake orifice height (ft)
c    r2      reach side slope of flood plane/lake orifice
diameter (ft)
c    w1      reach flood plane width factor (total width of flood
plane = w1*Width)/lake median particle size diameter, db50 (ft)
c    crat    ratio of maximum velocity to mean velocity in the
RCHRES cross-section under typical flow conditions (greater than
or equal to 1)
c    ks        the weighting factor for hydraulic routing
(calibration)
c
c     rchid rgid  trgid   lkfg    idepth     length    depth
width    slope     mann    r1    r2    w1    crrat  ks
      5046  1    0    0    0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5065  1    0    0    0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5066  1    0    0    0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5079  1    0    0    0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5080  1    0    0    0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5083  1    0    0    0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5173  1    0    0    0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5175  1    0    0    0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5183  1    0    0    0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
      5189  1    0    0    0.000000   0.000000   0.000000
      0.000000   0.000100   0.020000   0.500000   0.500000
      1.500000   1.500000   0.000000
c-----------------------------------------------------------------
----------------------------
c413 reach cross-section information
c
c    rchid   x1 y1   x2   y2...
c    rchid   reach id (same as subbasin id)
c    x       distance from the left reach bank (ft)
```

```
c            it should not be greater than bank full width in
card 410 (ft)
c    y       elevation from the reach bed (ft)
c            it should not be greater than bank full depth in
card 410 (ft)
c
c-----------------------------------------------------------------
----------------------------
c415 reach discharge-volume relationship
c
c    rchid   reach id
c    depth   water depth (feet)
c    area    water surface area (acres)
c    vol     water volume (ac-ft)
c    disch(1, 2, 3, ....noutflows)  outflows (cfs)
c
c     rchid  depth   area    vol    disch1    disch2   .......
dischN
c-----------------------------------------------------------------
----------------------------
c420 general point source information
c
c    nPtSource   number of individual point sources
c    nPtQuals    number of point source quals
c
c  nPtSource  nPtQuals
      0    0
c-----------------------------------------------------------------
----------------------------
c425 point source
c    Qualindex  point source qual index
c    Qualname   point source qual name
c    Qualid         point source qual id
c    sqalfr         point source sediment associated qual fraction
(0-1)
c
c  Qualindex  Qualname  qualid
c-----------------------------------------------------------------
----------------------------
c430 point source withdrawal
c    subbasin  point source reach id
c    permit    point source permit
c    pipe      point source pipe
c    wd_target point source withdrawal target reach id
c
c  subbasin  permit  pipe   wd_target
c-----------------------------------------------------------------
----------------------------
c440 sediment parameters controls
c
c    crvfg   if crvfg = 1, erosion-related cover may vary
throughout the year.
```

```
c             values are supplied in Table-type MON-COVER (card
453)
c    vsivfg  if vsivfg = 1, the rate of net vertical sediment
input may vary throughout the year.
c             if vsivfg = 2, the vertical sediment input is added
to the detached sediment storage only on days when no rainfall
occurred during the previous day.
c             values are supplied in Table-type MON-NVSI (card
454)
c    sandfg  if sandfg = 0, the sand is not simulated.
c             if sandfg = 1, the sand transport capacity is
calculated using the Toffaleti method.
c             if sandfg = 2, the sand transport capacity is
calculated using the Colby method.
c             if sandfg = 3, the sand transport capacity is
calculated using the power function of velocity.
c    sweepfg if sweepfg = 0, the street sweeping is not
simulated.
c
c     crvfg    vsivfg    sandfg    sweepfg
      0    0    3    0
c-----------------------------------------------------------------
----------------------------
c445 street sweeping (read if sweepfg =1, see card 440)
c
c    defid          parameter group id
c    deluid         landuse id
c    deluname       landuse name
c    start_month    start month of street sweeping requirement
c    end_month      end month of street sweeping requirement
c    frequency      days between street sweeping within the
landuse (0 for no sweeping)
c    percent_area   fraction of land surface which is available
for street sweeping (0 for no sweeping)
c    effic_sand     fraction of sand in solids storage that is
available for removal by sweeping (0-1)
c    effic_silt     fraction of silt in solids storage that is
available for removal by sweeping (0-1)
c    effic_clay     fraction of clay in solids storage that is
available for removal by sweeping (0-1)
c
c     defid   deluid   deluname   start_month   end_month
frequency   percent_area   effic_sand   effic_silt   effic_clay
c-----------------------------------------------------------------
----------------------------
c450 sediment parameter group 1 (read if sedfg =1)
c
c    defid   parameter group id
c    deluid  landuse id
c    smpf    supporting management practice factor
c    krer    coefficient in the soil detachment equation
c    jrer    exponent in the soil detachment equation
```

```
c    affix   fraction by which detached sediment storage
decreases each day as a result of
c            soil compaction. (/day)
c    cover   fraction of land surface which is shielded from
rainfall erosion
c    nvsi    rate at which sediment enters detached storage from
the atmosphere (lb/ac/day)
c            negative value may be used to simulate removal by
human activity or wind
c    kser    coefficient in the detached sediment washoff
equation
c    jser    exponent in the detached sediment washoff equation
c    kger    coefficient in the matrix soil scour equation, which
simulates gully erosion
c    jger    exponent in the matrix soil scour equation, which
simulates gully erosion
c    accsdp  rate at which solids accumulate on the land surface
(used in impervious land)
c    remsdp  fraction of solids storage which is removed each day
when there is no runoff,
c            for example, because of street sweeping (used in
impervious land)
c
c     defid deluid  smpf   krer   jrer  affix  cover    nvsi  kser
jser  kger  jger   accsdp remsdp
     1     1    1.000000   0.000000   0.000000   0.000000
     0.000000   0.000000   0.035000   2.000000   0.000000
     2.000000   0.001000   0.025000
     1     2    1.000000   0.000000   0.000000   0.000000
     0.000000   0.000000   0.030000   2.000000   0.000000
     2.000000   0.001000   0.025000
     1     3    1.000000   0.000000   0.000000   0.000000
     0.000000   0.000000   0.030000   2.000000   0.000000
     2.000000   0.001000   0.025000
     1     4    1.000000   0.000000   0.000000   0.000000
     0.000000   0.000000   0.035000   2.000000   0.000000
     2.000000   0.001000   0.025000
     1     5    1.000000   0.000000   0.000000   0.000000
     0.000000   0.000000   0.070000   2.000000   0.000000
     2.000000   0.001000   0.025000
     1     6    1.000000   0.000000   0.000000   0.000000
     0.000000   0.000000   0.065000   2.000000   0.000000
     2.000000   0.001000   0.025000
     1     7    1.000000   0.000000   0.000000   0.000000
     0.000000   0.000000   0.065000   2.000000   0.000000
     2.000000   0.001000   0.025000
     1     8    1.000000   0.000000   0.000000   0.000000
     0.000000   0.000000   0.085000   2.000000   0.000000
     2.000000   0.001000   0.025000
     1     9    1.000000   0.000000   0.000000   0.000000
     0.000000   0.000000   0.085000   2.000000   0.000000
     2.000000   0.001000   0.025000
```

