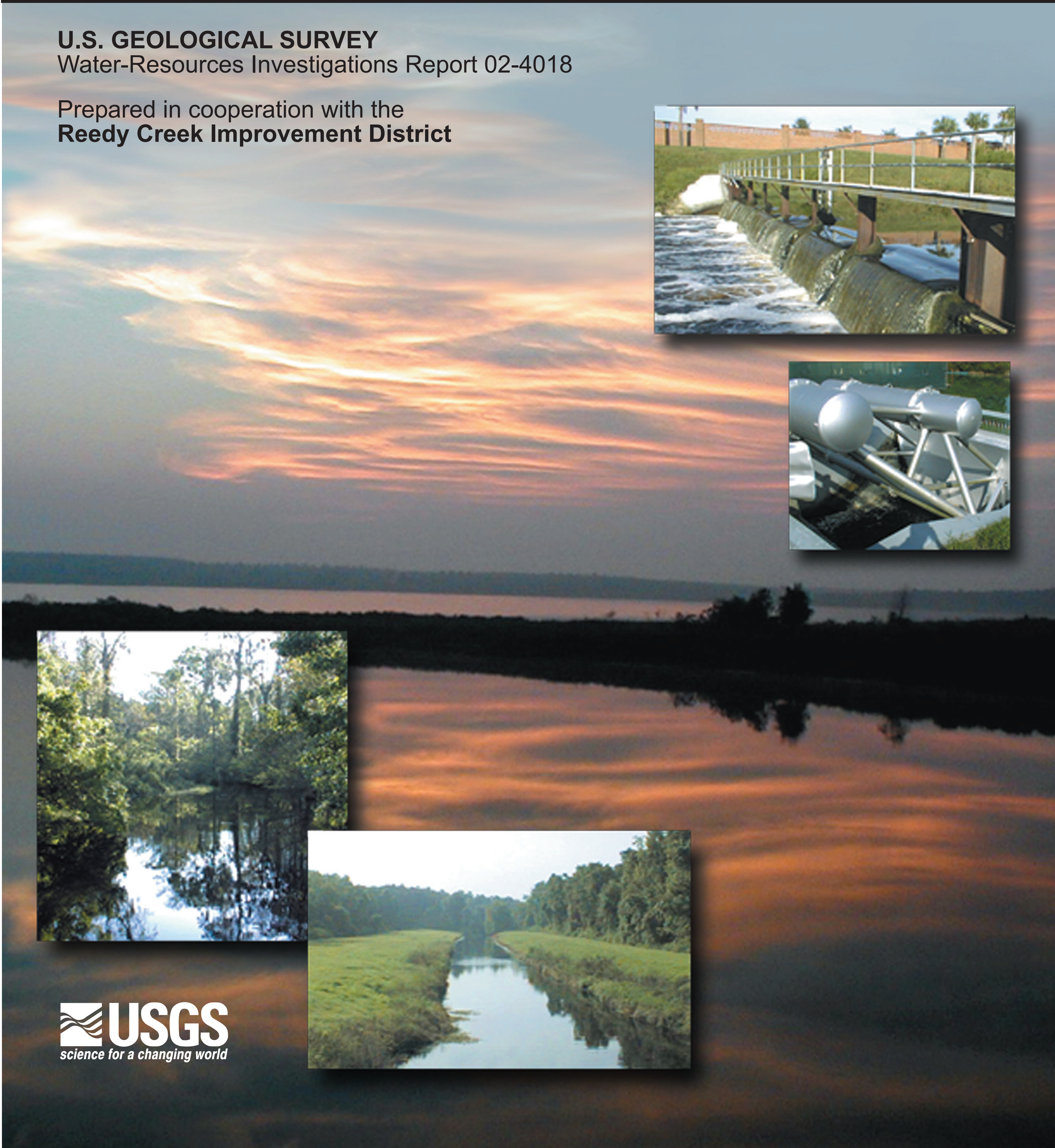
Simulation of Runoff and Water Quality for 1990 and 2008 Land-Use Conditions in the Reedy Creek Watershed, East-Central Florida



U.S. GEOLOGICAL SURVEY
Water-Resources Investigations Report 02-4018

Prepared in cooperation with the
Reedy Creek Improvement District

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science for a changing world

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By Shaun M. Wicklein and Donna M. Schiffer

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Tallahassee, Florida
2002

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CONVERSION FACTORS, VERTICAL DATUM, ABBREVIATIONS AND ACRONYMS

Multiply	By	To obtain
	Length	
inch (in.)	2.54	centimeter
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
	Area	
square foot (ft^2)	0.0929	square meter
square mile (mi^2)	2.590	square kilometer
square mile (mi^2)	259	hectare
acre	0.405	hectare
	Mass	
pound (lb)	0.4536	kilogram
	Flow	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second
inch per year (in/yr)	25.4	millimeter per year

Temperature in degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) as follows: °C=(°F-32)/1.8

Sea level: In this report, “sea level” refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

Altitude: In this report, altitude refers to distance above or below sea level.

Horizontal coordinate information is referenced to the North American Datum of 1927 (NAD27).

Acronyms and additional abbreviations used in report:

BASINS	Better Assessment Science Integrating Point and Nonpoint Sources
BMP	best management practices
BOD	biochemical oxygen demand
DO	dissolved oxygen
ET	evapotranspiration
GIS	Geographic Information System
HSPF	Hydrologic Simulation Program-Fortran
HSPEXP	Hydrological Simulation Program-Fortran EXPert system
IMPLND	impervious land surfaces
mg/L	milligrams per liter
NAPD/NTN	National Atmospheric Deposition Program/National Trends Network
NURP	Nationwide Urban Runoff Project
NOAA	National Oceanic and Atmospheric Administration
PERLND	pervious land surfaces
R^2	a coefficient of determination
RCID	Reedy Creek Improvement District
RIBS	rapid infiltration basins
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UCI	user control input

Simulation of Runoff and Water Quality for 1990 and 2008 Land-Use Conditions in the Reedy Creek Watershed, East-Central Florida

By Shaun M. Wicklein and Donna M. Schiffer

ABSTRACT

Hydrologic and water-quality data have been collected within the 177-square-mile Reedy Creek, Florida, watershed, beginning as early as 1939, but the data have not been used to evaluate relations among land use, hydrology, and water quality. A model of the Reedy Creek watershed was developed and applied to the period January 1990 to December 1995 to provide a computational foundation for evaluating the effects of future land-use changes on hydrology and water quality in the watershed.

The Hydrological Simulation Program-Fortran (HSPF) model was used to simulate hydrology and water quality of runoff for pervious land areas, impervious land areas, and stream reaches. Six land-use types were used to characterize the hydrology and water quality of pervious and impervious land areas in the Reedy Creek watershed: agriculture, rangeland, forest, wetlands, rapid infiltration basins, and urban areas. Hydrologic routing and water-quality reactions were simulated to characterize hydrologic and water-quality processes and the movement of runoff and its constituents through the main stream channels and their tributaries.

Because of the complexity of the stream system within the Reedy Creek Improvement District (RCID) (hydraulic structures, retention ponds) and the anticipated difficulty of modeling the system, an approach of calibrating the model parameters for a subset of the gaged watersheds and confirming the usefulness of the parameters by simulating the remainder of the gaged sites was selected for this study. Two sub-watersheds (Whittenhorse Creek and Davenport Creek) were selected for calibration because both have similar land use to watersheds within the RCID (with the exception of urban areas). Given the lack of available rainfall data, the hydrologic calibration of the Whittenhorse Creek and Davenport Creek sub-watersheds was considered acceptable (for monthly data, correlation coefficients, 0.86 and 0.88, and coefficients of model-fit efficiency, 0.72 and 0.74, respectively). The hydrologic model was tested by applying the parameter sets developed for Whittenhorse Creek and Davenport Creek to other land areas within the Reedy Creek watershed, and by comparing the simulated results to observed data sets for Reedy Creek near Vineland, Bonnet Creek near Vineland, and Reedy Creek near Loughman. The hydrologic model confirmation for Reedy Creek near Vineland (correlation coefficient, 0.91, and coefficient of model fit efficiency, 0.78, for monthly flows) was acceptable. Flows for Bonnet Creek near Vineland were substantially under simulated. Consideration of the ground-water contribution to Bonnet Creek could improve the water balance simulation for Bonnet Creek near Vineland. On longer time scales (monthly or over the 72-month simulation period), simulated discharges for Reedy Creek near Loughman agreed well with observed data (correlation coefficient, 0.88). For monthly flows the coefficient of model-fit efficiency was 0.77. On a shorter time scale (less than a month), however, storm volumes were greatly over simulated and low flows (less than 8 cubic feet per second) were greatly under simulated. A primary reason for the poor results at low flows is the diversion of an unknown amount of water from the RCID at the Bonnet Creek near Kissimmee site.

Selection of water-quality constituents for simulation was based primarily on the availability of water-quality data. Dissolved oxygen, nitrogen, and phosphorus species were simulated. Representation of nutrient cycling in HSPF also required simulation of biochemical oxygen demand and phytoplankton

populations. The correlation coefficient for simulated and observed daily mean dissolved oxygen concentration values at Reedy Creek near Vineland was 0.633. Simulated time series of total phosphorus, phosphate, ammonia nitrogen, and nitrate nitrogen generally agreed well with periodically observed values for the Whittenhorse Creek and Davenport Creek sites. Simulated water-quality constituents at the Bonnet Creek and Reedy Creek near Vineland sites varied as to how well the values agreed with periodically observed constituent concentrations. Simulated water-quality constituent concentrations for the Reedy Creek near Loughman site generally agreed well with observed constituent concentrations.

Simulation of a future land-use scenario for the Reedy Creek watershed was based on the hydrologic and water-quality simulations, projected 2008 land use within the RCID, and assuming no change in existing land use for other areas within the Reedy Creek watershed but external to the RCID. The percentages of forest and urban-impervious land use showed the most change between existing and future land use; forest areas decreased by 50 percent and urban-impervious areas increased by 300 percent. Simulated values of mean total phosphorus, phosphate, ammonia nitrogen, and nitrate nitrogen concentrations for existing and future land-use simulations were within 0.01 milligrams per liter of each other. The simulated maximum daily load increased an average of 10 percent for all constituents. Maximum daily nitrate nitrogen load increased about 17 percent, the greatest increase of all daily constituent loads. Duration curves of daily total phosphorus, phosphate, ammonia nitrogen, and nitrate nitrogen load indicated an increase in the likelihood of exceeding a given load throughout the range of daily constituent loads at Reedy Creek near Loughman.

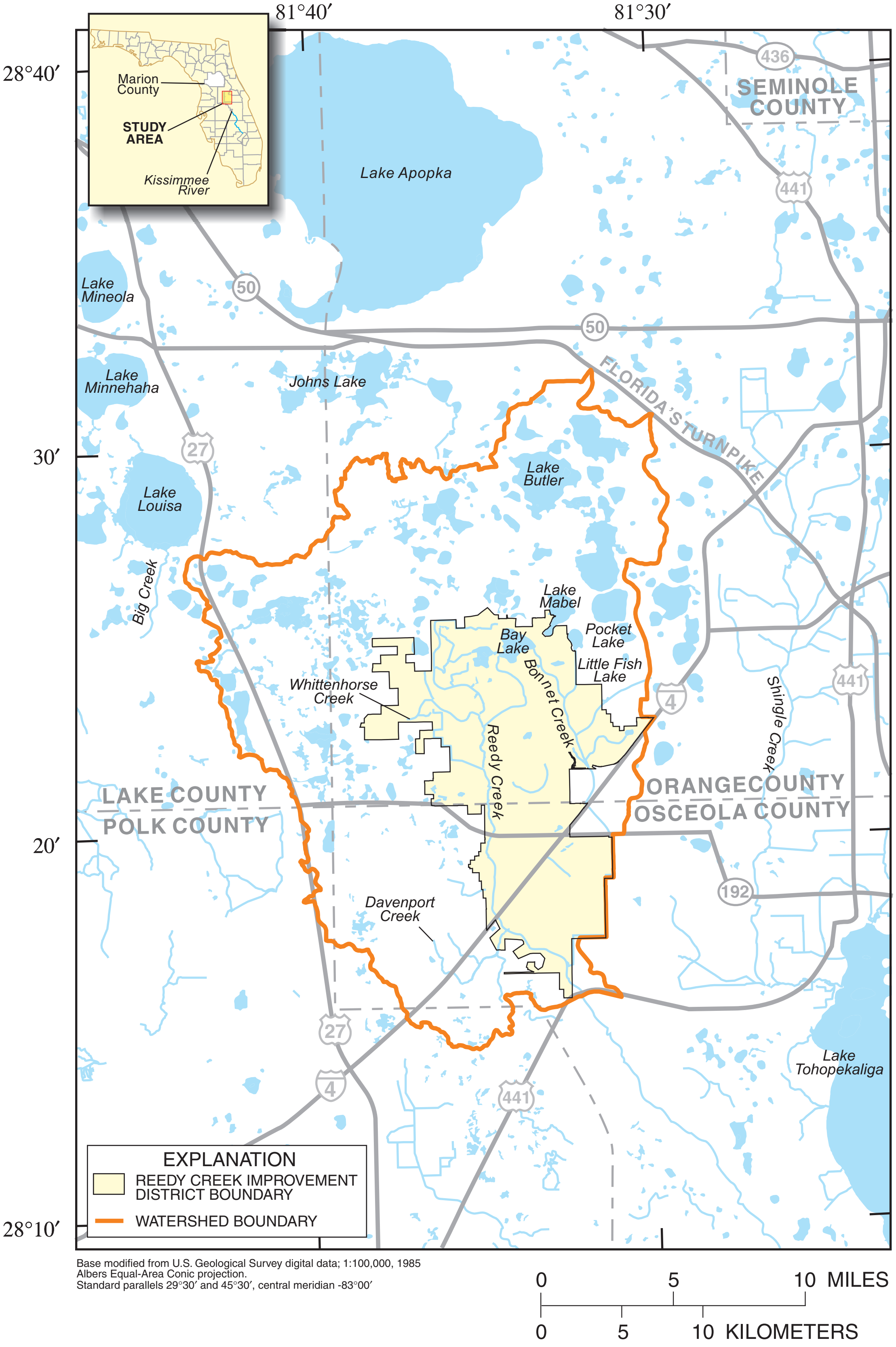
INTRODUCTION

Land use in central Florida has been greatly modified as a result of population increases and industrial growth. Since the 1960's, one of the most intensely modified land areas in central Florida has been the 177-square-mile (mi^2) Reedy Creek watershed, in southwest Orange, northwest Osceola, northeast Polk, and southwest Lake Counties. The Reedy Creek Improvement District (RCID) is an area of about 45 mi^2 within the Reedy Creek watershed (fig. 1). Land use affects both the hydrology and water quality of runoff from the watershed, but the effects are not easily quantified.

Although hydrologic and water-quality data have been collected within the Reedy Creek watershed and the RCID since as early as 1939, the data have not previously been used to evaluate the relations among land use, hydrology, and water quality. Changes in land use over time, due to land development, in the Reedy Creek watershed make predicting changes in hydrology and water quality difficult. Because of the natural variability of hydrologic and water-quality data, the spatial variability within watersheds, and the complexity of nutrient runoff and transport relations, it is difficult to relate specific watershed properties to conditions downstream unless the watershed is analyzed as a system. Watershed modeling can be used to better understand the relation of land use to hydrologic and water-quality processes occurring within a watershed. A continuous-simulation watershed model can provide the framework for understanding the relations among land use and water quantity and quality within the Reedy Creek watershed and the RCID. The U.S. Geological Survey (USGS) began a 5-year study in 1996 in cooperation with the RCID to better define the relations among land use, hydrology, and water quality in the Reedy Creek watershed.

Purpose and Scope

This report presents results of a study to evaluate and simulate rainfall-runoff relations and nutrient concentrations and loads within the Reedy Creek watershed, including the RCID. The Reedy Creek watershed was divided into sub-watersheds, and the hydrologic characteristics that control runoff were determined. Although the primary focus of the study was to simulate the hydrology and water quality within the RCID, the hydrology and water quality of the Reedy Creek watershed was modeled because changes outside the RCID also affect nutrient concentrations and loads within and downstream from the RCID. This report presents land-use, hydrologic, meteorological, and water-quality data used to calibrate and confirm the watershed model. Calibration and confirmation of a rainfall-runoff model, the Hydrological Simulation Program-Fortran (HSPF) (Bicknell and other, 1993), are described. Building on the hydrologic model, results of the water-quality simulation of the watershed are described. The period from January 1990 to December 1995 was simulated.



Base modified from U.S. Geological Survey digital data; 1:100,000, 1985
Albers Equal-Area Conic projection.
Standard parallels 29°30′ and 45°30′, central meridian -83°00′

Figure 1. Location of study area.

The effects of projected future land-use changes within the RCID were evaluated by revising the calibrated model to reflect projected 2008 land use and comparing the output with the results obtained from simulation of hydrology and water quality of runoff from existing land use (1990). An overall evaluation of modeling results and a discussion of possible ways to improve the model are presented.

Previous Investigations

Putnam (1975) summarized the hydrology and water quality of the Reedy Creek watershed and the RCID, along with effects of development from 1966 to 1973. German (1986) continued the appraisal of water resources and effects of land-use changes in the RCID from 1966 to 1980. Estimated daily loads of dissolved solids and selected nutrient species into and out of an undeveloped area in the Reedy Creek watershed south of the developed areas from June 1986 through May 1987 were described by German (1989). Hampson (1993) described the hydrology and water quality of Reedy Creek within the RCID for the period 1986-89, and investigated the input and output nutrient loads for a wetland conservation area in the southern part of the RCID resulting from wastewater discharges. Hampson's (1993) work also included several reaeration studies on Reedy Creek downstream from developed areas. German (1990) investigated the effects of land application of treated wastewater on ground-water quality in part of the RCID. Sumner and Bradner (1996) investigated the effects of reclaimed wastewater disposal through rapid infiltration basins (RIBS) on nutrients in ground water and in the unsaturated zone. A ground-water flow model of the western part of the RCID in an area affected by disposal of treated wastewater through irrigation and through RIBS was used to evaluate effects on the surficial aquifer system and surface water as well as the Floridan aquifer system (O'Reilly, 1998). Gee and Jenson (1990) produced a Master Drainage Plan for the RCID stormwater facilities, which the RCID Planning and Engineering Department periodically updates.