```
     1     10    1.000000   0.100000   1.810000   0.003000
     0.270000   0.000000   0.001000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1     11    1.000000   0.100000   1.810000   0.003000
     0.270000   0.000000   0.100000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1     12    1.000000   0.100000   1.810000   0.003000
     0.270000   0.000000   0.100000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1     13    1.000000   0.100000   1.810000   0.003000
     0.270000   0.000000   0.100000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1     14    1.000000   0.100000   1.810000   0.003000
     0.270000   0.000000   0.100000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1     15    1.000000   0.100000   1.810000   0.003000
     0.270000   0.000000   0.100000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1     16    1.000000   0.350000   1.810000   0.003000
     0.270000   0.000000   0.150000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1     17    1.000000   0.350000   1.810000   0.003000
     0.270000   0.000000   0.150000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1     18    1.000000   0.350000   1.810000   0.003000
     0.270000   0.000000   0.150000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1     19    1.000000   0.350000   1.810000   0.003000
     0.270000   0.000000   0.150000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1     20    1.000000   0.000000   1.810000   0.003000
     0.000000   0.000000   0.000000   2.000000   0.000000
     2.000000   0.000000   0.000000
     1     21    1.000000   0.100000   1.810000   0.003000
     0.000000   0.000000   0.100000   2.000000   0.000000
     2.000000   0.000000   0.000000
c-----------------------------------------------------------------
----------------------------
c451 sediment parameter group 2 (read if sedfg =1)
c
c    defid     parameter group id
c    deluid    landuse id
c    sed-suro  background concentration associated with surface
flow (mg/l)
c    sed-ifwo  background concentration associated with interflow
outflow (mg/l)
c    sed-agwo  background concentration associated with
groundwater outflow (mg/l)
c    sed_i     fraction of sediment class_i (sand, silt, and
clay)
c
c    (sand + silt + clay = 1)
```

```
c    Background sediment load is added to total sediment from
LAND prior to applying fractions
c
c     defid   deluid    sed_suro   sed_ifwo   sed_agwo   sed_1
sed_2   sed_3 ........sed_n
      1     1     0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     2     0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     3     0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     4     0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     5     0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     6     0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     7     0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     8     0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     9     0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     10    0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     11    0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     12    0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     13    0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     14    0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     15    0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     16    0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     17    0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     18    0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     19    0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     20    0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
      1     21    0.000000   0.000000   0.000000   0.050000
      0.550000   0.400000
c-----------------------------------------------------------------
----------------------------
c452 GQUAL-sediment to stream mapping (read if sediment as gqual)
c
c    defid   parameter group id
```

```
c    dwqid   general quality id
c    lutype  landuse type flow id (1 = impervious surfaceflow,
c            2 = pervious surfaceflow, 3 = pervious interflow, 4
= pervious groundflow)
c    sed_i   fraction of sediment class_i (sand, silt, and clay)
c
c     defid dwqid    lutype   sed_1   sed_2   sed_3 ........sed_n
c-----------------------------------------------------------------
----------------------------
c453 monthly erosion-related cover values
c    only required if crvfg = 1 (see card 440)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec erosion-related cover values at start of each month
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c454 monthly net vertical sediment input
c    only required if vsivfg = 1 (see card 440)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec net vertical sediment input at start of each month
(lb/acre/day)
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c455 sediment general parameters group 3 (read if sedfg = 1)
c    general sediment related parameters for instream transport
c
c    rgid     stream parameter group id
c    bedwid   bed width (ft) - this is constant for the entire
simulation period
c    beddep   initial bed depth (ft)
c    por      porosity
c    burial   burial rate of aggregated sediment layer (in/day)
c             if burial = 0 then burial rate in card 456 is used
c
c
c     rgid  bedwid  beddep  por  burial
      1    1.000000   0.000000   0.300000   0.000000
c-----------------------------------------------------------------
----------------------------
c456 sediment parameters group 4 (read if sedfg = 1)
c    cohesive suspended sediment variables for instream transport
c
c    rgid           stream parameter group id
```

```
c    sed_id          sediment class id
c    sedflg          sediment flag indicating sediment class (0
for sand, 1 for silt, and 2 for clay)
c    sedo            initial sediment conc in fluid phase
(mg/liter)
c    sedfrac         initial sediment fractions (by weight) in the
bed material
c    db50/d          median diameter of the non-cohesive sediment
(sand) (in) (sandfg = 1 or 2)
c                    / effective diameter of the cohesive
particles (silt and clay) (in)
c    w               corresponding fall velocity of the particle
in still water (in/s)
c    rho             density of the particles (gm/cm^3)
c    ksand/taucd     coefficient in the sandload power function
formula (sandfg = 3)
c                    / critical bed shear stress for deposition of
the cohesive particle - generally taucd <= taucs (lb/ft^2)
c                    if tau > taucd then no deposition
c                    if tau < taucd then deposition rate
approaches settling velocity, w
c    expsnd/taucs    exponent in the sandload power function
formula (sandfg = 3)
c                    / critical bed shear stress for scour of the
cohesive particle (lb/ft^2)
c                    if tau < taucs then no scour
c                    if tau > taucs then scour steadily increases
c    m               erodibility coefficient of the cohesive
particle (lb/ft^2/day)
c    burial          burial rate of the sediment particle (in/day)
c                    it is used if burial rate in card 455 is zero
c
c
c     rgid  sed_id  sedflg  sedo  sedfrac  db50/d   w  rho
ksand/taucd  expsnd/taucs  m   burial
      1    1    0    0.000000   0.100000   0.005000   0.020000
      2.500000   0.350000   3.200000   0.000000   0.000000
      1    2    1    0.000000   0.450000   0.000600   0.010000
      2.200000   0.150000   0.900000   3.000000   0.000000
      1    3    2    0.000000   0.450000   0.000060   0.000100
      2.000000   0.080000   0.800000   5.000000   0.000000
c-----------------------------------------------------------------
----------------------------
c457 Streambank erosion sediment parameters (read if sedfg = 1
and sedber = 1)
c
c    rchid   reach id
c    kber    coefficient for scour of the bank matrix soil
(calibration)
c    jber    exponent for scour of the bank matrix soil
(calibration)
c    qber    bank erosion flow threshold causing channel bank
```