Numerous reports on the surface- and ground-water resources of central Florida, including the Reedy Creek watershed, also are available. Tibbals (1990) simulated ground-water flow in the Floridan aquifer system in east-central Florida. Murray and Halford (1996) described hydrogeologic conditions in east-central Florida, calibrated a ground-water flow model to steady-state 1988 conditions, and evaluated the effects of projected 2010 withdrawals on the Floridan aquifer system.

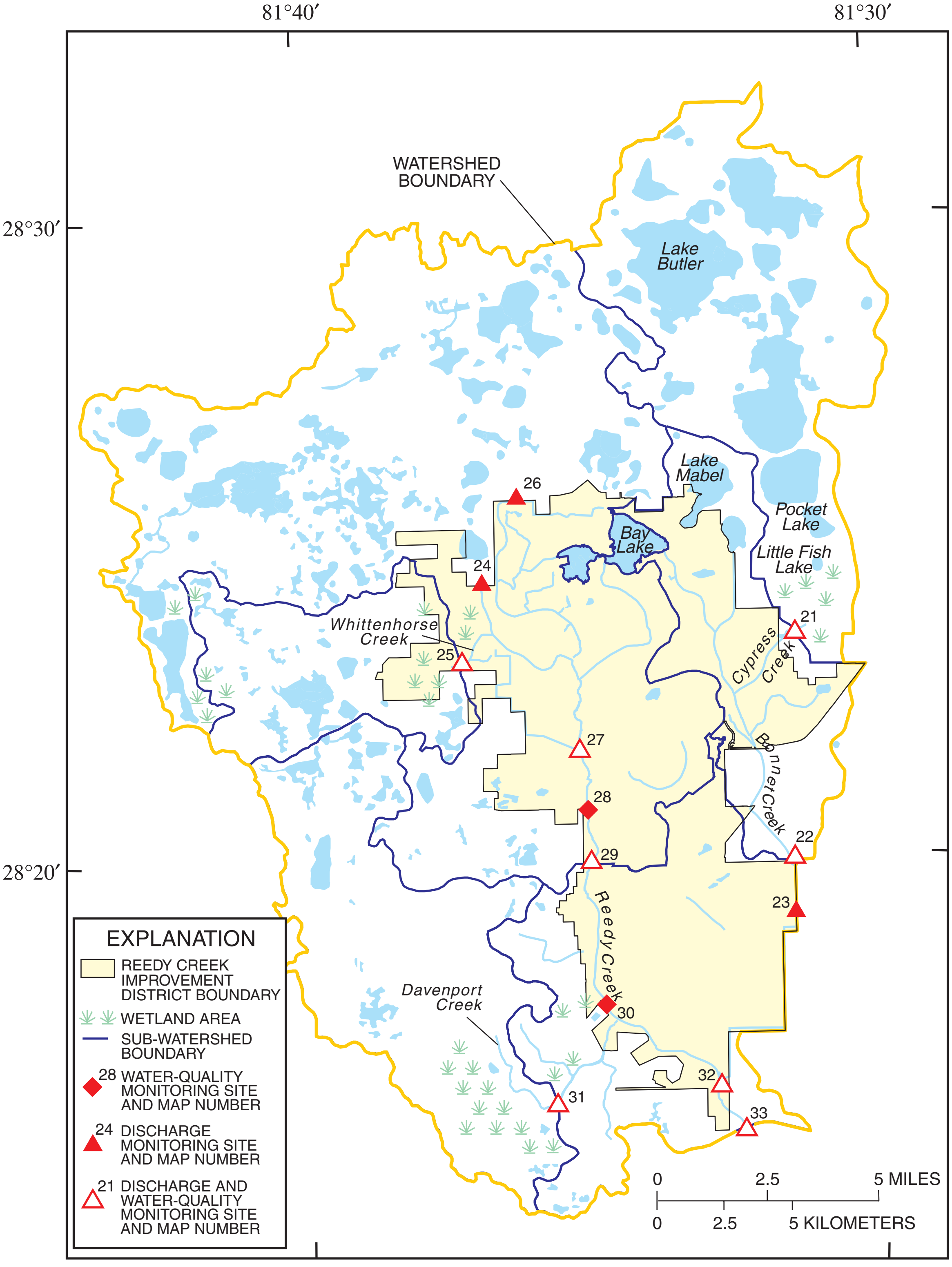
Acknowledgements

The authors thank RCID staff members Mahmoud Elsabagh for providing data and information about hydraulic modeling of the RCID using the model UNET; Rebecca Gubert, who provided extensive water-quality data; Eddie Snell for providing data and insight into the field data collection of the RCID; and other staff members who provided Geographic Information System (GIS) land-use and land-cover data of the RCID. E.R. German, USGS, Altamonte Springs, Florida, is gratefully acknowledged for his willingness to share his insight and experience in the investigation of the hydrology of the RCID area. C.S. Melching, Marquette University, Wisconsin, provided guidance in the modeling approach to the project and the application of the HSPF model. The authors also wish to extend appreciation to Tom Jobes, AQUA TERRA, for assistance on all matters related to HSPF; and A.M. O'Reilly, USGS, Altamonte Springs, Florida, for his guidance and instruction in the application of GIS for the project.

Description of Study Area

The Reedy Creek watershed forms the headwaters of the Kissimmee River and is located in Lake, Orange, Osceola, and Polk Counties in central Florida (fig. 1). The Reedy Creek watershed is composed of five sub-watersheds: Cypress Creek, Bonnet Creek, Reedy Creek, Whittenhorse Creek, and Davenport Creek (fig. 2). Low undulating hills and wide swampy valleys with numerous lakes and ponds of various sizes characterize the Reedy Creek watershed. A large part of the watershed is covered by forested wetlands where the water table is above or near the land surface for a substantial part of the year. Because drainage in the wetlands is poorly developed, water commonly remains in the watershed for long periods of time before flowing to creeks that drain the watershed.

Dominant land uses in the Reedy Creek watershed include urban areas (including recreational parks, parking lots, commercial and industrial developments), residential areas, forested wetlands, cropland (primarily citrus), pasture and shrub rangeland, and surface-water features such as lakes, streams, and



Base modified from U.S. Geological Survey digital data; 1:100,000, 1985
Albers Equal-Area Conic projection.
Standard parallels 29°30′ and 45°30′, central meridian -83°00′

Figure 2. Sub-watersheds and data collection sites in the Reedy Creek watershed, Florida (discharge and water quality monitoring sites, table 4).

canals. The distribution of land uses differs among the sub-watersheds of Reedy Creek, with more urban areas concentrated in the southern and eastern parts of the watershed: central Reedy Creek, Cypress Creek, and Bonnet Creek. Large tracts of land have been established within the watershed for conservation purposes. These conservation areas provide storage for stormwater runoff and aid in the improvement of downstream water quality.

In 1990, the RCID implemented the use of RIBS for the disposal of treated wastewater. The RIBS are shallow excavated depressions in sandy soils where the treated wastewater is disposed. RIBS are concentrated in the Whittenhorse Creek watershed and have affected the base flow of the creek (O'Reilly, 1998). Treated wastewater also is applied to the land surface through irrigation of citrus in the upper Reedy Creek and Whittenhorse Creek watersheds, which also can affect the watershed hydrology and water quality. Wastewater used for irrigation in the Reedy Creek watershed may originate from municipal wastewater treatment plants outside of the watershed; this was accounted for in the watershed model.

Climate of the study area is humid subtropical. The average annual rainfall in central Florida for the period 1913-92 was 51 inches (in.) (Murray and Halford, 1996). Average annual rainfall for the study period (1990-95) was about 50 in. based on rainfall data collected by the National Oceanic and Atmospheric Administration (NOAA) at Orlando International Airport. Rainfall within the study area varies anually, seasonally, and spatially. Seasonal rainfall variability, evident from inspection of long-term monthly rainfall data, produces substantial seasonal trends in surface- and ground-water levels and stream discharge. Daily rainfall during summer months (June through September) varied among sites within the study area during the simulated period (1990-95), on average, from 1 in. to as much as 5 in. Rainfall represents the largest input of water to the study area.

The largest loss of water from the study area is through evapotranspiration (ET). The two processes involved in ET, evaporation and transpiration, are difficult to separate and typically are treated as one. Knowles (1996) indicated that losses due to ET in Marion County, about 70 miles (mi) northwest of the Reedy Creek watershed (fig. 1), averaged about 38 in. per year. ET can vary considerably, both spatially and temporally, across the study area. Spatial variation primarily is the result of differences in vegetation and water availability; temporal variation primarily is the result of plant growth characteristics and climatological variables such as rainfall, solar radiation, wind speed, and humidity.

The ground-water flow system beneath the study area is a multi-aquifer system consisting of a thick sequence of carbonate rock overlain by unconsolidated deposits of sand, silt, and clay (O'Reilly, 1998). The surficial aquifer system is the uppermost water-bearing unit in the study area. The upper boundary of the ground-water system is defined by the water table, which in most areas is a subdued reflection of the land-surface topography. Modeling hydrologic processes that determine overland flow and interactions with the upper soil zones is complicated by the presence of a high water table in many parts of Florida, including the Reedy Creek watershed. The Floridan aquifer system underlies the surficial aquifer system in the study area and consists of two major permeable zones separated by a less permeable zone of highly variable water-transmitting characteristics. The depth to the top of the Floridan aquifer system is less than 100 feet (ft) and the aquifer ranges from 2,200-2,400 ft in thickness in the study area (Tibbals, 1990, figs. 10 and 11).

The Reedy Creek watershed includes a number of sub-watersheds including Cypress Creek, Davenport Creek, Whittenhorse Creek, and Bonnet Creek (fig. 2). The watershed also contains land and water areas that do not contribute flow to the stream channel system. Areas of non-contributing flow generally are located in sub-watersheds north and west of the RCID: upper Cypress Creek, upper east and upper west Reedy Creek, Whittenhorse Creek, and Davenport Creek. The natural drainage systems of Reedy and Bonnet Creeks were altered within the RCID as a result of development. Urbanization in the Reedy Creek watershed outside the RCID also altered streamflow characteristics.

The Cypress Creek sub-watershed is in the northeastern part of the Reedy Creek watershed and is a tributary to Bonnet Creek. Cypress Creek has a drainage area of 29.3 mi^2 or about 16 percent of the total watershed. Land and water areas that do not contribute flow to the stream channel system comprise about 4 percent (1.3 mi^2) of the Cypress Creek drainage area and are located in the northern and western parts of the sub-watershed. The creek receives outflow from a large chain of lakes, the largest of which is Lake Butler (fig. 2). Water from the chain of lakes overflows from Pocket Lake and Little Fish Lake into a large wetland area. The Cypress Creek stream channel is poorly defined to just upstream from the USGS gaging station Cypress Creek at Vineland (USGS site number 02264000; map number 21 in fig. 2). Downstream from this gaging station, Cypress Creek enters the RCID and flows through a series of control structures to Bonnet Creek.

The Bonnet Creek sub-watershed, which includes Cypress Creek, is in the eastern part of the Reedy Creek watershed. Bonnet Creek has a drainage area of 44.7 mi^2 or about 25 percent of the total watershed. Bonnet Creek is highly channelized within the RCID and flows through a conservation area south of the USGS gaging station Bonnet Creek near Vineland (USGS site number 02264100; map number 22 in fig. 2). Water is diverted out of the Bonnet Creek sub-watershed through a regulated outlet structure at the USGS Bonnet Creek near Kissimmee gaging station (USGS site number 02264140; map number 23 in fig. 2). Most discharge from Bonnet Creek flows into Reedy Creek upstream from the USGS gaging station Reedy Creek at S-40 near Loughman (USGS site number 02266495; map number 32 in fig. 2).

The Whittenhorse Creek sub-watershed is located in the west-central part of the Reedy Creek watershed. Whittenhorse Creek has a drainage area of 12.4 mi^2 or about 7 percent of the total watershed. Much of the Whittenhorse Creek sub-watershed is characterized by low topographic relief and forested wetlands, but other areas in the watershed that are at higher altitudes and areas with sandier soils have been used for citrus cultivation. Land and water areas that do not contribute flow to the stream channel system comprise less than 0.1 percent of the Whittenhorse Creek drainage area. The distribution of treated wastewater to RIBS contributes to baseflow (through ground-water inflows to the streambed) in Whittenhorse Creek in the reaches upstream from the USGS gaging station Whittenhorse Creek near Vineland (USGS site number 02266200; map number 25 in fig. 2).

Davenport Creek has a drainage area of 23.0 mi^2 or about 13 percent of the total watershed. Davenport Creek is poorly defined near its confluence with Reedy Creek and drains into a wetland area upstream from the USGS gaging station Reedy Creek at S-40 near Loughman (USGS site number 02266495; map number 32 in fig. 2). The Davenport Creek sub-watershed contains flat, swampy, wetland areas. A large percentage of higher ground in the watershed is used for agricultural purposes, mainly cultivation of citrus. Land and water areas not contributing flow to the Davenport Creek stream channel system comprise about 8 percent (1.9 mi^2) of the total drainage area. As with the other sub-watersheds of Reedy Creek, the drainage basin boundaries of the upper reaches of the Davenport Creek, upstream from the USGS gaging station Davenport Creek near Loughman (USGS site number 02266480; map number 31 in fig. 2), are not well defined.

Reedy Creek originates in wetlands in the northern and northwestern parts of the watershed. The watershed boundary is poorly defined in the upper part of the basin (Hampson, 1993). Land and water areas in the upper part of the watershed that do not contribute flow to channel system comprise approximately 6 percent (10.6 mi^2) of the entire 177-mi^2 Reedy Creek watershed. Non-contributing drainage areas in the upper part of the watershed are mainly citrus groves and small lakes. Wetlands that form the headwaters of Reedy Creek drain into the RCID north of USGS gaging stations Reedy Creek at S46 near Vineland and Lateral 405 at S-405A near Doctor Phillips (USGS site numbers 02266025 and 02266291; map numbers 24 and 26, respectively, in fig. 2). Within the RCID, the channel of Reedy Creek has been altered; many reaches have been channelized and numerous control structures are in place, primarily to regulate water levels of the creek. About 1.9 mi north of the USGS gaging station Reedy Creek near Vineland (USGS site number 02266300; map number 29 in fig. 2), the channelized stream section ends. Reedy Creek flows in a southerly direction before entering a large wetland conservation area upstream from the USGS gaging station Reedy Creek at S-40 near Loughman (USGS site number 02266495; map number 32 in fig. 2). Downstream from the USGS gaging station Reedy Creek at S-40 near Loughman, the creek flows through a natural channel past the USGS gaging station Reedy Creek near Loughman (USGS site number 02266500; map number 33 in fig. 2).

Study Approach

Although hydrologic and water-quality data have been collected within the Reedy Creek watershed, these data have not previously been used to evaluate the relations among land use, hydrology, and water quality. Because of the natural variability of hydrologic and water-quality data, the spatial variability within watersheds, and the complexity of nutrient runoff and transport relations, it is difficult to relate specific watershed characteristics to conditions downstream unless the watershed is evaluated and analyzed as a system.

The HSPF model was used to simulate runoff from land surfaces and, subsequently, nutrient concentrations in the watershed. Although data-intensive and complex, HSPF is the only available model that can simulate the continuous, dynamic event or steady-state behavior of both hydraulic and water-quality processes in a watershed (Singh, 1995). HSPF was selected for modeling Reedy Creek because of the model characteristics previously described, and also because of its modular structure and capacity for modifications or enhancements to meet specific needs in assessing effects of changes in the watershed. HSPF, jointly developed by the U.S. Environmental Protection Agency (USEPA) and USGS, is used widely and continues to undergo refinements and enhancements, ensuring that it will remain a viable and relevant tool in watershed modeling.

In order to develop rainfall-runoff and water-quality relations, climatic conditions and physical characteristics of the watershed must be quantified. To define rainfall-runoff and water-quality relations, data collected over the simulated period (January 1, 1990, to December 31, 1995) were compiled, evaluated, and processed into time series or other appropriate formats required for input to the model. These time series data provided inputs and fluxes necessary for calibration and confirmation of the model simulation. The time period simulated represents a 6-year period in which rainfall ranged from below average in the early part of the simulation to above average in the later years of simulation. Although the range in rainfall data and associated hydrologic conditions presented a challenge for developing a model, the resulting model generally is more applicable to a broader range of hydrologic conditions because of the extremes in rainfall that were included.

SIMULATION OF HYDROLOGY AND WATER QUALITY

The HSPF model was used to simulate rainfall-runoff relations and nutrient concentrations in the Reedy Creek watershed. HSPF is a comprehensive watershed model used to simulate hydrology, nonpoint runoff and soil processes, and in-stream water quality in complex agricultural, rural, and urban watersheds (Donigian and others, 1995). The HSPF model allows continuous simulation of the quantity and quality of land-based runoff linked with hydraulic routing and in-stream water-quality processes.

HSPF is an empirical model; conceptually, the model parameters have physical meaning but are not physically measurable and must be determined by calibration. The HSPF model is divided into three components to simulate the hydrology and water quality of a watershed: pervious land areas, impervious land areas, and stream reaches. The pervious land part of the hydrologic cycle is represented conceptually within HSPF by a series of interconnected water storage zones: an upper zone, a lower zone, and a groundwater zone (Duncker and others, 1995). Simple surface processes represent the impervious land part of the hydrologic cycle. The stream reaches simulate processes that occur in open or closed channel reaches, and they represent unidirectional flow through the channel network. Figure 3 is a schematic of how the model routes land-based runoff for both pervious and impervious areas. In pervious areas, the amount of water contained in the three storage zones and the flux of water between these zones and the stream or atmosphere are simulated on a continuous basis for a subarea having a given land cover and precipitation input. The flux of water between the storage zones and the stream or atmosphere is affected by a large number of model parameters, which are listed in table 1.