```
soil erosion (cfs)
c           if = negative then threshold flow is at the bank
full depth (cfs)
c    sed_i   fraction of sediment class_i (sand, silt, and clay)
c
c     rchid    kber    jber    qber   sed_1   sed_2   sed_3
....sed_n
c-----------------------------------------------------------------
----------------------------
c460 soil temperature control   (read if tempfg = 1)
c
c    msltfg  if = 1 monthly vary aslt and bslt parameters in
surface flow temperature calculation
c    miftfg  if = 1 monthly vary aift and bift parameters in
interflow temperature calculation
c    mgwtfg  if = 1 monthly vary agwt and bgwt parameters in
ground water temperature calculation
c
c     msltfg     miftfg      mgwtfg
c-----------------------------------------------------------------
----------------------------
c461 Soil Temperature   (read if tempfg =1)
c
c    defid   parameter group id
c    deluid  landuse id
c    tsopfg  if = 0 compute subsurface temperatures using a mean
departure from air temperature plus a smoothing factor
c            if = 1 compute subsurface temperature using
regression
c            if = 2 the lower/gw layer temperature is a function
of upper layer temperature instead of air temperature
c    aslt    surface layer temperature when the air temperature 0
degrees C
c    bslt    slope of the surface layer temperature regression
equation
c    aift    mean difference between interflow temperature and
air temperature (C)
c    bift    smoothing factor in the interflow temperature
calculation
c    agwt    mean difference between groundwater temperature and
air temperature (C)
c    bgwt    smoothing factor in the groundwater temperature
calculation
c    islt    initial surface flow temperature (C)
c    iift    initial interflow temperature (C)
c    igwt    initial groundwater temperature (C)
c
c            y = a + b * x
c     defid deluid   tsopfg    aslt     bslt     aift     bift
agwt   bgwt  islt   iift   igwt
c-----------------------------------------------------------------
----------------------------
```

```
c462 mon-aslt
c    only required if tempfg = 1 and msltfg = 1 (see card 460)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec surface layer temperature when the air temperature 0
degrees C at start of each month (C)
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c463 mon-bslt
c    only required if tempfg = 1 and msltfg = 1 (see card 460)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec slope of the surface layer temperature regression
equation at start of each month
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c464 mon-aift
c    only required if tempfg = 1 and miftfg = 1 (see card 460)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec mean difference between interflow temperature and
air temperature at start of each month (C)
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c465 mon-bift
c    only required if tempfg = 1 and miftfg = 1 (see card 460)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec smoothing factor in the interflow temperature
calculation at start of each month
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c466 mon-agwt
c    only required if tempfg = 1 and mgwtfg = 1 (see card 460)
c
c    defid   parameter group id
```

```
c    deluid  landuse id
c    jan-dec mean difference between groundwater temperature and
air temperature at start of each month (C)
c
c    defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c467 mon-bgwt
c    only required if tempfg = 1 and mgwtfg = 1 (see card 460)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec smoothing factor in the groundwater temperature
calculation at start of each month
c
c    defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c470 Temperature Parameters for Land Groups  (read if tempfg =1)
c
c    subbasin    subbasin id
c    melev     the mean watershed elevation (ft)
c    eldat       difference in elevation between watershed and
the air temperature gage (ft)
c    rmelev      the mean RCHRES elevation (ft)
c    reldat      difference in elevation between the RCHRES and
the air temperature gage (ft)
c                (positive if RCHRES is higher than the gage).
c
c    subbasin   melev     eldat   rmelev     reldat
c-----------------------------------------------------------------
----------------------------
c475 Temperature Parameters for Stream Groups  (read if tempfg =
1)
c
c    rgid    stream parameters group id
c    cfsaex  correction factor for solar radiation; fraction of
RCHRES surface exposed to radiation
c    katrad  longwave radiation coefficient
c    kcond   conduction-convection heat transport coefficient
c    kevap   evaporation coefficient
c
c    rgid   cfsaex    katrad     kcond     kevap
c-----------------------------------------------------------------
----------------------------
c480 Bed Heat Conduction Parameters for Stream Groups  (read if
tempfg=1)
c
c    rgid    stream parameters group id
c    preflg  flag for heat transfer rates for water surface (0 =
```

```
off)
c    bedflg  bed conduction flag
c            0 - bed conduction is not simulated
c            1 - single interface (water-mud) heat transfer
method
c            2 - two-interface (water-mud and mud-ground) heat
transfer method
c            3 - Jobson method (not supported)
c    tgflg   source of the ground temperature for the bed
conduction (used when bedflg is 1 or 2)
c            1 - time series (not supported)
c            2 - single value
c            3 - monthly values (card 485)
c    muddep  depth of the mud layer in the two-interface model
(bedflg = 2) (m)
c    tgrnd   constant (tgflg = 2) ground temperature (bedflg = 1
or 2) (degree C)
c    kmud    heat conduction coefficient between water and the
mud/ground (bedflg = 1 or 2) (kcal/m2/degC/hr)
c    kgrnd   heat conduction coefficient between ground and mud
in the two-interface model (bedflg = 2) (kcal/m2/degC/hr)
c
c     rgid   preflg   bedflg   tgflg   muddep   tgrnd   kmud
kgrnd
c-----------------------------------------------------------------
----------------------------
c485 monthly ground temperatures for bed heat conduction
algorithms
c    only required if tgflg = 3 (see card 480)
c
c    rgid     stream parameter group id
c    jan-dec  tgrndm - monthly ground temperatures for use in the
bed heat conduction models (degree C)
c
c  rgid    jan   feb   mar   apr   may   jun   jul   aug   sep
oct   nov   dec
c-----------------------------------------------------------------
----------------------------
c500 land to stream mapping (read if oxfg =1)
c
c    rgid    stream parameters group id
c    dwqid   general quality id
c    lutype  landuse type flow id (1 = impervious surfaceflow,
c            2 = pervious surfaceflow, 3 = pervious interflow, 4
= pervious groundflow)
c    bod     bod fraction in pqual
c    nox     nitrate fraction in pqual
c    tam     total ammonia fraction in  pqual
c    snh4    particulate NH4-N fraction in pqual
c    po4     ortho-phosphorus fraction in pqual
c    spo4    particulate PO4-P fraction in pqual
c    orn     organic-nitrogen fraction in pqual
```

```
c    orp     organic-phosphorus fraction in pqual
c    orc     organic-carbon fraction in pqual
c
c     rgid   dwqid    lutype   bod   nox   tam   snh4   po4   spo4
orn   orp   orc
c-----------------------------------------------------------------
----------------------------
c502 gases control   (read if oxfg =1)
c
c    midofg  if = 1 monthly very DO concentration in interflow
c    mico2fg if = 1 monthly very CO2 concentration in interflow
c    madofg  if = 1 monthly very DO concentration in ground water
c    maco2fg if = 1 monthly very CO2 concentration in ground
water
c
c     midofg     mico2fg      madofg      maco2fg
c-----------------------------------------------------------------
----------------------------
c503   DO-CO2 Control constant values (read if oxfg =1)
c
c    defid   parameter group id
c    deluid  landuse id
c    sdoxp   concentration of dissolved oxygen in surface flow
(mg/l)
c    sco2p   concentration of dissolved CO2 in surface flow
(mg/l)
c    idoxp   concentration of dissolved oxygen in interflow
outflow (mg/l)
c    ico2p   concentration of dissolved CO2 in interflow outflow
(mg/l)
c    adoxp   concentration of dissolved oxygen in active
groundwater outflow (mg/l)
c    aco2p   concentration of dissolved CO2 in active groundwater
outflow (mg/l)
c
c     defid deluid   sdoxp    sco2p     idoxp    ico2p     adoxp
aco2p
c-----------------------------------------------------------------
----------------------------
c504 mon-DO (interflow)  mg C/l
c    only required if oxfg = 1 and midofg = 1 (see card 502)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec interflow dissolved oxygen concentration at start of
each month (mg/l)
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-----------------------------------------------------------------
--------------------
c505 mon-DO (groundwater)
```

```
c    only required if oxfg = 1 and madofg = 1 (see card 502)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec groundwater dissolved oxygen concentration at start
of each month (mg/l)
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-------------------------------------------------------------------
--------------------
c506 mon-CO2 (interflow)  mg C/l
c    only required if oxfg = 1 and mico2fg = 1 (see card 502)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec interflow carbon dioxide concentration at start of
each month (mg/l)
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-------------------------------------------------------------------
----------------------------
c507 mon-CO2 (groundwater)
c    only required if oxfg = 1 and maco2fg = 1 (see card 502)
c
c    defid   parameter group id
c    deluid  landuse id
c    jan-dec groundwater carbon dioxide concentration at start of
each month (mg/l)
c
c     defid deluid   jan   feb   mar   apr   may   jun   jul   aug
sep   oct   nov   dec
c-------------------------------------------------------------------
----------------------------
c510 DO/BOD control
c
c    benrfg   benthic release flag (for benthic related
parameters)
c    reamfg reaeration flag (indicates the method used to
calculate the reaeration coefficient for free-flowing streams)
c    if = 1 then Tsivoglou method is used
c    if = 2 then Owens, Churchill, or O'Connor-Dobbins method is
used depending on velocity and depth of water
c    if = 3 then Coefficient is calculated as a power function of
velocity and/or depth
c
c     benrfg     reamfg
c-------------------------------------------------------------------
----------------------------
c511 ox-parm1
c
```

```
c    rgid    stream parameter group id
c    kbod20  bod decay rate at 20oC (1/hr)
c    tcbod   temperature adjustment coefficient for bod decay
c    kodset  bod settling rate (m/hr)
c    supsat  maximum allowable dissolved oxygen supersaturation
(expressed as a multiple of the dissolved oxygen saturation
concentration)
c    tcginv  temperature correction coefficient for surface gas
invasion
c    reak    empirical constant in the equation
c            if reamfg = 1 then it is an escape coefficient
(1/ft)
c            if reamfg = 3 then it is used to calculate the
reaeration coefficient (1/hr)
c    expred  exponent to depth in the reaeration coefficient
equation (for reamfg = 3)
c    exprev  exponent to velocity in the reaeration coefficient
equation (for reamfg = 3)
c    cforea  correction factor in the lake reaeration equation;
it accounts for good or poor circulation characteristics
c
c     rgid   kbod20   tcbod   kodset   supsat   tcginv   reak
expred   exprev   cforea
c-----------------------------------------------------------------
----------------------------
c512 ox-parm2
c
c    rgid       stream parameter group id
c    benod      benthal oxygen demand at 20 degrees C (with
unlimited DO concentration) (mg/m2/hr)
c    tcben      temperature correction coefficient for benthal
oxygen demand
c    expod      exponential factor in the dissolved oxygen term
of the benthal oxygen demand equation
c    brbod      benthal release rate of BOD under aerobic
conditions.(mg/m2/hr)
c    brbod_inc  increment to benthal release of BOD under
anaerobic conditions. (mg/m2/hr)
c    expre1     the exponent in the DO term of the benthal BOD
release equation
c
c     rgid   benod   tcben   expod   brbod   brbod_inc   exprel
c-----------------------------------------------------------------
--------------------
c513 oxrx-initial conditions
c
c    rgid   stream parameter group id
c    dox    DO initial condition. (mg/l)
c    bod    BOD initial condition in water column. (mg/l)
c    satdo  Initial DO saturation concentration. (mg/l)
c
c     rgid   dox   bod   satdo
```

```
c---------------------------------------------------------------------
--------------------
c514 ox-scour parms
c
c    rgid   stream parameter group id
c    scrvel threshold velocity above which the effect of scouring
on benthal release rates is considered. (m/s)
c    scrmul multiplier by which benthal releases are increased
during scouring.
c
c     rgid   scrvel   scrmul
c---------------------------------------------------------------------
--------------------
c520 nutrients control
c
c    tamfg    total ammonia flag
c    no2fg    nitrite flag
c    po4fg    ortho-phosphorus flag
c    amvfg    ammonia volatilization flag
c    denfg    denitrification flag
c    adnhfg   NH4 adsorption flag
c    adpofg   PO4 adsorption flag
c    mphfg    monthly pH flag (not supported in this version)
c
c     tamfg   no2fg   po4fg   amvfg   denfg   adnhfg   adpofg
mphfg
c---------------------------------------------------------------------
----------------------------
c521 nut-parm1
c
c    rgid    stream parameter group id
c    cvbo    conversion from milligrams biomass to milligrams
oxygen (mg/mg)
c    cvbpc   conversion from biomass expressed as phosphorus to
carbon (mols/mol)
c    cvbpn   conversion from biomass expressed as phosphorus to
nitrogen (mols/mol)
c    bpcntc  percentage of biomass which is carbon (by weight)
c    ktam20  nitrification rate of ammonia at 20 degrees C (1/hr)
c    kno220  nitrification rate of nitrite at 20 degrees C (1/hr)
c    tcnit   temperature correction coefficient for nitrification
c    kno320  nitrate denitrification rate at 20 degrees C (1/hr)
c    tcden   temperature correction coefficient for
denitrification
c    denoxt  dissolved oxygen concentration threshold for
denitrification (mg/l)
c
c     rgid   cvbo   cvbpc   cvbpn  bpcntc   ktam20  kno220  tcnit
kno320  tcden  denoxt
c---------------------------------------------------------------------
----------------------------
c522 nut-parm2
```