The Hydrological Simulation Program-Fortran EXPert system (HSPEXP) was used to assist in calibration of the hydrology of the Reedy Creek watershed model (Lumb and others, 1994). HSPEXP consists of a set of hierarchical rules designed to guide calibration of the model through a systematic evaluation of model parameters. Simulation errors are evaluated based on seven criteria: total volume, low-flow recession, 50 percent lowest flows, 10 percent highest flows, storm volumes, seasonal volume, and summer storm volume. Statistics calculated by HSPEXP provide the modeler with an evaluation of the agreement between simulated and observed runoff values.

Water-quality subroutines within HSPF simulate constituent processes and fluxes associated with pervious and impervious land surfaces, water-quality processes occurring within the stream reach, and advection of constituents downstream as water is

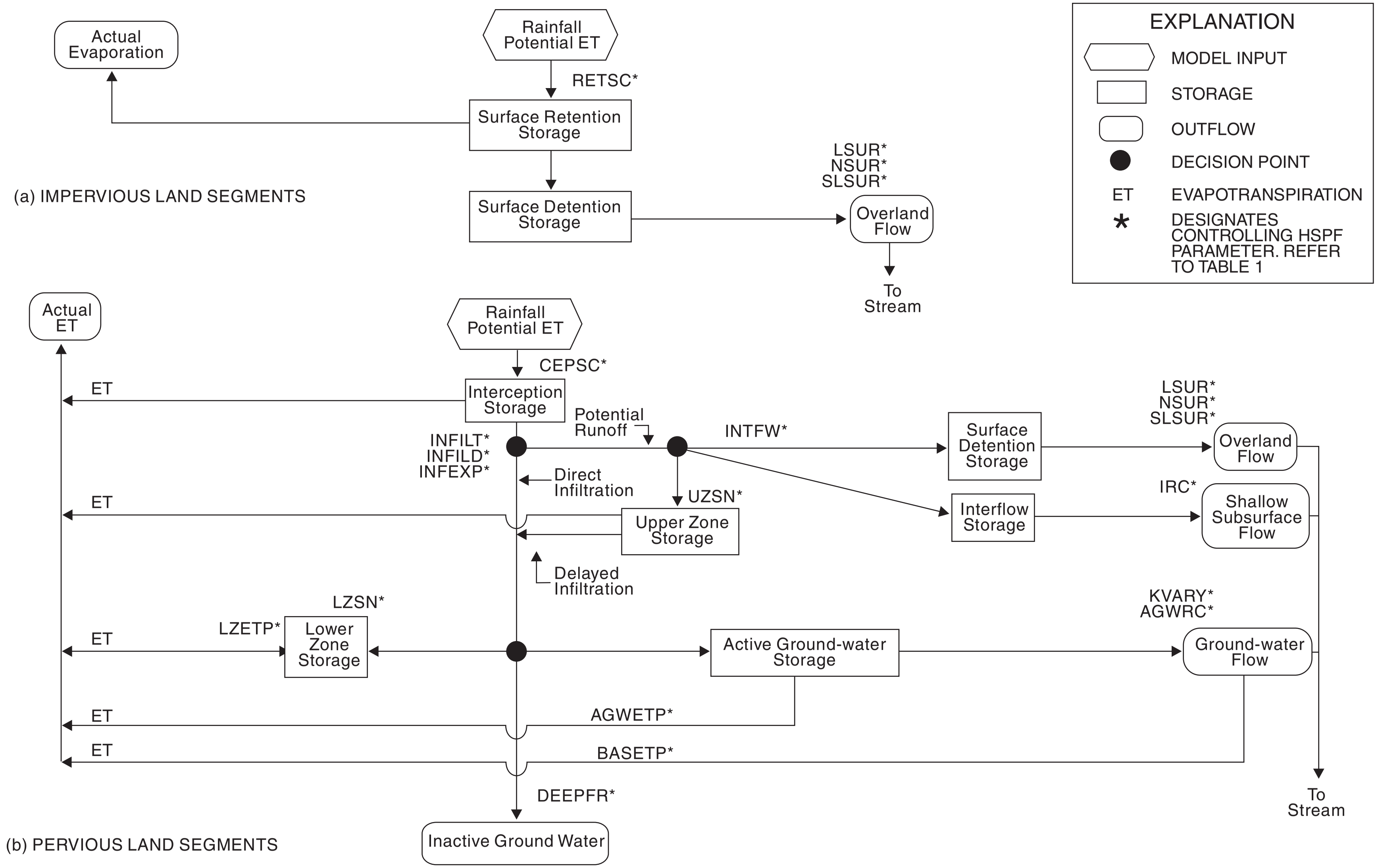


Figure 3. Hydrological Simulation Program-Fortran flowchart for (a) impervious and (b) pervious land segments (modified from Berris, 1995).

Table 1. Hydrological Simulation Program-Fortran (HSPF) parameters used to simulate hydrology

[land area: PERLND, pervious; IMPLND, impervious. Modified from Jarret and others, 1998, table 6]

Abbreviation	Explanation	Land area
LZETP	Lower zone evapotranspiration. An index value (ranging from 0 to 0.99) representing the density of deep rooted vegetation	PERLND
INFILT	Infiltration capacity. An index to the infiltration capacity of soils. This parameter also affects percolation to the ground-water zone	PERLND
INFEXP	Exponent for the infiltration equation. Controls the rate of infiltration decrease as a function of increasing soil moisture	PERLND
INFILD	Ratio of maximum to mean infiltration rate	PERLND
INTFW	Interflow index. An index that controls the amount of infiltrated water that flows as shallow subsurface runoff	PERLND
IRC	Interflow recession coefficient. An index for the rate of shallow subsurface flow	PERLND
CESPC	Interception storage capacity	PERLND
RETSC	Retention storage capacity	IMPLND
LZSN	Lower zone nominal storage. An index to the soil moisture holding capacity of the unsaturated zone	PERLND
UZSN	Upper zone nominal storage. An index to the amount of surface storage in depressions and the upper few inches of soil	PERLND
BASETP	Fraction of available potential-evapotranspiration demand that can be met from ground-water outflow. Simulates evapotranspiration from riparian vegetation	PERLND
AGWETP	Fraction of available potential-evapotranspiration demand that can be met from stored ground water. Simulates evapotranspiration from phreatophytes, in general	PERLND
AGWRC	Ground-water recession parameter. An index of the rate at which ground water drains from the land	PERLND
KVARY	Ground-water outflow modifier. An index of how much effect recent recharge has on ground-water outflow	PERLND
DEEPFR	Fraction of ground water that does not discharge to the surface within the boundaries of the modeled area	PERLND
LSUR	Average length of the overland flow plane	PERLND or IMPLND
SLSUR	Average slope of the overland flow plane	PERLND or IMPLND
NSUR	Average roughness of the overland flow plane	PERLND or IMPLND

routed through the channel system. HSPF simulates the contribution of water-quality constituents transported from land surfaces to stream reaches by overland flow, outflow from the interflow (shallow subsurface flow) storage zone, and outflow from the ground-water storage zone. Water-quality constituent concentrations transported from land surfaces can be simulated by a simple build-up and wash-off model of the constituent from the land surface or by a series of cycling reactions such as volatilization, denitrification, fixation, or mineralization of a constituent on the land surface. The simple build-up and wash-off model was used for the Reedy Creek watershed model. Outflow concentration of a water-quality constituent from the interflow and ground-water storage zones can be controlled by parameters affecting contribution of constituent concentration to the stream reach for each individual storage zone. In the Reedy Creek watershed model, constant constituent concentrations were applied to the interflow and ground-water flow for each pervious land cover type. HSPF has the ability to apply variable monthly concentrations to interflow and ground-water flow, but this was not applied to the Reedy Creek watershed model because monthly trends were not apparent in the observed in-stream water-quality concentrations.

Water-quality constituent loads simulated for pervious and impervious areas in HSPF are routed to the stream channel network. Physical processes such as longitudinal advection, heat balances; dissolved oxygen (DO), biochemical oxygen demand (BOD), and inorganic nitrogen and phosphorus balances; plankton populations; inorganic sediment deposition, scour, and transport; and other chemical reactions and processes are simulated within a single open- or closed-channel reach or a completely mixed lake (water-based processes). Precipitation, evaporation, and other fluxes influence the processes that occur in a stream reach. Water-quality processes occurring within the stream reach and simulated by HSPF are compartmentalized into subroutines for different constituent types that simulate constituent reactions, cycling, and interactions with other constituent types.

Data Collection and Compilation

Input data for the HSPF model include spatial data (land use, topography, and drainage characteristics such as reach length and cross section data) and time series data (air and water temperatures, wind speed, atmospheric deposition rates of ammonia and nitrate nitrogen, rainfall, potential ET, solar radiation, and application rates of irrigation and treated wastewater). Time series of daily mean discharge, daily mean DO concentration, and periodic observations of water-quality constituent concentrations were used for calibration and confirmation of the model.

Spatial Data

Land-use and topographic data for the Reedy Creek watershed were derived using GIS data provided by the St. Johns River Water Management District, South Florida Water Management District, Southwest Florida Water Management District, and RCID. Land-use data were available for the period of 1986-90 and land-cover attributes from GIS data sources were correlated with the USGS land-use and land-cover classification system for use with remote sensor data (U.S. Geological Survey, 1990). GIS land-use data were adjusted, based on land-cover type and additional land-use information obtained by ground truth observation and data from the U.S. Department of Agriculture, National Agricultural Statistics Service (1999), to represent the distribution of land use in the Reedy Creek watershed as it existed in January 1990. No adjustments were made to the land-use or land-cover data for changes that might have occurred during the simulated period (January 1990-December 1995). This period was selected, however, because relatively little development occurred in the Reedy Creek watershed during that time.

Time Series Data

Metorologic data compiled and used as input to the Reedy Creek watershed model include air temperature, wind speed, atmospheric deposition of ammonia and nitrate nitrogen, rainfall, solar radiation, and pan evaporation (used to calculate potential ET) (table 2).

Table 2. Meteorologic and atmospheric-deposition sites used for the Hydrological Simulation Program-Fortran model of the Reedy Creek watershed, Florida

[Abbreviation for data type: D, atmospheric deposition; S, solar radiation; P, pan evaporation; W, wind speed; T, air temperature; R, rainfall. Abbreviation for source of data: NADP, National Atmospheric Deposition Program/National Trends Network; NOAA, National Oceanic and Atmospheric Administration; M&E, Metcalf and Eddy Services, Inc.; USGS, U.S. Geological Survey. --, not applicable or no data. Sites listed in figure 4]

Map number	Site name	Site number	Latitude	Longitude	Data type	Frequency	Source of data
1	Kennedy Space Center	FL99	28° 32' 34"	80° 38' 40"	D	Quarterly	NADP
2	Daytona Beach International Airport	082158	29° 11' --"	81° 03' --"	S	Hourly	NOAA
3	Lisbon	085076	28° 52' --"	81° 47' --"	P	Daily	NOAA
4	Orlando International Airport	086628	28° 26' 02"	81° 19' 30"	W	Hourly	NOAA
5	Orlando International Airport	086628	28° 26' 02"	81° 19' 30"	T	Hourly	NOAA
6	Orlando International Airport	086628	28° 26' 02"	81° 19' 30"	R	Hourly	NOAA
7	Clermont 7 S	081641	28° 27' --"	81° 45' --"	R	Daily[1]	NOAA
8	Lake Alfred Exp Station	084707	28° 06' --"	81° 43' --"	R	Daily[1]	NOAA
9	Kissimmee 2	084625	28° 17' --"	81° 25' --"	R	Daily[1]	NOAA
10	Water Conserv II Rain Gage 6-1	--	28° 29' 56"	81° 36' 57"	R	Daily[1]	M&E
11	Water Conserv II Rain Gage 6-2	--	28° 29' 28"	81° 37' 03"	R	Daily[1]	M&E
12	Water Conserv II Rain Gage 6-3	--	28° 29' 15"	81° 37' 27"	R	Daily[1]	M&E
13	Water Conserv II Rain Gage 6-4	--	28° 29' 25"	81° 37' 53"	R	Daily[1]	M&E
14	Water Conserv II Rain Gage 7-1	--	28° 27' 18"	81° 38' 05"	R	Daily[1]	M&E
15	Water Conserv II Rain Gage 7-2	--	28° 27' 05"	81° 37' 34"	R	Daily[1]	M&E
16	Water Conserv II Rain Gage 9-1	--	28° 26' 15"	81° 37' 54"	R	Daily[1]	M&E
17	Lateral 101 at S-101 near Lake Buena Vista	02264060	28° 22' 28"	81° 31' 01"	R	Hourly	USGS
18	Lateral 410 at S-410 near Vineland	02266295	28° 21' 58"	81° 35' 55"	R	Hourly	USGS

[1] Data collected at least daily but typically hourly.

Daily maximum and minimum air temperature and daily wind speed collected by the National Oceanic and Atmospheric Administration (NOAA) at the Orlando International Airport weather station (fig. 4, map numbers 4-5) were compiled (National Oceanic and Atmospheric Administration, National Climatic Data Center, 1999). Total atmospheric deposition of ammonia nitrogen and nitrate nitrogen collected seasonally by the National Atmospheric Deposition Program/National Trends Network (NADP/NTN) at the Kennedy Space Center atmospheric deposition station (fig.4, map number 1) also were compiled for use in the watershed model (National Atmospheric Deposition Program/National Trends Network, 1999).

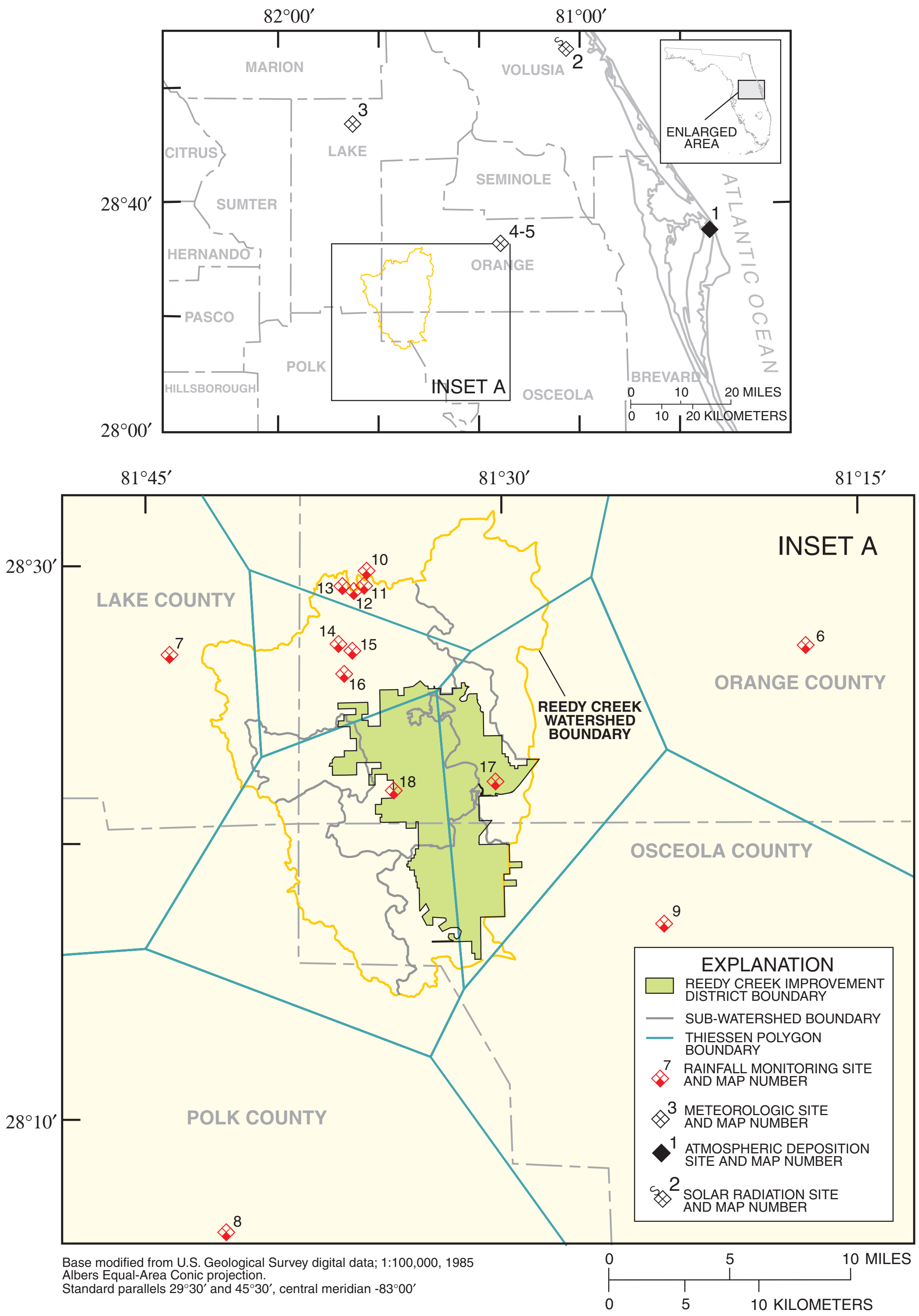
Because of the uneven distribution of rainfall data-collection sites, a Thiessen polygon analysis (Thiessen, 1911) was required to determine the spatial distribution of rainfall data for model input. Rainfall data for numerous sites in central Florida around the 177-mi^2 study area were examined for length of available record and missing record. Sites considered for use in the model included seven sites in the northern and northwestern parts of the watershed (fig. 4, table 2, map numbers 10-16), two in the central part of the watershed (fig. 4, table 2, map numbers 17-18), and four sites located outside of the watershed (fig. 4, table 2, map numbers 6-9). Rainfall data at these sites were evaluated for missing record, and compared for variability in daily, monthly, and annual totals. Before using the rainfall sites for the Thiessen polygon analysis, further analysis was done to determine whether redundancies existed in data at the rainfall sites because of the close proximity of some of the rainfall sites relative to others used in the analysis. If redundancies were detected based on the analysis, data from these sites could be grouped together, and an average rainfall total used for the model input.

Possible redundancies in the data at closely located rainfall sites were evaluated by analyzing rainfall totals between rainfall sites, and the effect of distance on the correlation of rainfall totals. For the analysis, 5 years of daily rainfall record were evaluated and correlation coefficients were computed between pairs of rainfall sites based on daily, 7-day, 14-day, 21-day, and 30-day cumulative rainfall totals. The correlation coefficients for pairs of rainfall sites were plotted as a function of distance between sites to determine whether there was redundancy in the data among the sites.

Results of the correlation analysis between rainfall totals at sites as a function of distance varied depending on the period of time over which the rainfall was being summed, as well as by distance. In general, higher correlations between sites resulted when summed over longer periods of time (14 to 30 days) or for shorter distances when summed for shorter time periods (1 to 7 days). For example, the correlation between daily total rainfall at sites only 1 mi apart was 0.92, but at a distance of 6 mi or more, the correlation coefficient decreased to only 0.5. For 7-day rainfall sums, sites located 2 mi apart or closer had a correlation coefficient of 0.9 or better; the correlation coefficients decreased to 0.83 where sites were 3.8 mi apart or more, and to 0.71 where sites were 5.3 mi apart. For 14-day rainfall totals, the correlation coefficients ranged from 0.97 for sites less than 0.5 miles apart to 0.73 for sites 5.3 mi apart. At a summing interval of 30 days, stations 3.77 mi or closer were correlated at 0.9 or better; but at distances of 5.3 mi or greater, correlations ranged from 0.8 to 0.4.

Rainfall data for the USGS sites within the RCID were the most poorly correlated (fig. 4, table 2, map numbers 17-18); these daily values were closely examined and the records compared to the NOAA and Water Conserv II sites (fig. 4, table 2, map numbers 6-9 and 10-16, respectively). Even though rainfall data at the USGS sites were poorly correlated, those sites have the advantage of being located within the central part of the watershed and thus better suited for generation of rainfall-runoff in the watershed than sites near the boundaries or external to the watershed. Although the RCID currently (2001) maintains a rainfall data network, no data were available for the first 2 years of the simulation period. When available, however, RCID data were used to supplement data collected at nearby USGS rainfall sites.

Thiessen polygon analysis was combined with the correlation-distance analysis to determine which Thiessen polygon scenario to apply to the watershed model. Several analyses were tried based on distances between sites, using the correlation-distance analysis as a guide for initial trials. Thiessen polygons were determined using distances ranging from 1 to 8 mi. At a distance of 5 mi or greater, the resulting Thiessen polygons for the study area were identical using a set of 13 rainfall sites. Based on these analyses, Thiessen polygons based on a distance between sites of greater than 4 mi were used for the spatial distribution of rainfall data in the model. Data for rainfall sites located



Base modified from U.S. Geological Survey digital data; 1:100,000, 1985
Albers Equal-Area Conic projection.
Standard parallels 29°30′ and 45°30′, central meridian -83°00′

Figure 4. Meteorologic and atmospheric deposition sites (top), and rainfall sites and Thiessen polygons (Inset A) used for the Hydrological Simulation Program-Fortran model of the Reedy Creek watershed, Florida (map numbers are listed in table 2).

within one Thiessen polygon were averaged for that polygon. This was done for sites located at map numbers 10-13, and map numbers 14-16 (fig. 4, Inset A). For all other Thiessen polygons, a single rainfall site was available for use as input to the model.

Using the Thiessen polygon analysis, the Reedy Creek watershed was divided into four major rainfall areas: (1) the upper Reedy Creek watershed (fig. 4, map numbers 10-13); (2) upper Reedy Creek watershed south (fig. 4, map numbers 14-16); (3) southern Reedy Creek watershed east, represented by rainfall at Lateral 101 at S101 near Lake Buena Vista (fig. 4, map number 17); and (4) southern Reedy Creek watershed west, represented by rainfall at Lateral 410 at S-410 near Vineland (fig. 4, map number 18). Rainfall from the NOAA weather station at Orlando International Airport (fig. 4, map number 6) was used for data comparison and disaggregation of non-hourly rainfall to hourly rainfall data. A summary of rainfall data used for Thiessen polygon areas used in the watershed model is given in table 3.

Evapotranspiration is a function of many variables including vegetation type, net radiation, solar radiation, wind speed, and air temperature. Results from several studies in and near the study area provided information on which to base ET estimates (Tibbals, 1990; Lee and Swancar, 1994; and Phelps and others, 1995). Pan evaporation data collected at a NOAA station at Lisbon (fig. 4 and table 2, map number 3) were determined to best represent conditions for the entire watershed. Pan evaporation data were corrected using pan coefficients determined in studies at Belle Glade, near Lake Okeechobee (Kohler, 1954), so as to represent potential ET across the watershed.

Irrigation of agricultural areas using ground water and application of treated wastewater are sources of water applied to the watershed but not included in rainfall totals. Data on irrigation practices and application rates were obtained from Orange County, the City of Orlando, O'Reilly (1998), and the files of the USGS, Altamonte Springs, Florida. A monthly time series of irrigation applied to agricultural areas was developed for the study period, January 1990 to December 1995. Application rates of treated wastewater applied to RIBS for the study period were supplied by the RCID. A time series of total monthly application of wastewater to the RIBS was developed for use in the model.

Streamflow data have been collected by the USGS at sites within the Reedy Creek watershed for many years. Daily discharge data for 10 sites (table 4, fig. 2) in the basin are available for the 6-year study period, January 1990 to December 1995 (U.S. Geological Survey, 2000). Data for six sites were used to develop, calibrate, and confirm model parameters for the watershed: Cypress Creek at Vineland, Bonnet Creek near Vineland, Whittenhorse Creek near Vineland, Reedy Creek near Vineland, Davenport Creek near Loughman, and Reedy Creek near Loughman (USGS site numbers 02264000, 02264100, 02266200, 02266300, 02266480, and 02266500; map numbers 21, 22, 25, 29, 31, and 33 in fig. 2, respectively). Four sites are located at hydrologic structures where collection of representative hydrologic data is difficult: Reedy Creek at S46 near Vineland, Lateral 405 at S-405A near Doctor Phillips, Lateral 405 below S-405 near Vineland, and Reedy Creek at S-40 near

Table 3. Representative rainfall areas used for the Hydrologic Simulation Program-FORTRAN model of the Reedy Creek watershed, Florida

[Thiessen polygon areas are shown in fig. 4]

Site name	Maximum daily rainfall (inches)	Date of maximum rainfall	Annual rainfall total (inches)						Annual mean rainfall (inches)
			1990	1991	1992	1993	1994	1995	
Southern Reedy Creek watershed east[1]	5.21	8-2-95	39.27	46.84	55.63	57.28	45.57	67.61	52.03
Southern Reedy Creek watershed west[2]	3.76	6-16-94	39.41	60.97	55.21	52.14	58.37	53.08	53.20
Upper Reedy Creek watershed[3]	3.82	6-17-94	36.46	50.48	43.36	37.16	68.30	51.02	47.80
Upper Reedy Creek watershed south[4]	3.35	9-30-90	39.27	51.40	44.26	40.05	62.82	51.51	48.22

[1] Lateral 101 at S-101 near Lake Buena Vista.

[2] Lateral 410 at S-410 near Vineland.

[3] Composite of Water Conserv II rain gage sites 6-1, 6-2, 6-3, and 6-4.

[4] Composite of Water Conserv II rain gage sites 7-1, 7-2, and 9-1.

Table 4. Streamflow and water-quality data-collection sites, Reedy Creek watershed, Florida

[USGS, U.S. Geological Survey; data type: D, discharge; De, estimated daily discharge; P, periodic water-quality; T, continuous water temperature; O, continuous dissolved oxygen. --, not available. Map number shown in figure 2]

Map number	Site name and USGS identification number	Latitude	Longitude	Date established	Drainage area[1] (square miles)	Data type
21	Cypress Creek at Vineland (02264000)	28° 23' 25"	81° 31' 11"	August 1954	29.3	D, P
22	Bonnet Creek near Vineland (02264100)	28° 19' 30"	81° 31' 15"	May 1966	44.7	D, P
23	Bonnet Creek near Kissimmee (02264140)	28° 18' 28"	81° 31' 28"	June 1986	--	De
24	Reedy Creek at S46 near Vineland (02266025)	28° 24' 18"	81° 36' 42"	October 1986	25.4	D
25	Whittenhorse Creek near Vineland (02266200)	28° 23' 05"	81° 37' 00"	May 1966	12.4	D, P
26	Lateral 405 at S-405A near Doctor Phillips (02266291)	28° 25' 37"	81° 36' 19"	October 1986	19.6	D
27	Lateral 405 below S-405 near Vineland (02266294)	28° 23' 39"	81° 35' 07"	October 1970	indeterminate	D, P
28	Reedy Creek above Hwy 192 near Vineland (02266298)	28° 20' 54"	81° 34' 53"	May 1986	--	T
29	Reedy Creek near Vineland (02266300)	28° 19' 57"	81° 34' 48"	May 1966	84.6	D, P, T, O
30	Reedy Creek at I-4 near Loughman (02266320)	28° 17' 54"	81° 34' 40"	May 1986	--	T
31	Davenport Creek near Loughman (02266480)	28° 16' 15"	81° 35' 28"	January 1969	23.0	D, P
32	Reedy Creek at S-40 near Loughman (02266495)	28° 16' 32"	81° 32' 39"	October 1986	174	D, T, O
33	Reedy Creek near Loughman (02266500)	28° 15' 48"	81° 32' 12"	October 1939	177	D, P

[1] Drainage area from U.S.Geological Survey, 2000, Water resources data, Florida, water year 1999, volume 1A.

Loughman (USGS site numbers 02266025, 02266291, 02266294, and 02266495; map numbers 24, 26, 27, and 32 in fig. 2, respectively). Data for these four sites are of relatively poor quality in comparison to sites used for model parameter development, calibration, and confirmation, so these data were not directly used in model development, calibration, or confirmation.

Flow is diverted from the Reedy Creek watershed to the east through a pair of gated culverts at the USGS gaging station Bonnet Creek near Kissimmee (USGS site number 02264140; map number 23 in fig. 2). Data for the site were not available for the modeled period; however, German (1989) collected flow data and computed discharge at the site for the period June 1986 to May 1987. These data were used to estimate the flow diversion for the modeled time period by using a linear regression. Discharge values calculated by German (1989) at this location and recorded values for water-surface elevation at Reedy Creek at S-40 near Loughman were correlated (fig. 5). The regression yielded a coefficient of determination (R^2) of 0.60, a standard error of estimate of 8.74 cubic feet per second (ft^3/s), and relatively normal distribution of residuals (fig. 5). The daily amount of water diverted from Bonnet Creek for the simulated time period was calculated based on this regression.

Water-quality time series data suitable for simulation of water-quality reactions and comparison with simulation results are available for several locations in the Reedy Creek watershed (fig. 2, table 4). Continuous water temperature and DO concentration data have been collected by the USGS at sites within the Reedy Creek watershed since 1977 (U.S. Geological Survey, 2000). Hourly water temperature data were used to represent water temperatures in the watershed, and mean daily DO concentrations were used for comparison to simulation results. Periodic water samples have been collected and analyzed for nutrient concentrations by the USGS and RCID at sites within the Reedy Creek watershed and were used for comparison

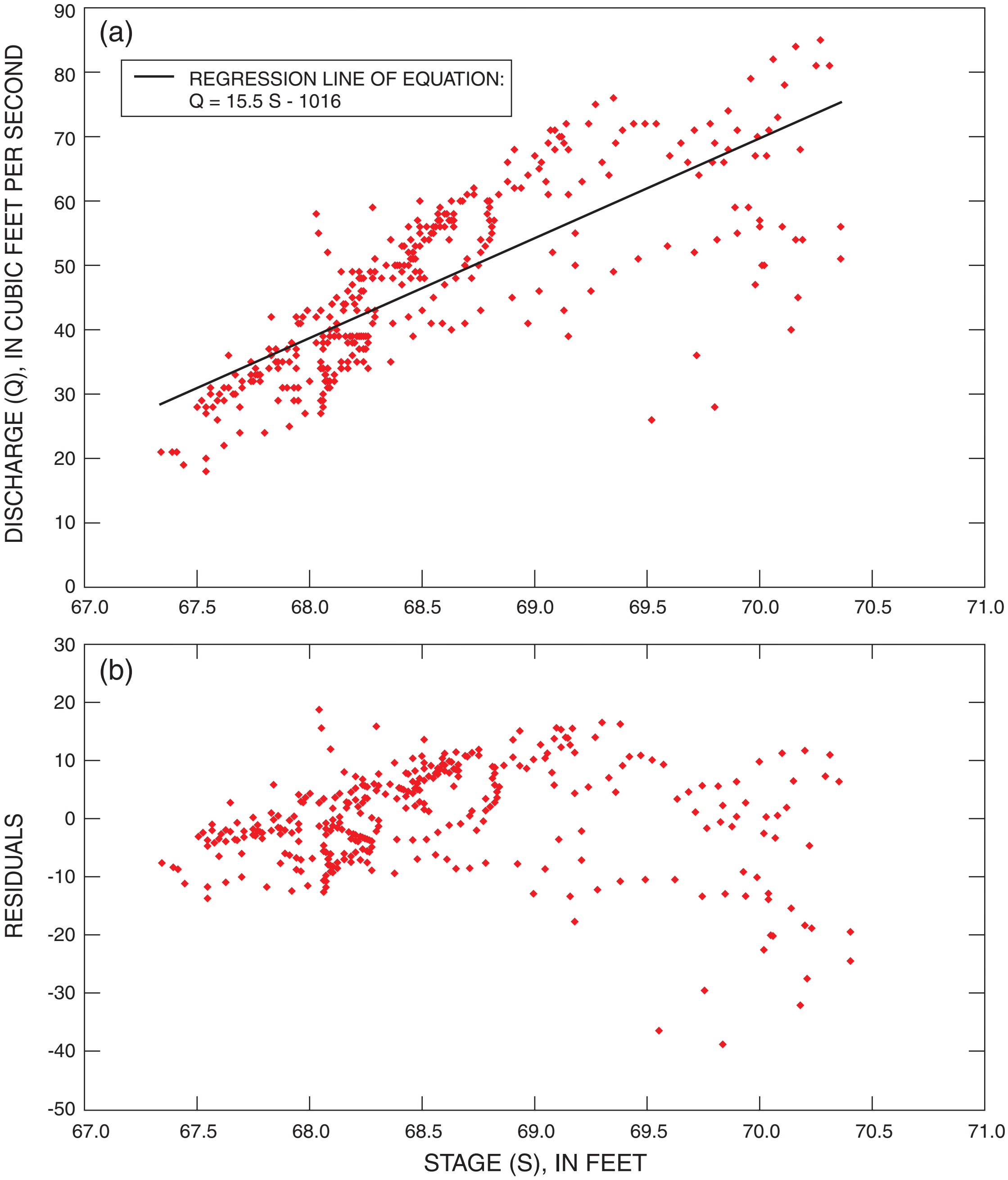


Figure 5. Relations between (a) discharge and stage and (b) regression residuals and stage for Bonnet Creek near Kissimmee, Florida.

to simulation results. Observed water-quality data were used for adjustment of model parameters and for evaluation of the goodness-of-fit of the model.

Solar radiation data available from the USEPA, Better Assessment Science Integrating Point and Nonpoint Sources (BASINS) system, were used in the Reedy Creek watershed model for simulation of water-quality processes occurring within a stream reach (U.S. Environmental Protection Agency, 1999). Atmospheric deposition data available from the National Atmospheric Deposition Program/National Trends Network (NADP/NTN) were used in the Reedy Creek watershed model to simulate build-up and wash-off of a constituent from pervious and impervious land areas (National Atmospheric Deposition/National Trends Network, 1999). Quarterly total atmospheric deposition data of ammonia nitrogen and nitrate nitrogen for a site in east-central Florida at the Kennedy Space Center (fig. 4 and table 2, map number 1) were compiled from data available on the World Wide Web. Hourly solar radiation data for a site in east-central Florida at Daytona Beach International Airport (fig. 4 and table 2, map number 2) were compiled from data sources available in the BASINS system.

Model Development

The major steps for simulating runoff quantity and quality for the Reedy Creek watershed during this study included: simulation plan development; database development; watershed segmentation; parameter estimation and input preparation; hydrology and water-quality calibration and confirmation; and simulation of an alternative scenario. The initial steps in model development were simulation planning and database development. The watershed model provided the computational foundation for evaluating the effects of changes in land use on hydrology and water quality. Data were compiled, evaluated, and processed to define the watershed characteristics, and to provide inputs and fluxes necessary for calibration and confirmation of the model.

The classification of watershed characteristics and the division of the land surface into land-use types is called watershed segmentation (Donigian and others, 1995). The Reedy Creek watershed was segmented into three components for runoff and water-quality simulation by HSPF: land-use types, land segments based on drainage basin characteristics, and channel reaches. This division allows the assignment of parameter values to discrete land parcels and channel reaches, the assignment of runoff volumes to specific destinations, the representation of build-up and wash-off of constituents from the land surface, and the simulation of in-stream water-quality processes.

Based on the available spatial data, it was determined that six land-use types characterize the Reedy Creek watershed: agriculture, rangeland, forest, wetlands, RIBS, and urban areas (fig. 6). HSPF simulates runoff from pervious and impervious land surfaces, so the land-use types defined for the Reedy Creek watershed were grouped into pervious and impervious categories. Agriculture, rangeland, forest, wetlands, and RIBS land-use types are considered pervious land areas. Pervious and impervious land areas for urban areas were calculated based on land-use and land-cover classification in the spatial analysis (U.S. Geological Survey, 1990), impervious area percentages described in Wanielista and Yousef (1993, p. 506), and information provided by the RCID (K. Kolbo, Reedy Creek Improvement District, oral commun., 1999). Percentages of pervious and impervious land area for indicated land-use types within modeled sub-watersheds of the Reedy Creek watershed for 1990 are shown in table 5.