```
c
c    rgid         stream parameter group id
c    brtam_1      benthal release rate of ammonia under aerobic
condition (mg/m2/hr)
c    brtam_2      benthal release rates of ammonia under
anaerobic conditions (mg/m2/hr)
c    brpo4_1      benthal release rate of ortho-phosphorus under
aerobic condition (mg/m2/hr)
c    brpo4_2      benthal release rate of ortho-phosphorus under
anaerobic condition (mg/m2/hr)
c    bnh4(1-3)    constant bed concentrations of ammonia-N
adsorbed to sand, silt, and clay (mg/kg)
c    bpo4(1-3)    constant bed concentrations of ortho-
phosphorus-P adsorbed to sand, silt, and clay (mg/kg)
c
c     rgid   brtam_1   brtam_2   brpo4_1   brpo4_2   bnh4_1   bnh4
_2   bnh4_3    bpo4_1   bpo4_2   bpo4_3
c-----------------------------------------------------------------
--------------------
c523 nut-parm3
c
c    rgid         stream parameter group id
c    anaer        concentration of dissolved oxygen below which
anaerobic conditions are assumed to exist (mg/l)
c    adnhpm(1-3)  adsorption coefficients (Kd) for ammonia-N
adsorbed to sand, silt, and clay (cm3/g)
c    adpopm(1-3)  adsorption coefficients for ortho-phosphorus-P
adsorbed to sand, silt, and clay (cm3/g)
c    expnvg       exponent in the gas layer mass transfer
coefficient equation for NH3 volatilization
c    expnvl       exponent in the liquid layer mass transfer
coefficient equation for NH3 volatilization
c
c     rgid  anaer    adnhpm_1   adnhpm_2   adnhpm_3   adpopm_1
adpopm_2   adpopm_3   expnvg   expnvl
c-----------------------------------------------------------------
--------------------
c524 nut-initial conditions
c
c    rgid       stream parameter group id
c    no3        initial concentration of nitrate (mg/l)
c    tam        initial concentration of total ammonia (mg/l)
c    no2        initial concentration of nitrite (as N) (mg/l)
c    po4        initial concentration of ortho-phosphorus (as P)
(mg/l)
c    snh4(1-3)  initial suspended concentrations of ammonia-N
adsorbed to sand, silt, and clay (mg/kg)
c    spo4(1-3)  initial suspended concentrations of ortho-
phosphorus-P adsorbed to sand, silt, and clay (mg/kg)
c
c     rgid   no3   tam   no2   po4   snh4_1   snh4_2   snh4_3
spo4_1   spo4_2   spo4_3
```

```
c-----------------------------------------------------------------
--------------------
c530 plank flags
c
c    phyfg    phytoplankton flag
c    zoofg    zooplankton flag
c    balfg    benthic algae flag
c    sdltfg   influence of sediment washload on light extinction
flag
c    amrfg    ammonia retardation of nitrogen-limited growth flag
c    decfg    linkage between carbon dioxide and phytoplankton
growth flag (if on, the linkage is decoupled)
c    nsfg     ammonia is included as part of available nitrogen
supply in nitrogen limited growth calculations
c    orefg    indicates the oref parameter in card 534 as a
flowrate (if = 0) otherwise velocity
c
c     phyfg   zoofg   balfg   sdltfg   amrfg   decfg   nsfg
orefg
c-----------------------------------------------------------------
----------------------------
c531 plank-parm1
c
c    rgid    stream parameter group id
c    ratclp  ratio of chlorophyll A content of biomass to
phosphorus content
c    nonref  non-refractory fraction of algae and zooplankton
biomass
c    litsed  multiplication factor to total sediment
concentration to determine sediment contribution to light
extinction (l/mg/ft)
c    alnpr   fraction of nitrogen requirements for phytoplankton
growth that is satisfied by nitrate
c    extb    base extinction coefficient for light (1/m)
c    malgr   maximum unit algal growth rate (1/hr)
c
c     rgid    ratclp   nonref   litsed   alnpr   extb    malgr
c-----------------------------------------------------------------
----------------------------
c532 plank-parm2
c
c    rgid    stream parameter group id
c    cmmlt   Michaelis-Menten constant for light limited growth
(lay/min)
c    cmmn    nitrate Michaelis-Menten constant for nitrogen
limited growth (mg/l)
c    cmmnp   nitrate Michaelis-Menten constant for phosphorus
limited growth (mg/l)
c    cmmp    phosphate Michaelis-Menten constant for phosphorus
limited growth (mg/l)
c    talgrh  temperature above which algal growth ceases (C)
c    talgrl  temperature below which algal growth ceases (C)
```

```
c    talgrm  temperature below which algal growth is retarded (C)
c
c     rgid    cmmlt    cmmn    cmmnp    cmmp    talgrh   talgrl
talgrm
c-----------------------------------------------------------------
--------------------
c533 plank-parm3
c
c    rgid   stream parameter group id
c    alr20  algal unit respiration rate at 20 degrees C (1/hr)
c    aldh   high algal unit death rate (1/hr)
c    aldl   low algal unit death rate (1/hr)
c    oxald  increment to phytoplankton unit death rate due to
anaerobic conditions (1/hr)
c    naldh  inorganic nitrogen concentration below which high
algal death rate occurs (as nitrogen) (mg/l)
c    paldh  inorganic phosphorus concentration below which high
algal death rate occurs (as phosphorus) (mg/l)
c
c     rgid     alr20      aldh      aldl     oxald     naldh
paldh
c-----------------------------------------------------------------
--------------------
c534 plank-parm4
c
c    rgid    stream parameter group id
c    phycon  constant inflow concentration of plankton from land
to reach (mg/l)
c    seed    minimum concentration of plankton not subject to
advection (i.e., at high flow) (mg/l)
c    mxstay  concentration of plankton not subject to advection
at very low flow (mg/l)
c    oref    velocity/outflow at which the concentration of
plankton not subject to advection is midway between SEED and
MXSTAY, see card 530 (m/s or m3/s)
c    claldh  chlorophyll a concentration above which high algal
death rate occurs (ug/l)
c    physet  phytoplankton settling rate (m/hr)
c    refset  settling rate for dead refractory organics (m/hr)
c    cfsaex  This factor is used to adjust the input solar
radiation to make it applicable to the RCHRES;
c            for example, to account for shading of the surface
by trees or buildings
c    mbal    maximum benthic algae density (as biomass) (mg/m2)
c    cfbalr  ratio of benthic algal to phytoplankton respiration
rate
c    cfbalg  ratio of benthic algal to phytoplankton growth rate
c
c     rgid   phycon   seed   mxstay   oref   claldh   physet
refset  cfsaex  mbal   cfbalr   cfbalg
c-----------------------------------------------------------------
--------------------
```