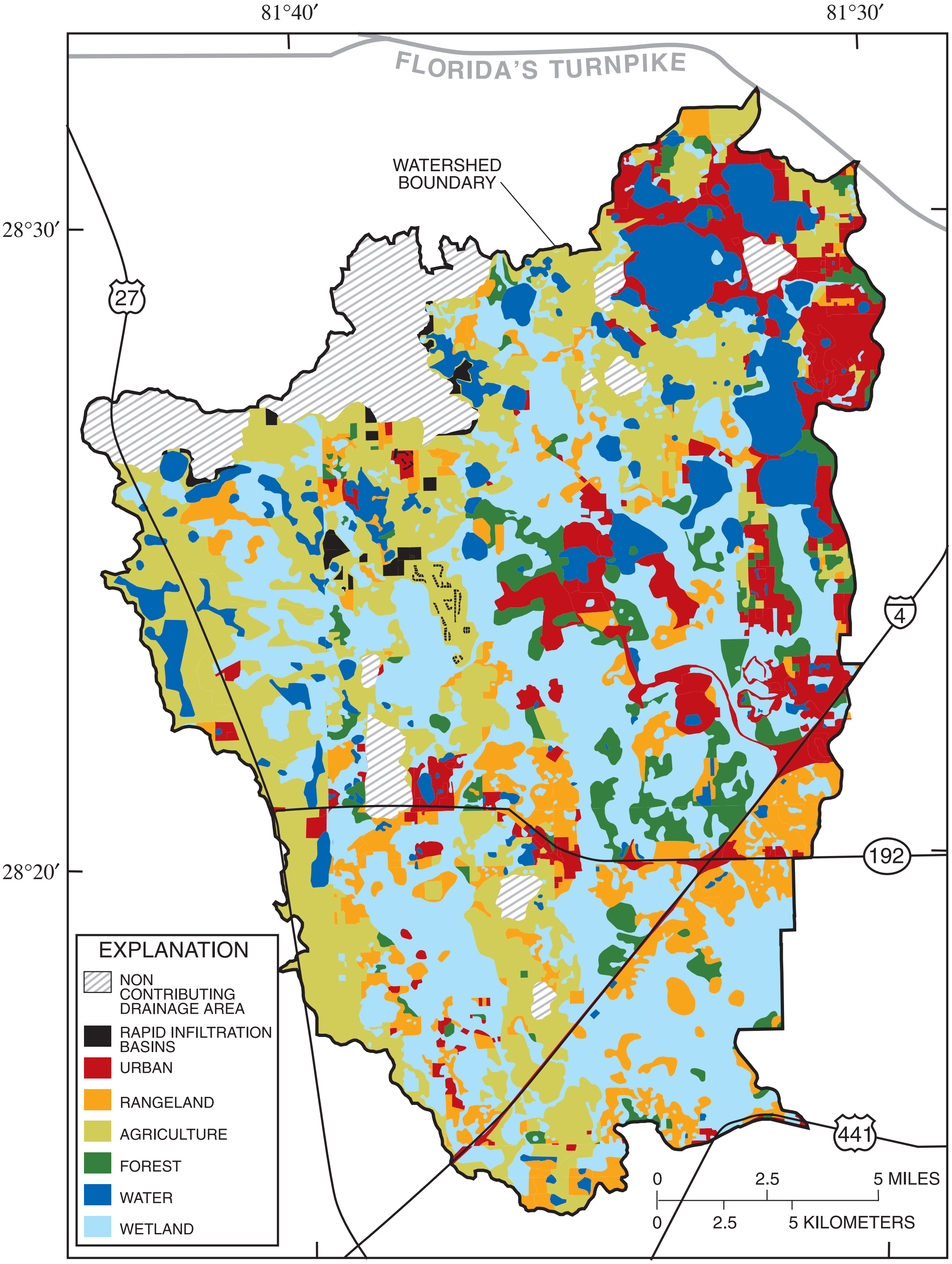
The watershed was divided into land segments for simulation purposes based on the location of streamflow gaging stations (table 4). A land segment is a parcel of land with distinctive but fairly uniform meteorological, physical (soil and slope), and hydrologic traits and is assumed to produce a homogeneous hydrologic and water-quality response for a given land-use type. Individual land segments with similar characteristics belong to the same land-segment type.

Table 5. Percentages of modeled pervious and impervious land areas based on geographic coverages from 1990 for land use types in sub-watersheds used in the Hydrological Simulation Program-Fortran model of the Reedy Creek watershed, Florida

[When the sum of percentages is less than 100 percent, the remaining area is covered by open water; RIBS, rapid infiltration basins]

Sub-watershed	Pervious land area (percent)						Impervious land area (percent)
	Agriculture	Forest	Rangeland	Urban	Wetland	RIBS	
Whittenhorse Creek	27.5	2.4	19.0	1.3	43.6	0.4	0.6
Davenport Creek	45.5	2.8	16.0	3.6	26.7	0.0	1.5
Reedy Creek near Vineland	20.3	5.5	21.5	5.3	34.4	0.2	3.6
Bonnet Creek near Vineland[1]	2.2	10.8	14.2	9.8	40.1	0.0	13.2
Reedy Creek near Loughman[1]	19.9	6.0	20.0	5.4	37.3	0.1	4.1

[1] Does not include land areas in the Cypress Creek Basin.



Base modified from U.S. Geological Survey digital data; 1:100,000, 1985
Albers Equal-Area Conic projection.
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Figure 6. Land use in the Reedy Creek watershed, Florida, used in the 1990-95 hydrologic and water-quality simulations.

Each land-segment type is assigned its own process-related parameters. Each land segment contains one or more of the six land-use types defined within the watershed. The segmentation of the land surface generally is based on the spatial variability in precipitation and differences in the physical characteristics of the watershed. Land segmentation for this study was based on topography, land use, depth to water table, and the relative altitudes of land surface and the Floridan aquifer system potentiometric surface (recharge and discharge areas). The Reedy Creek watershed was subdivided into five major land segments (fig. 7, table 6).

Table 6. Description of channel reaches and associated land segments assigned for routing of runoff through the Reedy Creek watershed, Florida, in the Hydrological Simulation Program-Fortran model

[mi, miles; --, not applicable; see fig. 8 for reach number, see fig. 7 for land segments]

Reach number	Reach description	Reach length (mi)	Drains to reach	Associated land segment
2	Bay Lake and Seven Seas Lagoon	1.00	3, 10	1
3	Upper L-405 Canal	5.56	6	1
4	C-4 Canal	2.13	6	1
5	L-403, EPCOT	3.36	6	1
6	Lower L-405 Canal	2.50	7	1
7	Reedy Creek near Vineland	2.01	8	1
8	Reedy Creek above I-4	2.52	15	1
9	Lake Mabel and South Lake	2.00	12	1
10	L-105 Canal	1.77	12	1
11	L-103 Canal and Lake Buena Vista	2.92	13	1
12	L-107 Canal and Upper C-1 Canal	6.75	13	1
13	Bonnet Creek near Vineland	2.37	14	1
14	Lower C-1 Canal	4.51	15	1
15	Reedy Creek at S-40	2.84	16	1
16	Reedy Creek near Loughman	--	--	1
21	Cypress Creek	--	11	2
31	Upper East Reedy Creek	1.0[1]	3	3
41	Upper West Reedy Creek	1.0[1]	4	3
51	Whittenhorse Creek	2.37	4	4
61	Davenport Creek	4.64	15	5

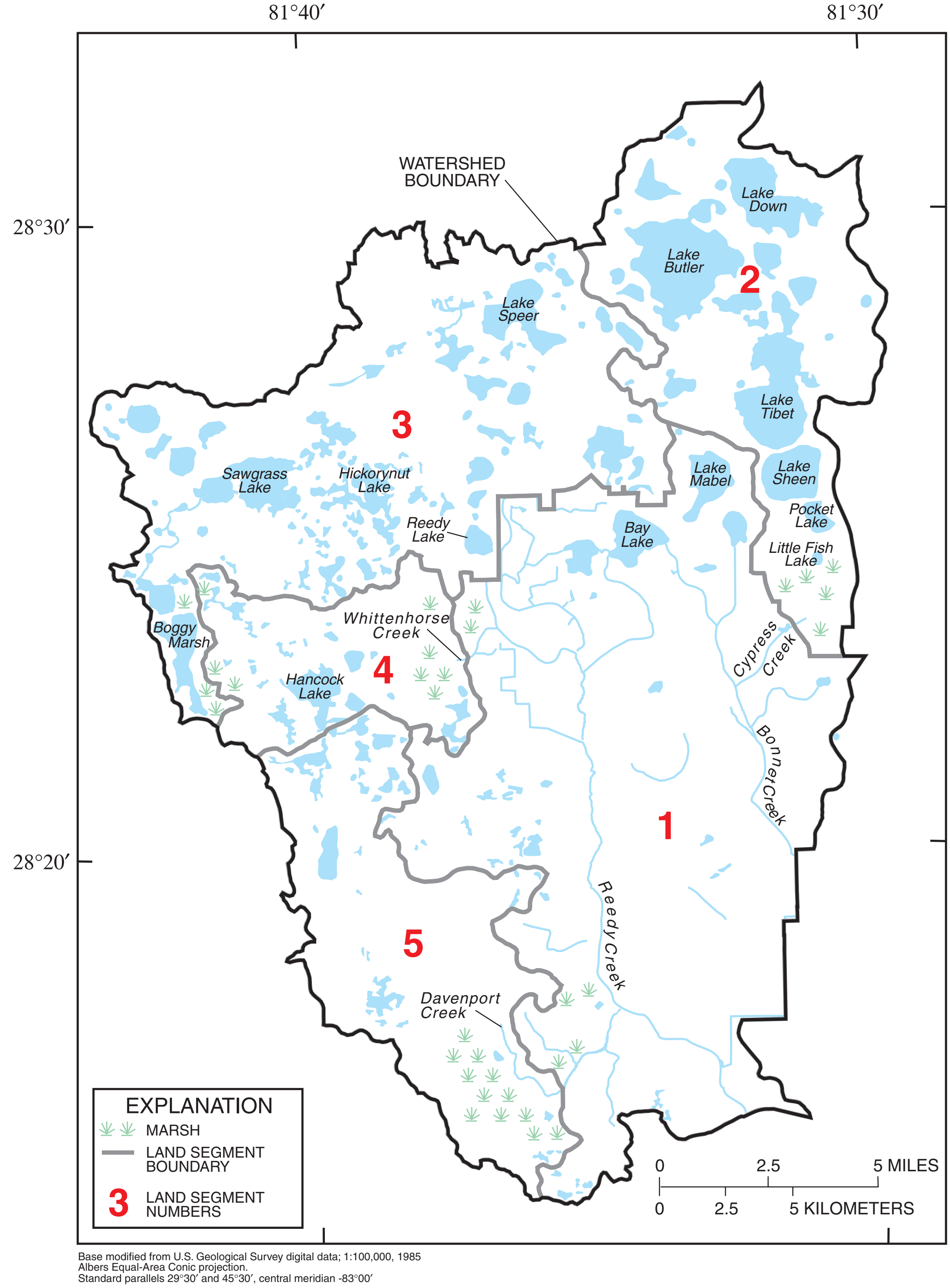
[1] Reach drains wetland with no clearly defined channel; reach represented as 1 mile for modeling purposes.

The HSPF model performs a simple routing of streamflow along channels of a drainage network to the outlet of a drainage basin. Use of the routing capability requires that a linked network of stream channels, lakes, ponds, and wetlands is divided into segments called channel reaches. A channel reach has relatively uniform morphologic and hydraulic properties, and drains or connects sub-watersheds. Segmentation of channel reaches is somewhat generalized in the Reedy Creek watershed and is not intended to represent every culvert, ditch, pond, and channel in the drainage network.

Characterization of the stream channel system was based on measured channel cross-section data and topographic information. Cross-section data were derived from USGS streamflow records and from input files of the UNET hydraulic model (R. L. Barkau, written commun., 1992) of the RCID (M. Elsabagh, Reedy Creek Improvement District, oral commun., 1997). Accurate characterization of the stream channel is needed to provide a sound basis for routing streamflow and water-quality constituents through the channel system so that the model will approximate the observed hydrologic and water-quality data as closely as possible.

Segmentation of the stream channel reaches was based on the location of man-made structures, channel slope, and changes in the channel from natural to altered conditions (or the opposite, altered conditions to natural channel conditions). A total of 20 stream channel reaches was used to represent the movement of runoff and its constituents through stream channels and their tributaries (fig. 8, table 6). The length of the reaches varied from 1.0 to 6.8 mi. Stream reaches 31 and 41 drain low wetland areas with no clearly defined channel; the length of each reach was represented as 1 mi for modeling purposes. Each lake in the Reedy Creek watershed was not explicitly modeled. Lake and wetland areas directly linked with the stream channel network were accounted by reach-reservoir interactions in the model. Reaches 2-16 are associated with land segment 1 (RCID internal area), reach 21 (Cypress Creek) is associated with land segment 2, reaches 31 and 41 (Upper East and Upper West Reedy Creek, respectively) are associated with land segment 3, reach 51 (Whittenhorse Creek) is associated with land segment 4, and reach 61 (Davenport Creek) is associated with land segment 5 (table 6).

The HSPF source code includes 17 parameters for simulating hydrology of the rainfall-runoff process for pervious land surfaces (PERLND) and four parameters for impervious land surfaces (IMPLND) (table 1). Water quality of surface runoff was simulated in the pervious and impervious parts of the HSPF model



Base modified from U.S. Geological Survey digital data; 1:100,000, 1985
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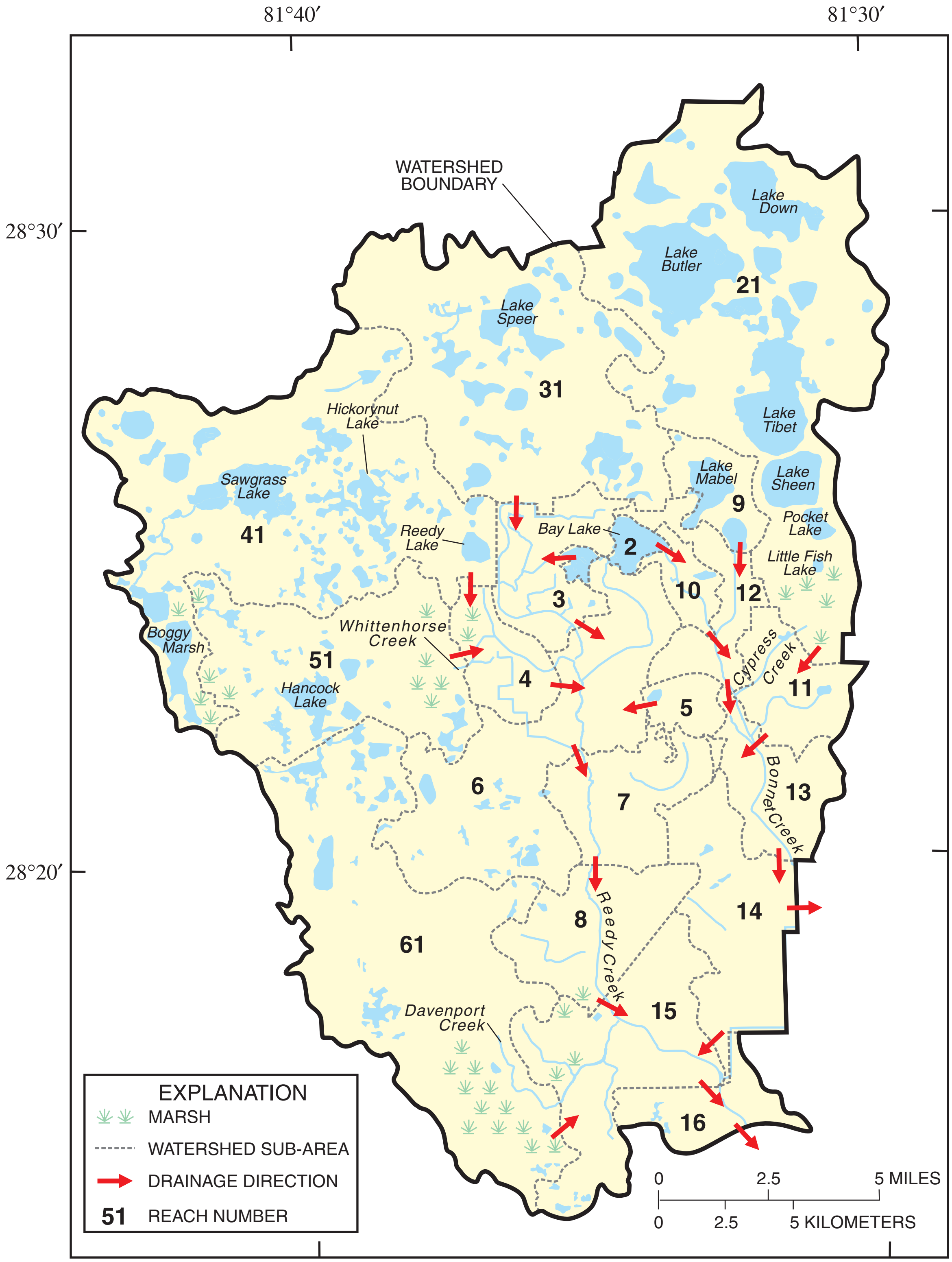
Standard parallels 29°30′ and 45°30′, central meridian -83°00′

Figure 7. Distribution of land segments in the Reedy Creek watershed, Florida (land segment numbers from table 6).



Base modified from U.S. Geological Survey digital data; 1:100,000, 1985
Albers Equal-Area Conic projection.
Standard parallels 29°30′ and 45°30′, central meridian -83°00′

Figure 8. Surface-water reach network used in the Reedy Creek watershed, Florida (reach number from table 6).

by build-up and wash-off of constituents from the land surface. Water quality of the interflow and ground-water flow was simulated in the pervious parts of the HSPF model by contribution of a constant constituent loading for each land-use type. Nutrient cycling in-stream reaches was simulated using three water-quality subroutines in HSPF: 1) primary DO and BOD balances; 2) primary inorganic nitrogen and phosphorus balances; and 3) plankton populations (Bicknell and others, 1993). Parameters used in water-quality subroutines for simulation of nutrient cycling in-stream reaches for the Reedy Creek watershed model are listed in appendix A. Values for hydrologic parameters initially were estimated from values used in a modeling study in South Florida (AQUA TERRA Consultants and Linsley, Kraeger Associates, 1997). Water-quality parameter values initially were estimated from model input files from previous water-quality studies (U.S. Environmental Protection Agency, 2001), ground- and surface-water constituent concentration values and reactions reported by German (1986 and 1990), Hampson (1993), and Sumner and Bradner (1996), and files of the USGS in Altamonte Springs, Florida. The HSPF user control input (UCI) file used to simulate hydrology and water quality for the Reedy Creek watershed is listed in appendix D.

The Cypress Creek (fig. 2) watershed lacked sufficient rainfall data, continuous lake-stage data, and bathymetric data needed for simulation using HSPF. The closest rainfall site that could be used in the model to simulate runoff in the Cypress Creek watershed was about 1.5 mi southwest of the southern part of the watershed. Spatial variability of rainfall across the Cypress Creek watershed can cause varying lake levels among the large and numerous hydraulically interconnected lakes within the watershed. These lake level differences can result in flow reversals in the canals connecting the lakes. Wind also can affect lake levels and movement of water through the canals. Channel roughness and associated resistance to flow also can affect water movement from Pocket and Little Fish Lakes into the swamp upstream of the Cypress Creek gaging station. Adequate hydrologic modeling of the Cypress Creek watershed using HSPF would require data that were not available during the study period. After many attempts to simulate discharge from Cypress Creek with HSPF, it was determined that the best approach to modeling the entire Reedy Creek watershed was to use the observed flow and periodic water-quality data from the USGS gaging station at Cypress Creek near Vineland as a point source for use in the hydrologic and water-quality parts of the HSPF model. Land areas within the Cypress Creek drainage were excluded from the model, and daily discharge values were input as a point source of inflow to the stream reach downstream from the USGS gaging station at Cypress Creek near Vineland.

Hydrologic Model Calibration

Because of the complexity of the stream system within the RCID (hydraulic structures, retention ponds) and the anticipated difficulty of modeling the system, an approach of calibrating the model parameters for a subset of the gaged watersheds and confirming the usefulness of the parameters by simulating the remainder of the gaged sites was selected for this study. The use of calibrated parameter sets for regional (for example, countywide) floodplain and stormwater management on ungaged watersheds or at ungaged sites on gaged watersheds has frequently been applied since Lumb and James (1976) proposed this approach for stormwater management in DeKalb County, Georgia. This approach was commonly applied for floodplain management in northeastern Illinois (Price, 1994; Duncker and others, 1995), and also has been applied successfully in Louisville, Kentucky (Jarrett and others, 1998) and in southwestern Minnesota (Jones and Winterstein, 2000). Therefore, the calibration of HSPF model parameters at gaged sites and confirmation of the usefulness of those parameters at other gaged locations in the Reedy Creek watershed using the calibrated parameters is consistent with standard applications of the HSPF model throughout the country.

This calibration and confirmation approach was selected rather than the more common approach of calibrating a model for a given watershed and time period and then verifying the model for the same watershed for a different time period (that is, the calibration and verification approach) because of the limited availability of complete time series of meteorologic data, complex hydraulic relations within the RCID, and changes in land use during the study period (1990-95). For the calibration of HSPF, it is generally recommended that the “period of comparison should be as long as the data permit, preferably 5 years or more” (Linsley and others, 1975, p. 347). When this study began (1996), 6 years of extensive rainfall and runoff data were available, only slightly more than the recommended minimum.

Complex hydraulics and changing land use in the Reedy Creek watershed also were limiting conditions. Flow patterns within the RCID property are extremely complex because of the many gated structures, canals, and wetlands. Thus, hydraulic effects of these structures and features could complicate the true rainfall-runoff response and its proper parameterization. By focusing the calibration effort on gaged watersheds draining into the RCID (that is, Cypress Creek, Davenport Creek, and Whittenhorse Creek), it was expected that a more reliable calibration of the rainfall-runoff response could be obtained. Also, the Reedy Creek watershed was undergoing development and it was uncertain whether 1990 land-use data (the most recent available data) could be used reliably in the simulation of runoff in the late 1990s. For these reasons, the parameter calibration and confirmation process was used.

The hydrologic part of the watershed model was calibrated through numerous iterative model runs, and model output were compared to observed data. Two sub-watersheds, Whittenhorse Creek and Davenport Creek, which are tributaries of Reedy Creek, were selected for calibration because these sub-watersheds have land-use types similar to those in the sub-watersheds elsewhere within the RCID, with the exception of urban areas (fig. 6). HSPEXP was used to assist in calibration of the Davenport Creek and Whittenhorse Creek sub-watersheds. The default fit criteria used by HSPEXP (Lumb and others, 1994, p. 56) were modified to aid in obtaining better agreement between simulated and observed values (table 7). Simulated and observed water balances were compared for overall (the entire period from January 1990 through December 1995), annual, monthly, and storm-runoff event time periods. Model parameters were adjusted iteratively until the best-fit model was obtained.

Model parameters were adjusted for the calibration sub-watersheds, Whittenhorse Creek and Davenport Creek, to match overall (1990-95), annual, and monthly runoff volumes, and then to obtain agreement between the observed and simulated storm runoff volumes and runoff-duration curves of daily runoff. Graphical and statistical methods were used to assess the quality of model fit. Statistics can provide a measure of model improvement, and trends and biases can be detected graphically. The model was calibrated using an hourly computational time step and data were output at a daily time step for a 6-year period, January 1990 to December 1995.

The percent error between simulated and observed values was used to calibrate the overall, annual, and monthly water balances. Donigian and others (1984) state that for HSPF simulations, the annual or monthly fit is very good when the error is less than 10 percent, good when the error is 10 to 15 percent, and fair when the error is 15 to 25 percent.

Table 7. Hydrological Simulation Program-Fortran EXPert system (HSPEXP) default fit-quality criteria, fit-quality criteria used for calibration and confirmation of the Hydrological Simulation Program-Fortran (HSPF) rainfall-runoff hydrologic simulation, and calibration and confirmation sites simulated in the Reedy Creek watershed, Florida

[Criteria and error difference between simulated and observed values are in percent difference between simulated and observed values, with the exception of the error in low-flow recession, which is expressed as the absolute value of the difference between simulated and observed values]

Statistics	Criteria		Error difference between simulated and observed values				
	Default	Modeled	Whittenhorse Creek	Davenport Creek	Reedy Creek near Vineland	Bonnet Creek	Reedy Creek near Loughman
Error in total volume	10.0	10.0	-2.8	1.6	-12.2	-29.2	7.4
Error in low-flow recession	0.03	0.03	-0.02	-0.03	-0.02	-0.03	0.02
Error in 50 percent lowest flows	10.0	10.0	-3.3	12.6	-37.0	-59.6	-26.4
Error in 10 percent highest flows	15.0	15.0	1.9	-5.2	-3.0	-26.6	11.3
Error in storm volumes	20.0	15.0	7.6	20.8	-2.4	-8.5	138.3
Seasonal volume error	30.0	10.0	6.9	35.5	19.0	16.1	17.9
Summer storm volume error	50.0	15.0	-16.1	-14.5	24.8	-14.8	111.8

The quality of fit of the monthly streamflow values also was evaluated using the three statistics: 1) correlation coefficient between simulated and observed discharge; 2) coefficient of model-fit efficiency between simulated and observed flow; and 3) number of months where the percent error was less than a specific value (10 and 25 percent). The correlation coefficient, C, is calculated as:

$$C = \frac{\sum_{i=1}^{N} (Qo_i - Qo) \times (Qs_i - Qs)}{\left[\sum_{i=1}^{N} (Qo_i - Qo)^2 \times \sum_{i=1}^{N} (Qs_i - Qs)^2 \right]}, \quad (1)$$

where

Qo_i	is the observed runoff volume for month i,
Qo	is the observed average monthly runoff volume,
Qs_i	is the simulated runoff volume for month i,
Qs	is the simulated average monthly runoff volume, and
N	is the number of months in the calibration period.

The coefficient of model-fit efficiency, E (Nash and Sutcliffe, 1970), is calculated as:

$$E = \frac{\sum_{i=1}^{N} (Qo_i - Qo)^2 - \sum_{i=1}^{N} (Qo_i - Qs_i)^2}{\sum_{i=1}^{N} (Qo_i - Qo)^2}. \quad (2)$$

Studies cited by Duncker and others (1995) had coefficient of model-fit efficiencies varying from 0.80 to 0.98 for basins ranging in size from 0.88 to 1,342 mi^2 and model periods of 4 to 8 years. For the purposes of this study, the model fit was considered excellent if the coefficient of model-fit efficiency was greater than 0.97, good when greater than 0.9, and fair when greater than 0.8.

Daily flows were evaluated graphically by comparing the observed and simulated daily runoff-duration curves and time series. General agreement between the simulated and observed runoff-duration curves indicates adequate calibration over the range of simulated flow conditions. Inadequate calibration is indicated by significant departures between simulated and observed runoff-duration curves. The model calibration obtained “best-fit” simulations for Whittenhorse Creek (land segment 4) and Davenport Creek (land segment 5). Each land segment was calibrated separately, and calibration parameters for pervious and impervious land areas are presented in appendix B.

Simulated flows for Whittenhorse Creek agreed with observed flows for six of the seven fit-quality criteria specified in HSPEXP for calibration of HSPF (table 7). The default criterion for the error in summer storm volume is 50 percent and the calibration result yielded an error of -16.1 percent, less than 1 percent difference from the more stringent criterion (15 percent). Further, the criteria used in this study are more stringent than the default criteria listed in the user’s manual for HSPEXP (Lumb and others, 1994, p. 56) (table 7). According to the criteria of Donigian and others (1984), the overall water balance for the Whittenhorse Creek calibration was very good, and the annual water balances ranged from very good to poor over the simulation period. Observed and simulated monthly mean time series plots show the fit of the hydrologic calibration for Whittenhorse Creek (fig. 9). Duration curves of observed and simulated daily mean discharge at Whittenhorse Creek indicate good agreement for values above a discharge of about 1.0 ft^3/s (fig. 10).

Simulated flows for Davenport Creek agreed with observed flows for four of the seven fit-quality criteria specified in HSPEXP for this study: error in total volume, error in low-flow recession, error in 10 percent highest flows, and error in summer storm volumes (table 7). The error in 50 percent lowest flows was 12.6 percent, and the HSPEXP criterion use in this study was 10 percent. The error in 50 percent lowest flows was considered close enough to the HSPEXP criterion to be marginally acceptable. Adjustment of parameter values affecting the 50 percent lowest flows had adverse affects on other criteria specified in HSPEXP. The default criterion for the error in storm volumes is 20 percent, and the calibration result

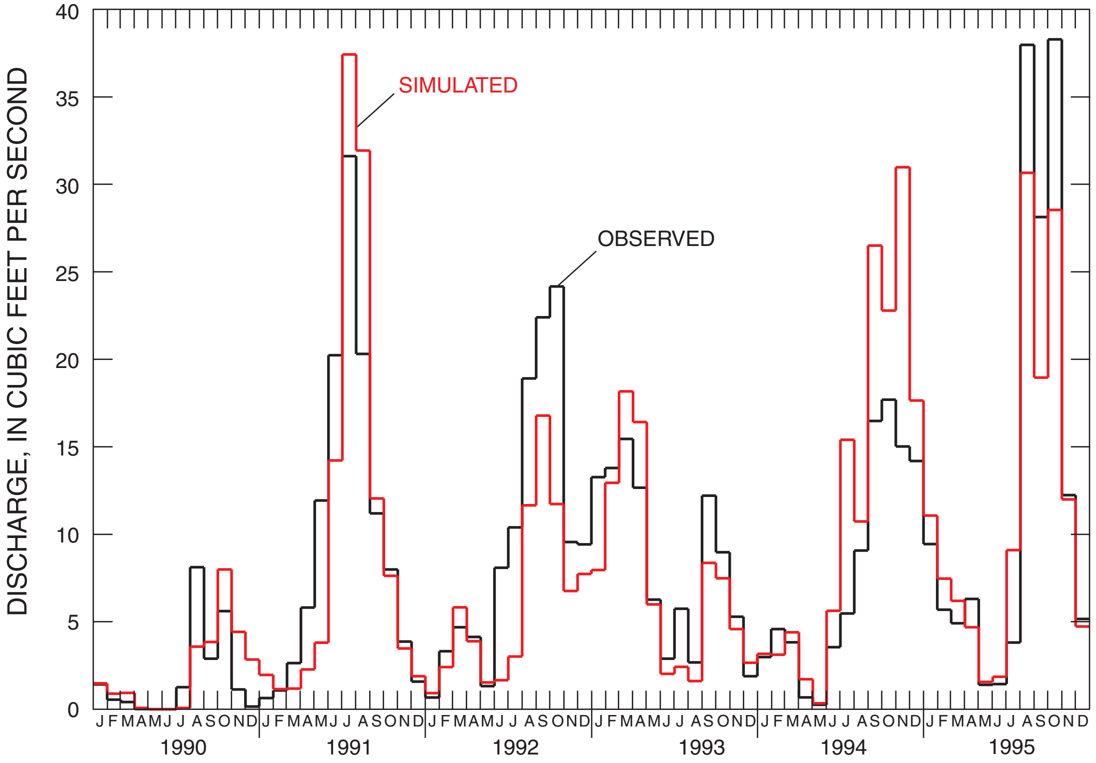


Figure 9. Simulated and observed monthly mean discharge values at Whittenhorse Creek near Vineland, Florida.

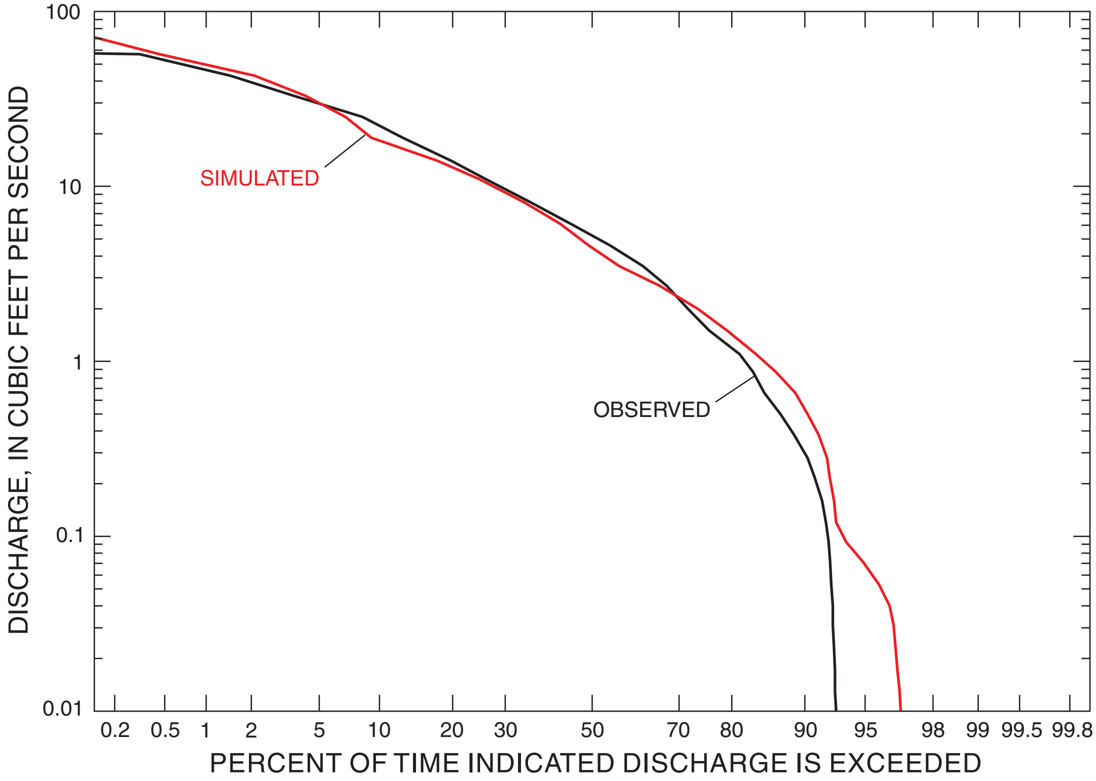


Figure 10. Discharge duration curves for simulated and observed daily mean values at Whittenhorse Creek near Vineland, Florida.

yielded an error of 20.8 percent. The simulated storm volumes matched the observed values close to the HSPEXP default criterion, but not the more stringent criterion set for this study (15 percent). The obtained result was close enough to the default HSPEXP criterion for error in storm volumes that it was considered acceptable. The seasonal volume error (35.5 percent) was larger than the HSPEXP default criterion of 30 percent; however, the fixed specification for HSPEXP of the seasons as June-August and December-February does not always match seasonal trends in the study area. This criterion may be given reduced weight or omitted from the judgment regarding the acceptability of the model fit for sub-areas within the Reedy Creek watershed. According to the criteria of Donigian and others (1984), the overall water balance for the Davenport Creek calibration was very good, and the annual water balances ranged from very good to fair over the simulation period. A plot of observed and simulated monthly mean discharge (fig. 11) shows the fit of the Davenport Creek calibration. Duration curves of observed and simulated daily mean discharge at Davenport Creek indicate an acceptable fit for discharges that were exceeded 90 percent of the time over the simulated period, that is, for discharges greater than 3 ft^3/s (fig. 12).