```
c535 plank-initial conditions
c
c    rgid   stream parameter group id
c    phyto  initial phytoplankton concentration, as biomass
(mg/l)
c    benal  initial benthic algae density, as biomass (mg/m2)
c    orn    initial dead refractory organic nitrogen
concentration (mg/l)
c    orp    initial dead refractory organic phosphorus
concentration (mg/l)
c    orc    initial dead refractory organic carbon concentration
(mg/l)
c
c     rgid    phyto    benal   orn    orp    orc
c-----------------------------------------------------------------
--------------------
c540 pH controls
c
c    phffg1   value of 0 indicates that the removal factor for
total inorganic carbon is constant, given as phfrc1
c                a value of 1 indicates the monthly removal
factors
c    phffg2   value of 0 indicates that the removal factor for
dissolved carbon dioxide is constant, given as phfrc2
c             a value of 1 indicates the monthly removal factors
c    phfrc1   removal fraction for total inorganic carbon
c    phfrc2   removal fraction for dissolved carbon dioxide
c
c     phffg1   phffg2   phfrc1   phfrc2
c-----------------------------------------------------------------
----------------------------
c541 pH-parm
c
c    rgid    stream parameter group id
c    phcnt maximum number of iterations used to solve for the pH
c    alkcon      number of the conservative substance which is
used to simulate alkalinity
c            Alkalinity must be simulated in order to obtain
valid results
c    cfcinv      ratio of the carbon dioxide invasion rate to the
oxygen reaeration rate
c    brco2_1    benthal release rate of CO2 (as carbon) for
aerobic conditions (mg/m2/hr)
c    brco2_2 benthal release rate of CO2 (as carbon) for
anaerobic conditions (mg/m2/hr)
c
c     rgid    phcnt   alkcon   cfcinv   brco2_1   brco2_2
c-----------------------------------------------------------------
----------------------------
c542 pH-initial conditions
c
c    rgid  stream parameter group id
```

```
c    tic         initial total inorganic carbon (mg/l)
c    co2         initial carbon dioxide (as carbon) (mg/l)
c    ph          initial pH
c
c     rgid    tic    co2   ph
c------------------------------------------------------------------
--------------------
c543 mon-tic (monthly removal fraction for total inorganic
carbon)
c    only required if phfg = 1 and phffg1 = 1 (see card 502 and
card 540)
c
c    rgid    stream parameter group id
c    jan-dec total inorganic carbon removal fraction at the start
of each month
c
c  rgid    jan   feb   mar   apr   may   jun   jul   aug   sep
oct   nov   dec
c------------------------------------------------------------------
----------------------------
c544 mon-co2 (monthly removal fraction for dissolved carbon
dioxide)
c    only required if phfg = 1 and phffg2 = 1 (see card 502 and
card 540)
c
c    rgid    stream parameter group id
c    jan-dec dissolved carbon dioxide removal fraction at the
start of each month
c
c  rgid    jan   feb   mar   apr   may   jun   jul   aug   sep
oct   nov   dec
c------------------------------------------------------------------
----------------------------
c600 TMDL control flags
c
c    ncpt         if > 0 then use point sources control card 660
c    ncland       if > 0 then use landuse control card 670
c                 if = 1 then apply reduction to only surface
output
c                 if = 2 then apply reduction to total land output
c    ncrch        if > 0 then use reach control card 685 and 690
c    ntrgp        number of threshold groups in Card 410 and 610
c    ntnum        number of defined thresholds for analysis
c                 if > 0 then use threshold control cards 605 and
610
c
c   ncpt  ncland  ncrch  ntrgp  ntnum
      0    2    0    0    0
c------------------------------------------------------------------
----------------------------
c605 TMDL threshold mapping (used if ntnum > 0 in card 600)
c
```

```
c    tnum       threshold ordinal number
c    tqsd       threshold qual (1 for dissolved only and 2 for
total)
c    tcount     number of water quality constituent to aggregate
c    tqid       list of tqid to aggregate - number of tqid in
list = tcount (GQUAL/RQUAL IDs)
c
c    tnum   tqsd    tcount   tqid1   tqid2   .......   tqidn
c-----------------------------------------------------------------
----------------------------
c610 TMDL threshold definitions (used if ntnum > 0 in card 600)
c
c    trgid      threshold reach group ID (corresponds to trgid on
Card 410)
c    tnum       threshold number (corresponds to tnum on Card
605)
c    ttype      threshold type (possible values: 0, 1, 2, 3 or -
1, -2, -3)
c                0 = no standard to be applied for the trgid
c                1 = instantaneous values > threshold
c                2 = arithmetic mean > threshold
c                3 = geometric mean > threshold
c               -1 = instantaneous values < threshold
c               -2 = arithmetic mean < threshold
c               -3 = geometric mean < threshold
c    tdays      number of days over model output is aggregated
and/or is compared
c               if tdays = 0 then threshold becomes percent of
time
c    jan-dec    twelve monthly values for threshold (for
constant, use same value 12 times)
c               (units are same as in card 250)
c
c    examples: ttype  tdays  description/interpretation
c                 1      1  at least one instantaneous value
within a 1-day running period > threshold
c                -1      1  at least one instantaneous value
within a 1-day running period < threshold
c                 1      0  percent of time that instantaneous
value > threshold
c                 2      4  4-day running arithmetic mean >
threshold
c                 3     30  30-day running geometric mean >
threshold (for previous 30-days)
c
c  trgid  tnum   ttype  tdays   jan   feb   mar   apr   may   jun
jul   aug   sep   oct   nov   dec
c-----------------------------------------------------------------
-----------------------
c660 TMDL point source control (used if ncpt > 0 on card 600)
c
c    rchid         reach id
```