Hydrologic model calibration statistics for Whittenhorse and Davenport Creeks over the 72-month simulation period, January 1990 to December 1995, are listed in table 8. The correlation coefficients, coefficients of model-fit efficiency, and other statistics of monthly flows for Whittenhorse Creek and Davenport Creek are not as good as those obtained in other studies summarized in Duncker and Melching (1998) because the quality and distribution of rainfall data available for the Reedy Creek watershed are not as good as the data in those studies. Specifically, watersheds where high coefficients of model-fit efficiency were reported typically had several rainfall gages in or very close to the watershed and were located in parts of the country having less spatial variability in rainfall than the Reedy Creek watershed. The coefficients of model-fit efficiency for monthly flows obtained for Whittenhorse Creek and Davenport Creek are similar to those obtained in simulations of the Minnesota River basin in Minnesota (correlation coefficient between 0.877 and 0.927; coefficient of model-fit efficiency between 0.702 and 0.851) (S.E. Kroening, U.S. Geological Survey, oral comm., 2001). Given the lack of available rainfall data, the hydrologic calibration of the Whittenhorse Creek and Davenport Creek sub-watersheds was considered acceptable.

Hydrologic Model Confirmation

Confirmation that the model parameter set results in an acceptable simulation of runoff for hydrologically similar watersheds provides a means of evaluating the parameter set. An acceptable confirmation indicates that the calibrated parameter set may be suitable for simulation of runoff in similar parts of the Reedy Creek watershed. The parameter set developed from the calibration can be transferred to other land areas in the Reedy Creek watershed. The validity of the parameter set is indicated by the goodness-of-fit of the simulated flows to the observed flows at selected confirmation sites.

The hydrologic model was tested by applying the parameter sets developed for Whittenhorse Creek and Davenport Creek to other land segments within the Reedy Creek watershed, and by comparing the

Table 8. Hydrological Simulation Program-Fortran calibration and confirmation statistics for monthly flows simulated for five sites over a 6-year (72-month) period (1990-95) in the Reedy Creek watershed, Florida

	Calibration		**Confirmation**		
	Whittenhorse Creek near Vineland	**Davenport Creek near Loughman**	**Reedy Creek near Vineland**	**Bonnet Creek near Vineland**	**Reedy Creek near Loughman**
Coefficient of model-fit efficiency	0.7166	0.7535	0.7846	0.6780	0.7741
Correlation coefficient	.8593	.8808	.9072	.9043	.8839
Number of months with a very good fit[1]	12	7	10	7	4
Number of months with a fair fit[2]	27	21	26	23	14

[1] Number of months when the difference between simulated and observed average monthly discharge was less than 10 percent.

[2] Number of months when the difference between simulated and observed average monthly discharge was less than 25 percent.

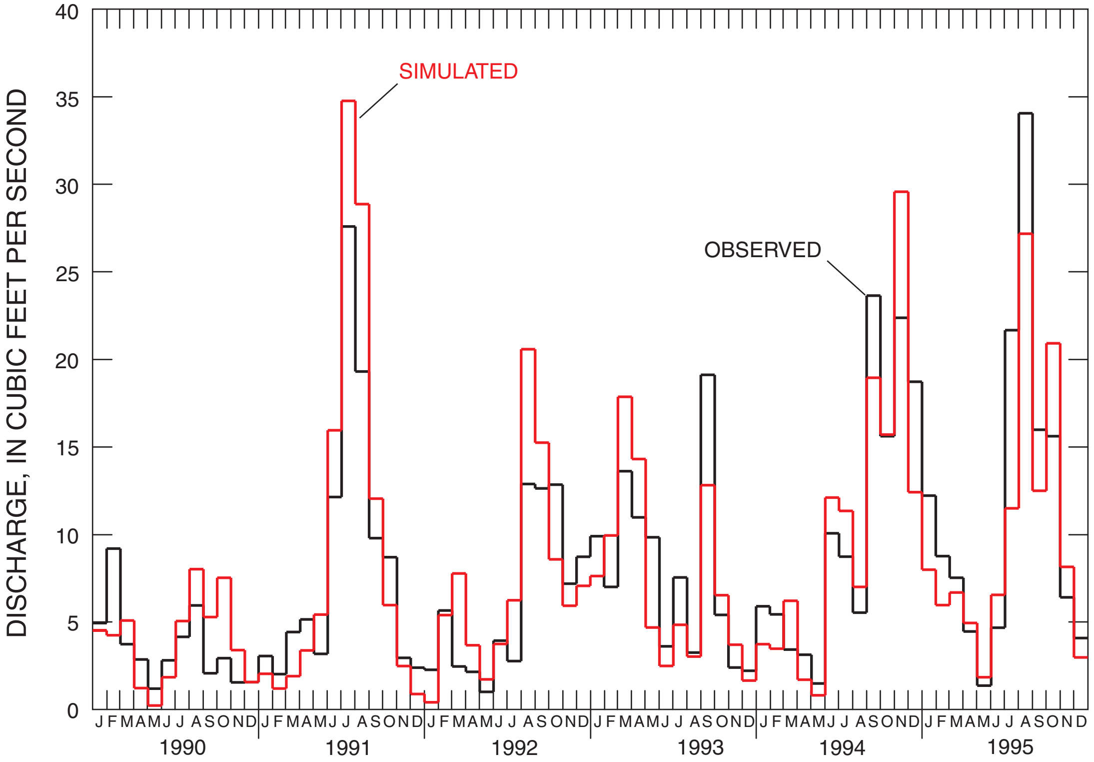


Figure 11. Observed and simulated monthly mean discharge values at Davenport Creek near Loughman, Florida.

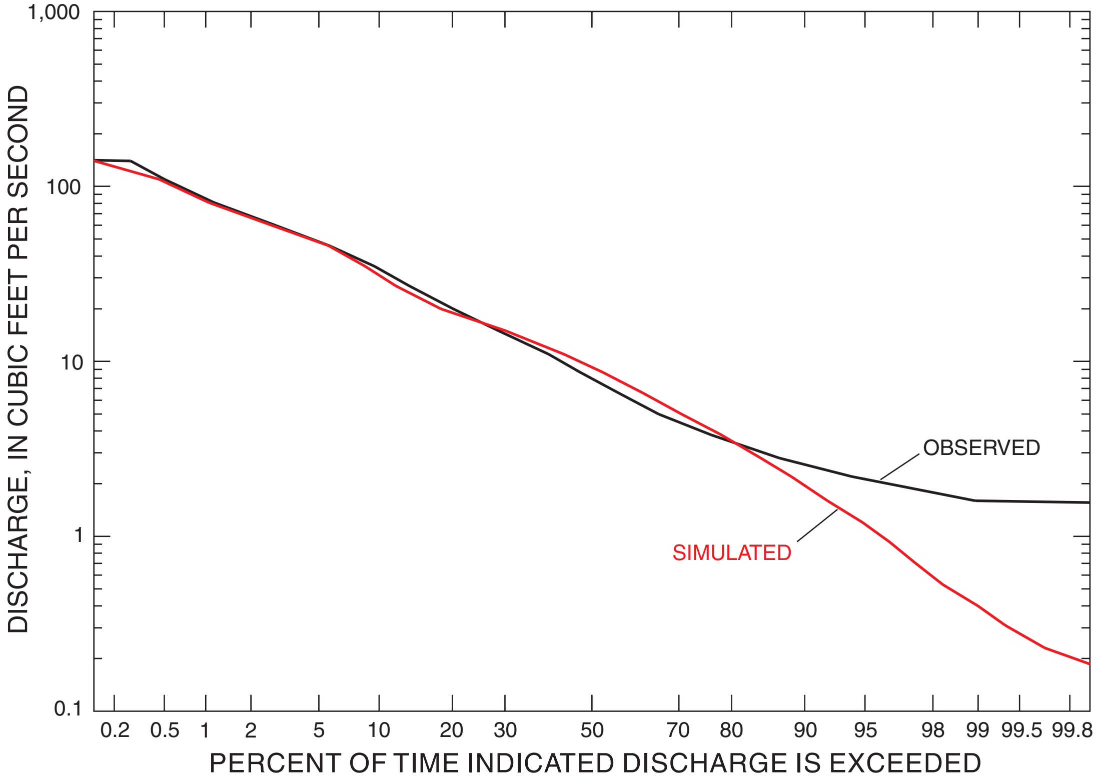


Figure 12. Discharge duration curves for simulated and observed daily mean values at Davenport Creek near Loughman, Florida.

simulated results to observed data sets. Calibration sub-watersheds are directly associated with land segments within the modeled watershed; land segment 4 is synonymous with the Whittenhorse Creek calibration sub-watershed, and land segment 5 is synonymous with the Davenport Creek calibration sub-watershed. Similarities in characteristics among land segments, such as distribution of land-use types, topography, and hydrology determined whether parameters developed from the calibration step could be applied to another land segment. The model parameters developed from the Whittenhorse Creek calibration (land segment 4) were applied to land segment 3 (Upper East and Upper West Reedy Creeks); the model parameters developed for Davenport Creek (land segment 5) were applied to land segment 1 (internal RCID and southern part of the watershed) (appendix B and fig. 7).

Simulated flows for Reedy Creek near Vineland agreed with the observed flows for three of the seven fit-quality criteria specified in HSPEXP for this study: error in low-flow recession, error in 10 percent highest flows, and error in storm volumes. If the default criteria listed in the user's manual for HSPEXP (Lumb and others, 1994, p. 56) were applied, five of the seven fit-quality criteria would be met, including errors in: low-flow recession, 10 percent highest flows, storm volumes, seasonal volumes, and summer storm volumes. The errors that exceed the HSPEXP criteria are related to simulation of the lowest flows: error in total volume and error in 50 percent lowest flows. The error in total volume was largely affected by the under simulation of flows below about 100 ft^3/s. The overall water balance for the Reedy Creek near Vineland model confirmation was good, and the annual water balances ranged from good to poor over the simulation period using the criteria of Donigian and others (1984). Observed and simulated monthly mean time series plots show the fit of the hydrologic confirmation for Reedy Creek near Vineland (fig. 13). Duration curves of observed and simulated daily mean discharges confirm the errors noted in the simulation of the lowest flows as indicated by divergence of the curves above an exceedance of 50 percent (fig. 14). A slight divergence of the curves is also seen below an exceedance of about 1 percent.

The correlation coefficient and coefficient of model-fit efficiency and other statistics generated for monthly flows for Reedy Creek near Vineland (table 8) are not as good as those obtained in other studies summarized in Duncker and Melching (1998). However, the coefficients of model-fit efficiency for monthly flows are better than those obtained for either calibration sub-watersheds, Whittenhorse Creek and Davenport Creek, and similar to those obtained in the Minnesota River basin in Minnesota (S.E. Kroening, U.S. Geological Survey, oral comm., 2001). The fact that better statistical fit coefficients were calculated for the confirmation site than for the calibration sites indicates that a sound conceptual model has been developed. Given the inadequate distribution of rainfall gaging stations throughout the watershed, the hydrologic confirmation for Reedy Creek at Vineland was considered acceptable.

Flows for Bonnet Creek near Vineland were substantially under simulated. The total simulated runoff volume was about 71 percent of the total observed runoff volume over the study period. Thus, the difference in total simulated runoff volume was about 29 percent. The overall water balance for the Bonnet Creek near Vineland model confirmation was poor, and annual water balances ranged from good to poor over the simulation period using the criteria of Donigian and others (1984). Plots of observed and simulated monthly mean discharges indicate under simulation of discharges during all years of the simulated period (fig. 15). Duration curves of daily mean discharge also indicate an under simulation of discharges throughout the range of discharge (fig. 16). Observed discharge data for the Cypress Creek near Vineland gaging station were input as a point source upstream from the Bonnet Creek near Vineland model confirmation site. Therefore, the error between simulated and observed discharge at the Bonnet Creek near Vineland site is attributed to the simulation of the intervening area between the Cypress Creek and Bonnet Creek gaging stations. Hydrologic model confirmation statistics for Bonnet Creek near Vineland over the 72-month simulation period, January 1990 to December 1995, are listed in table 8.

Part of the difficulty in simulating the area between the Cypress Creek and Bonnet Creek gaging stations was due to uncertainty in the size of the contributing drainage area. German (1986 and 1989) approximated the intervening drainage area between the Cypress Creek and Bonnet Creek gaging stations to be about 26 mi^2; however, the annual water resources report (U.S. Geological Survey, 2000) indicates the area is 15.4 mi^2. Additionally, the area between the Cypress Creek and Bonnet Creek gaging

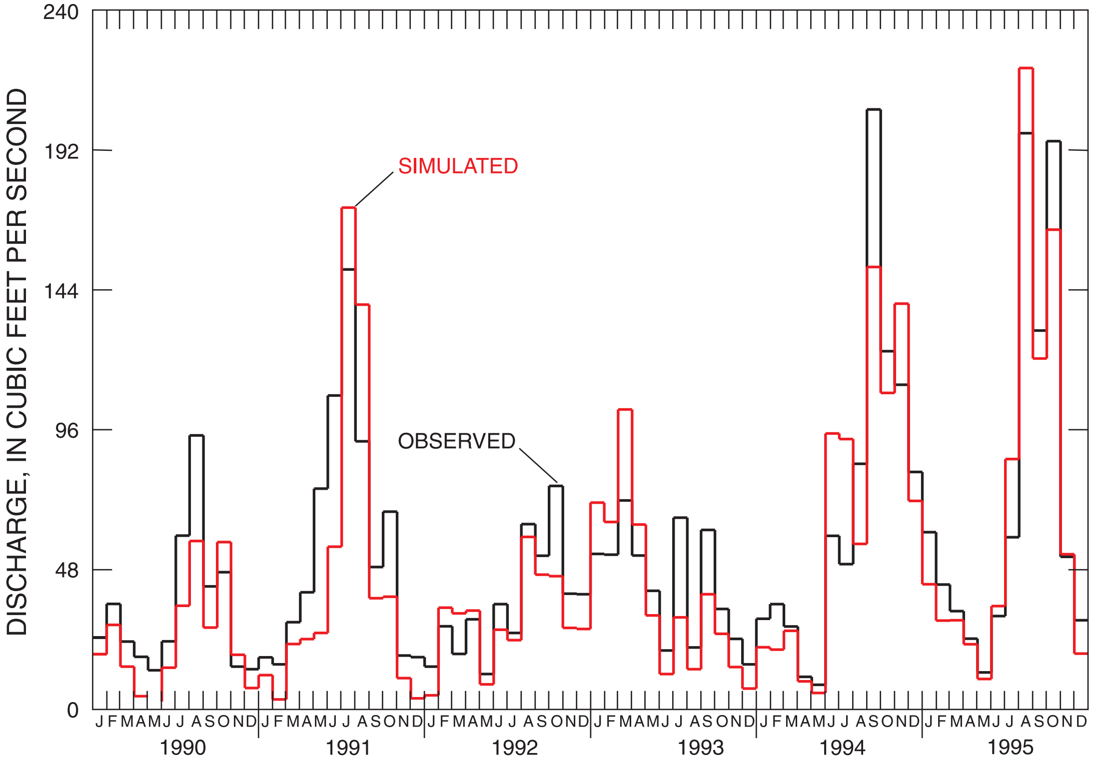


Figure 13. Observed and simulated monthly mean discharge values at Reedy Creek near Vineland, Florida.

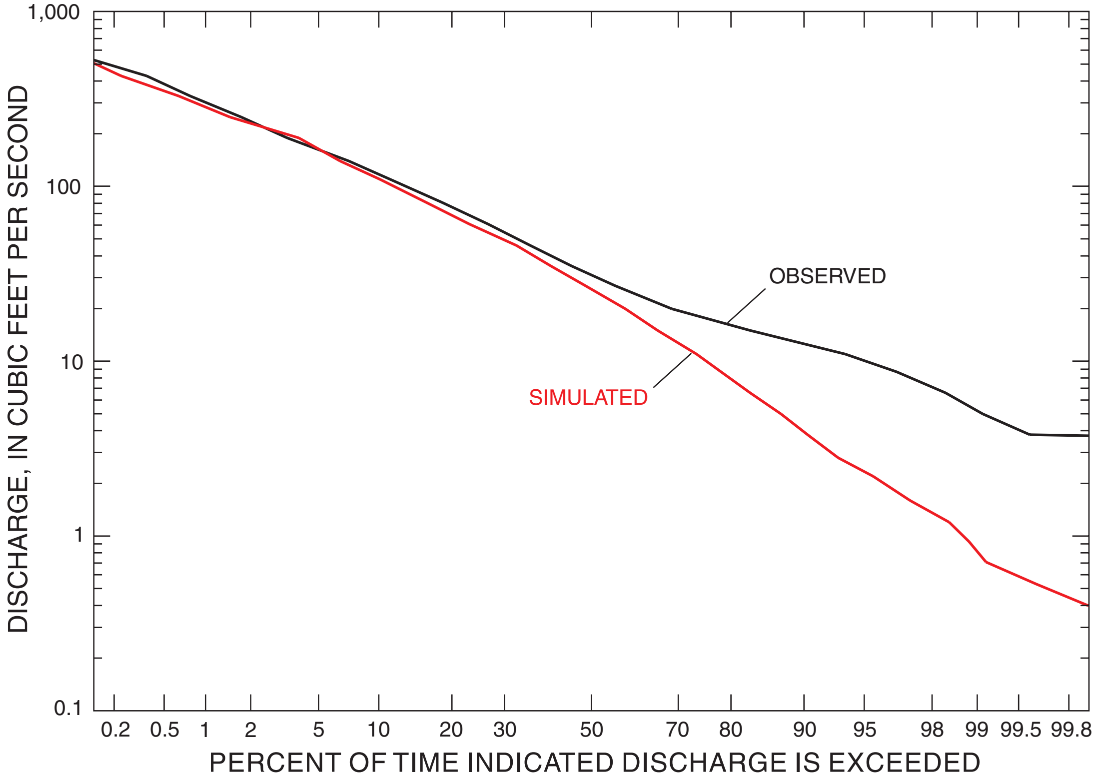


Figure 14. Discharge duration curves for observed and simulated daily mean values at Reedy Creek near Vineland, Florida.