```
c    permit        point source index (level1)
c    pipe          point source index qualifier (level2)
c    reduction     reduction of pollutant from point source (in
fraction)
c
c   rchid   permit   pipe
reduction_flow...reduction_qual1...reduction_qual2...reduction_qu
aln
c-----------------------------------------------------------------
----------------------------
c670 TMDL land-based control (used if ncland > 0 on card 600)
c
c    subbasin   subwatershed id
c    deluid     land use id
c    luname     land use name
c    reduction  reduction of pollutant from corresponding landuse
and subwatershed
c
c     subbasin  deluid pluname  reduction
      5046  1     HD_SF_Residential     0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000
      5046  2     LD_SF_Res_Moderate    0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000
      5046  3     LD_SF_Res_Steep 0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5046  4     MF_Res     0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5046  5     Commercial 0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5046  6     Institutional   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5046  7     Industrial 0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5046  8     Transportation  0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5046  9     Secondary_Roads 0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000
      5046  10    Urban_Grass_Irrigated 0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000
      5046  11    Urban_Grass_NonIrrigated   0.000000   0.000000
      0.000000   0.000000   0.000000   0.000000   0.000000
      0.000000   0.000000   0.000000
```

5046 12 Agriculture_Moderate_B 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5046 13 Agriculture_Moderate_D 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5046 14 Vacant_Moderate_B 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5046 15 Vacant_Moderate_D 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5046 16 Vacant_Steep_A 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5046 17 Vacant_Steep_B 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
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5046 18 Vacant_Steep_C 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5046 19 Vacant_Steep_D 0.000000 0.000000 0.000000
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5046 20 Water 0.000000 0.000000 0.000000 0.000000
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5046 21 Water_Reuse 0.000000 0.000000 0.000000
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5065 1 HD_SF_Residential 0.000000 0.000000
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5065 2 LD_SF_Res_Moderate 0.000000 0.000000
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5065 3 LD_SF_Res_Steep 0.000000 0.000000 0.000000
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0.000000 0.000000
5065 4 MF_Res 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
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5065 5 Commercial 0.000000 0.000000 0.000000
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5065 6 Institutional 0.000000 0.000000 0.000000
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5065 7 Industrial 0.000000 0.000000 0.000000
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0.000000 0.000000
5065 8 Transportation 0.000000 0.000000 0.000000

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0.000000	0.000000
5065	9	Secondary_Roads	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5065	10	Urban_Grass_Irrigated	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5065	11	Urban_Grass_NonIrrigated	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5065	12	Agriculture_Moderate_B	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5065	13	Agriculture_Moderate_D	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5065	14	Vacant_Moderate_B	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5065	15	Vacant_Moderate_D	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5065	16	Vacant_Steep_A	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5065	17	Vacant_Steep_B	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5065	18	Vacant_Steep_C	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5065	19	Vacant_Steep_D	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5065	20	Water	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000
5065	21	Water_Reuse	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5066	1	HD_SF_Residential	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5066	2	LD_SF_Res_Moderate	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5066	3	LD_SF_Res_Steep	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5066	4	MF_Res	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000

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5066 5 Commercial 0.000000 0.000000 0.000000
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5066 6 Institutional 0.000000 0.000000 0.000000
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5066 7 Industrial 0.000000 0.000000 0.000000
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5066 8 Transportation 0.000000 0.000000 0.000000
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5066 9 Secondary_Roads 0.000000 0.000000 0.000000
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5066 10 Urban_Grass_Irrigated 0.000000 0.000000
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5066 11 Urban_Grass_NonIrrigated 0.000000 0.000000
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5066 12 Agriculture_Moderate_B 0.000000 0.000000
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5066 13 Agriculture_Moderate_D 0.000000 0.000000
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5066 14 Vacant_Moderate_B 0.000000 0.000000
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5066 15 Vacant_Moderate_D 0.000000 0.000000
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5066 16 Vacant_Steep_A 0.000000 0.000000 0.000000
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5066 17 Vacant_Steep_B 0.000000 0.000000 0.000000
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5066 18 Vacant_Steep_C 0.000000 0.000000 0.000000
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5066 19 Vacant_Steep_D 0.000000 0.000000 0.000000
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5066 20 Water 0.000000 0.000000 0.000000 0.000000
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5066 21 Water_Reuse 0.000000 0.000000 0.000000
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5079 1 HD_SF_Residential 0.000000 0.000000
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5079 2 LD_SF_Res_Moderate 0.000000 0.000000
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5079 3 LD_SF_Res_Steep 0.000000 0.000000 0.000000
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5079 4 MF_Res 0.000000 0.000000 0.000000
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5079 5 Commercial 0.000000 0.000000 0.000000
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5079 6 Institutional 0.000000 0.000000 0.000000
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5079 7 Industrial 0.000000 0.000000 0.000000
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5079 8 Transportation 0.000000 0.000000 0.000000
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5079 9 Secondary_Roads 0.000000 0.000000 0.000000
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5079 10 Urban_Grass_Irrigated 0.000000 0.000000
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5079 11 Urban_Grass_NonIrrigated 0.000000 0.000000
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5079 12 Agriculture_Moderate_B 0.000000 0.000000
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5079 13 Agriculture_Moderate_D 0.000000 0.000000
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5079 14 Vacant_Moderate_B 0.000000 0.000000
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5079 15 Vacant_Moderate_D 0.000000 0.000000
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5079 16 Vacant_Steep_A 0.000000 0.000000 0.000000
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5079 17 Vacant_Steep_B 0.000000 0.000000 0.000000
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5079 18 Vacant_Steep_C 0.000000 0.000000 0.000000

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5079 19 Vacant_Steep_D 0.000000 0.000000 0.000000
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5079 20 Water 0.000000 0.000000 0.000000 0.000000
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5079 21 Water_Reuse 0.000000 0.000000 0.000000
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5080 1 HD_SF_Residential 0.000000 0.000000
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5080 2 LD_SF_Res_Moderate 0.000000 0.000000
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5080 3 LD_SF_Res_Steep 0.000000 0.000000 0.000000
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5080 4 MF_Res 0.000000 0.000000 0.000000
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5080 5 Commercial 0.000000 0.000000 0.000000
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5080 6 Institutional 0.000000 0.000000 0.000000
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5080 7 Industrial 0.000000 0.000000 0.000000
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5080 9 Secondary_Roads 0.000000 0.000000 0.000000
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5080 10 Urban_Grass_Irrigated 0.000000 0.000000
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5080 11 Urban_Grass_NonIrrigated 0.000000 0.000000
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5080 12 Agriculture_Moderate_B 0.000000 0.000000
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5080 13 Agriculture_Moderate_D 0.000000 0.000000
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5080 14 Vacant_Moderate_B 0.000000 0.000000
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5080 15 Vacant_Moderate_D 0.000000 0.000000
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5080 16 Vacant_Steep_A 0.000000 0.000000 0.000000
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5080 17 Vacant_Steep_B 0.000000 0.000000 0.000000
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5080 18 Vacant_Steep_C 0.000000 0.000000 0.000000
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5080 19 Vacant_Steep_D 0.000000 0.000000 0.000000
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5080 20 Water 0.000000 0.000000 0.000000 0.000000
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5080 21 Water_Reuse 0.000000 0.000000 0.000000
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5083 1 HD_SF_Residential 0.000000 0.000000
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5083 2 LD_SF_Res_Moderate 0.000000 0.000000
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5083 3 LD_SF_Res_Steep 0.000000 0.000000 0.000000
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5083 4 MF_Res 0.000000 0.000000 0.000000
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5083 5 Commercial 0.000000 0.000000 0.000000
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5083 6 Institutional 0.000000 0.000000 0.000000
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5083 7 Industrial 0.000000 0.000000 0.000000
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5083 8 Transportation 0.000000 0.000000 0.000000
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5083 9 Secondary_Roads 0.000000 0.000000 0.000000
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5083 10 Urban_Grass_Irrigated 0.000000 0.000000
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5083 11 Urban_Grass_NonIrrigated 0.000000 0.000000
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5083 12 Agriculture_Moderate_B 0.000000 0.000000
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5083 13 Agriculture_Moderate_D 0.000000 0.000000
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5083 14 Vacant_Moderate_B 0.000000 0.000000
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5083 15 Vacant_Moderate_D 0.000000 0.000000
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5083 16 Vacant_Steep_A 0.000000 0.000000 0.000000
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5083 17 Vacant_Steep_B 0.000000 0.000000 0.000000
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5083 18 Vacant_Steep_C 0.000000 0.000000 0.000000
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5083 19 Vacant_Steep_D 0.000000 0.000000 0.000000
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5083 20 Water 0.000000 0.000000 0.000000 0.000000
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5083 21 Water_Reuse 0.000000 0.000000 0.000000
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5173 1 HD_SF_Residential 0.000000 0.000000
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5173 2 LD_SF_Res_Moderate 0.000000 0.000000
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5173 3 LD_SF_Res_Steep 0.000000 0.000000 0.000000
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5173 4 MF_Res 0.000000 0.000000 0.000000
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5173 5 Commercial 0.000000 0.000000 0.000000
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5173 6 Institutional 0.000000 0.000000 0.000000
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5173 7 Industrial 0.000000 0.000000 0.000000

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5173 8 Transportation 0.000000 0.000000 0.000000
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5173 9 Secondary_Roads 0.000000 0.000000 0.000000
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5173 10 Urban_Grass_Irrigated 0.000000 0.000000
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5173 11 Urban_Grass_NonIrrigated 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
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5173 12 Agriculture_Moderate_B 0.000000 0.000000
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5173 13 Agriculture_Moderate_D 0.000000 0.000000
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5173 14 Vacant_Moderate_B 0.000000 0.000000
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5173 15 Vacant_Moderate_D 0.000000 0.000000
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5173 16 Vacant_Steep_A 0.000000 0.000000 0.000000
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5173 17 Vacant_Steep_B 0.000000 0.000000 0.000000
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5173 18 Vacant_Steep_C 0.000000 0.000000 0.000000
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5173 19 Vacant_Steep_D 0.000000 0.000000 0.000000
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5173 20 Water 0.000000 0.000000 0.000000 0.000000
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5173 21 Water_Reuse 0.000000 0.000000 0.000000
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5175 1 HD_SF_Residential 0.000000 0.000000
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5175 2 LD_SF_Res_Moderate 0.000000 0.000000
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0.000000 0.000000 0.000000
5175 3 LD_SF_Res_Steep 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000

0.000000	0.000000
5175	4	MF_Res	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5175	5	Commercial	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5175	6	Institutional	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5175	7	Industrial	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5175	8	Transportation	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5175	9	Secondary_Roads	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5175	10	Urban_Grass_Irrigated	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5175	11	Urban_Grass_NonIrrigated	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5175	12	Agriculture_Moderate_B	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5175	13	Agriculture_Moderate_D	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5175	14	Vacant_Moderate_B	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5175	15	Vacant_Moderate_D	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5175	16	Vacant_Steep_A	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5175	17	Vacant_Steep_B	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5175	18	Vacant_Steep_C	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5175	19	Vacant_Steep_D	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5175	20	Water	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000

5175 21 Water_Reuse 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5183 1 HD_SF_Residential 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5183 2 LD_SF_Res_Moderate 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5183 3 LD_SF_Res_Steep 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5183 4 MF_Res 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5183 5 Commercial 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5183 6 Institutional 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5183 7 Industrial 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5183 8 Transportation 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5183 9 Secondary_Roads 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5183 10 Urban_Grass_Irrigated 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5183 11 Urban_Grass_NonIrrigated 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5183 12 Agriculture_Moderate_B 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5183 13 Agriculture_Moderate_D 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5183 14 Vacant_Moderate_B 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5183 15 Vacant_Moderate_D 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000
5183 16 Vacant_Steep_A 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000
5183 17 Vacant_Steep_B 0.000000 0.000000 0.000000

```
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5183	18	Vacant_Steep_C	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5183	19	Vacant_Steep_D	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5183	20	Water	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000
5183	21	Water_Reuse	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5189	1	HD_SF_Residential	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5189	2	LD_SF_Res_Moderate	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5189	3	LD_SF_Res_Steep	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5189	4	MF_Res	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5189	5	Commercial	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5189	6	Institutional	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5189	7	Industrial	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5189	8	Transportation	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5189	9	Secondary_Roads	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000
5189	10	Urban_Grass_Irrigated	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5189	11	Urban_Grass_NonIrrigated	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5189	12	Agriculture_Moderate_B	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	0.000000	0.000000
5189	13	Agriculture_Moderate_D	0.000000	0.000000
0.000000	0.000000	0.000000	0.000000	0.000000
```

```
     0.000000   0.000000   0.000000
     5189  14   Vacant_Moderate_B     0.000000   0.000000
     0.000000   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000   0.000000
     5189  15   Vacant_Moderate_D     0.000000   0.000000
     0.000000   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000   0.000000
     5189  16   Vacant_Steep_A  0.000000   0.000000   0.000000
     0.000000   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     5189  17   Vacant_Steep_B  0.000000   0.000000   0.000000
     0.000000   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     5189  18   Vacant_Steep_C  0.000000   0.000000   0.000000
     0.000000   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     5189  19   Vacant_Steep_D  0.000000   0.000000   0.000000
     0.000000   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
     5189  20   Water 0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000   0.000000   0.000000   0.000000
     0.000000
     5189  21   Water_Reuse      0.000000   0.000000   0.000000
     0.000000   0.000000   0.000000   0.000000   0.000000
     0.000000   0.000000
c-----------------------------------------------------------------
----------------------------
c680 TMDL reach control (used if ncrch > 0 on card 600)
c
c    rchid          controlled reach id
c    outlet         controlled reach outlet id
c    switch_mon     monthly switch to control conc limit or
reduction of pollutant from the corresponding reach (0-off, 1-on)
c
c   rchid   outlet   switch_1   switch_2......switch_12
c-----------------------------------------------------------------
----------------------------
c685 TMDL reach control (used if ncrch > 0 on card 600)
c
c    rchid          controlled reach id
c    outlet         controlled reach outlet id
c    limit-flow     flow limit from the corresponding reach (cfs)
c    limit_pol      concentration limit of pollutant from the
corresponding reach (mg/l or ug/l or #/100ml)
c
c   rchid   outlet   limit_flow
limit_qual1...limit_qual2...limit_qualn
c-----------------------------------------------------------------
----------------------------
c690 TMDL reach control (used if ncrch > 0 on card 600)
c
c    rchid          controlled reach id
```

```
c    outlet        controlled reach outlet id
c    reduction     reduction of pollutant from the corresponding
reach (fraction)
c                  reduction in outflow will also reduce the
pollutant mass from the outflow and
c                  any defined reduction to pollutant will be the
additional
c
c   rchid   outlet
reduction_flow...reduction_qual1...reduction_qual2...reduction_qu
aln
c-----------------------------------------------------------------
----------------------------
```