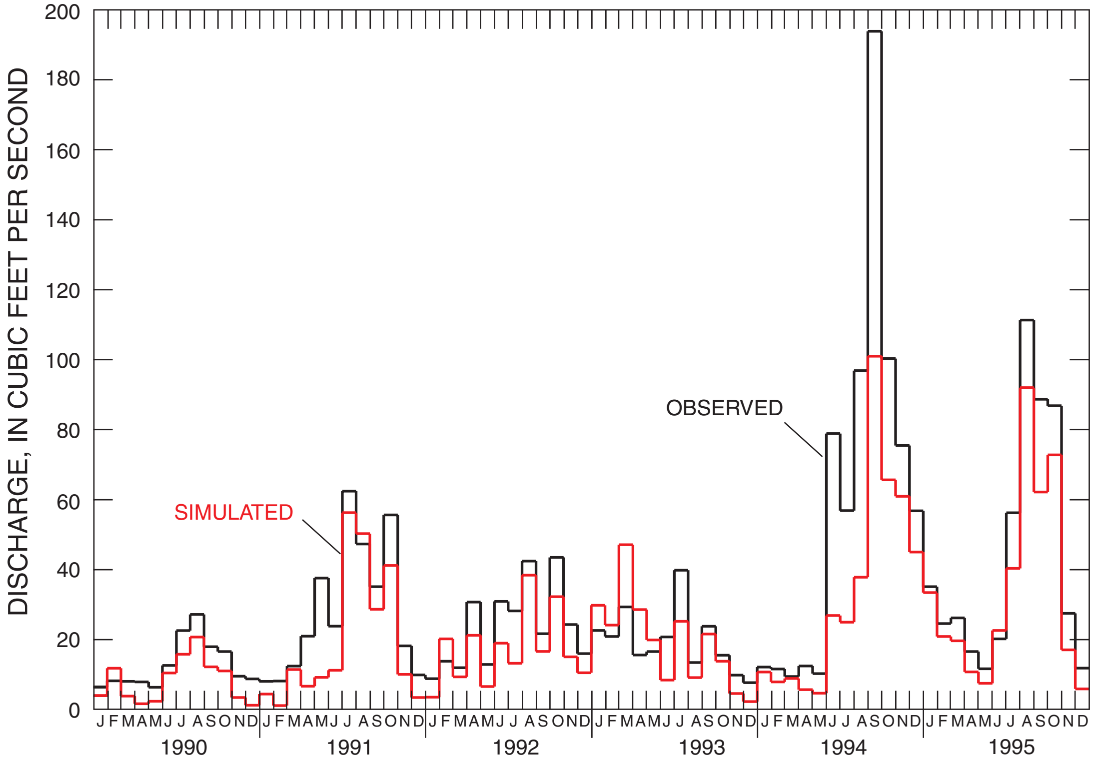


Figure 15. Observed and simulated monthly mean discharge values at Bonnet Creek near Vineland, Florida.

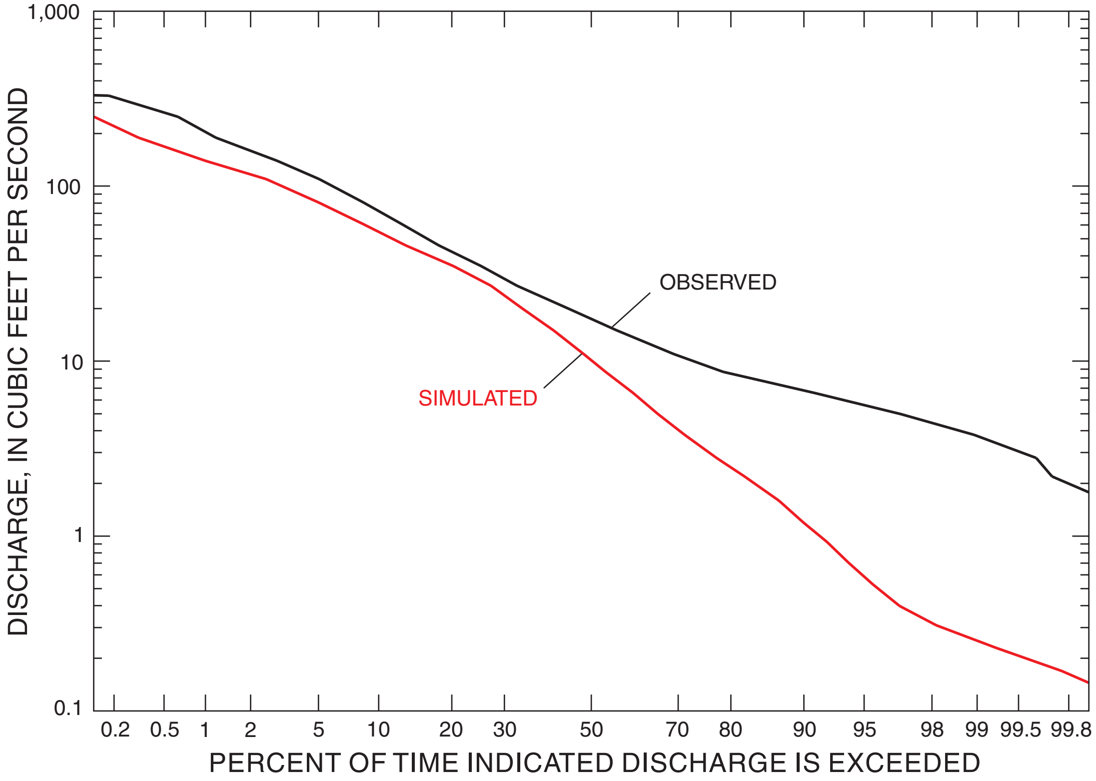


Figure 16. Discharge duration curves for observed and simulated daily mean values at Bonnet Creek near Vineland, Florida.

stations contains a substantial amount of impervious area. Streamflow records for Cypress and Bonnet Creeks near Vineland are rated as "fair" and "poor," respectively (U.S. Geological Survey, 2000). Further, the hydraulic control at Bonnet Creek is a sheet-pile weir with sluice gate, located a short distance downstream from the gage. If the weir and gate are operated consistently, then the stage-discharge rating at the site should be stable. Examination of changes in the stage-discharge relation for the site, however, indicates substantial shifts that seem inconsistent for this type of control, further increasing the uncertainty regarding the data at this site.

Another source of error in simulating flow in the areas between the Cypress Creek and Bonnet Creek gaging stations may relate to discrepancies between surface-water and ground-water flow divides. The current model boundary reasonably defines the eastern surface-water drainage boundary; however, ground water may be a significant source of baseflow in parts of the Reedy Creek watershed (O'Reilly, 1998). It is possible that ground water is contributing an indeterminate amount of water to the lower Bonnet Creek drainage. Consideration of ground-water contribution to Bonnet Creek could improve the water balance simulation for Bonnet Creek near Vineland; however, a thorough evaluation of the ground-water contribution is beyond the scope of the current study.

On longer time scales (monthly or over the 72-month simulation period) the simulated monthly discharges from Reedy Creek near Loughman agreed well with observed data (fig. 17). Simulated flows for Reedy Creek near Loughman agreed with the observed flows for three of the seven fit-quality criteria specified in HSPEXP for this study: error in total volume, error in low-flow recession, and error in 10 percent highest flows. The water balance for the entire study period is matched within 8 percent, and the monthly flows achieved the second highest value of the coefficient of model-fit efficiency among all the sites in this study (table 8). On a shorter time scale (less than a month), however, storm volumes are greatly over simulated and low flows (less than 8 ft^3/s) are greatly under simulated. Duration curves of observed and simulated daily mean discharge reflect the poor representation of the high and low distribution of daily discharges (fig. 18). A primary reason for the poor results at low flows is the diversion of an unknown amount of water from the RCID at the Bonnet Creek near Kissimmee site (fig. 2, map number 23). The simulation results at Reedy Creek near Loughman likely can be improved once the quantity of the diversion is known. The difficulties in the simulation of the flow at Reedy Creek near Loughman also result from the under simulation of flow at Bonnet Creek near Vineland. Finally, the hydrologic flow routing applied in HSPF is poorly suited to the complex hydraulics in the large wetland conservation area between Highway 192 (Reedy Creek near Vineland and Bonnet Creek near Vineland) and the Reedy Creek near Loughman gaging station.

Results of the hydrologic modeling indicate that the regional confirmation approach worked well for flow simulation at Reedy Creek near Vineland. There were, however, a number of complications in simulating flows at Bonnet Creek near Vineland and Reedy Creek near Loughman; these complications support the original concerns about the complexities of simulating flows within the RCID boundary. The decision to calibrate the rainfall-runoff model parameters for the sub-watersheds draining to the RCID and confirm the usefulness of these parameters at gages within the RCID probably yielded better results than if model calibration had been done for the observed discharges at each streamflow gage.

Given the uncertainty in the rainfall data used to drive the HSPF model, the model yields acceptably reliable simulations of flow for Whittenhorse Creek, Davenport Creek, and Reedy Creek near Vineland. The simulation of flows at Bonnet Creek near Vineland is questionable primarily because of the uncertainty in the drainage area of Bonnet Creek near Vineland. The simulation of flows for Reedy Creek near Loughman also is questionable because of the uncertainty in the simulated Bonnet Creek near Vineland flows, the uncertain amount of diversion at Bonnet Creek near Kissimmee, and the difficulties of simulating complex flow in the large wetland conservation area between Highway 192 and the Reedy Creek near Loughman gaging station.

Water-Quality Model Calibration

Selection of water-quality constituents for simulation was based primarily on the availability of water-quality data for sites throughout the Reedy Creek watershed (table 4). Dissolved oxygen, nitrogen, and phosphorus species were simulated because of the availability of observed continuous and periodic water-quality data. Representation of nutrient cycling

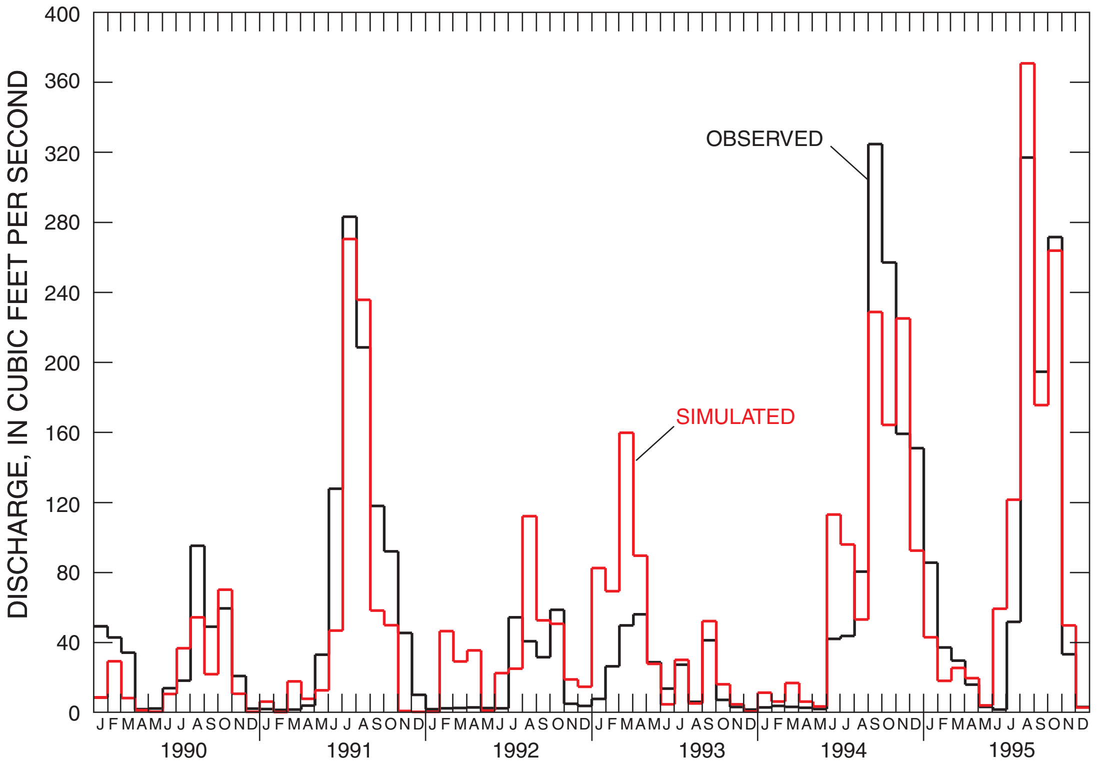


Figure 17. Observed and simulated monthly mean discharge values at Reedy Creek near Loughman, Florida.

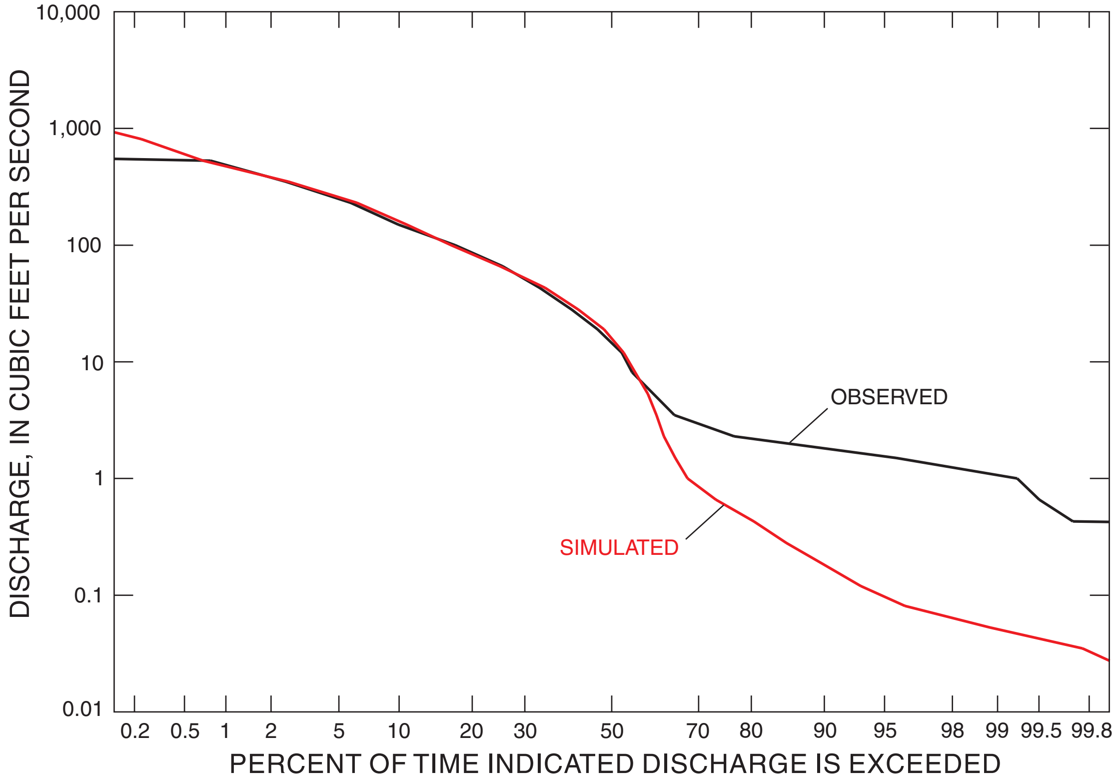


Figure 18. Discharge duration curves for Observed and simulated daily mean values at Reedy Creek near Loughman, Florida.

in HSPF also requires simulation of BOD and phytoplankton populations. In addition to precipitation and potential ET used in the hydrologic part of the model, continuous records of solar radiation, air and water temperature, wind speed, and atmospheric deposition of ammonia and nitrate nitrogen were used as input to the water-quality part of the model (tables 2 and 4, appendix D). Ground-water quality data from surficial aquifer system monitoring wells also were used to evaluate the water-quality part of the model.

Simulated water-quality constituent loadings from land areas within the Cypress Creek drainage were excluded from the water-quality part of the model. A discussion of difficulties in representing the Cypress Creek sub-watershed in the HSPF model was presented previously in this report. Daily constituent loadings of DO, BOD, ammonia nitrogen, nitrate nitrogen, and total phosphorus were input as a point source of inflow to the stream reach downstream from the Cypress Creek near Vineland gaging station. Mean monthly DO concentrations were computed from 57 periodic observations of DO concentration at the Cypress Creek near Vineland gaging station from 1989-96. The mean monthly DO concentrations were disaggregated using the mean monthly value for each day of the month to create a daily mean concentration time series for each day of the year. The daily time series of DO concentrations computed for a 1 year period were applied to each year of the simulation period (1990-95). Daily DO concentrations were combined with daily streamflow values to calculate daily constituent loadings. Linear interpolation was applied between periodic observations of constituent concentration for ammonia nitrogen, nitrate nitrogen, and total phosphorus to create a daily constituent concentration time series. Daily constituent concentrations of ammonia nitrogen, nitrate nitrogen, and total phosphorus were combined with the daily streamflow values to calculate daily constituent loadings. Time series of BOD loadings were estimated from 13 periodic observations of BOD concentration for 1994-96 from other locations in the Reedy Creek watershed. Based on these observations and empirical knowledge of the hydrologic and water-quality conditions at the Cypress Creek gaging station, a constant value was used to represent the BOD concentration for the simulation period. Daily values of streamflow were combined with the constant BOD concentration to obtain a time series of daily BOD loading.

The water-quality part of the model was calibrated in an iterative manner. Calibration of water-quality constituents was performed by visual comparison of observed and simulated constituent concentrations except for DO, which was calibrated using a statistical comparison. Parameters pertaining to DO were calibrated based on observed data for the site at Reedy Creek near Vineland (fig. 2, map number 29); parameters pertaining to other constituents were calibrated based on observed data for Whittenhorse Creek, Davenport Creek, Reedy Creek near Vineland, Bonnet Creek near Vineland, and Reedy Creek near Loughman.

The calibration and confirmation approach used in the hydrologic part of the watershed model was used as a starting point to calibrate the water-quality model. The sub-watersheds of Whitenhorse Creek and Davenport Creek were calibrated, and the water-quality model parameters sets for those sub-watersheds were distributed as in the hydrologic part of the model. The model fit for simulated and observed constituent concentrations was subsequently reviewed for hydrologic model confirmation sites: Reedy Creek near Vineland, Bonnet Creek near Vineland, and Reedy Creek near Loughman. Based on review of water-quality model fit at hydrologic model confirmation sites, it was determined that further calibration of the water-quality parameter set was needed to obtain an acceptable fit for observed and simulated constituent concentrations.

The poor water-quality model fit observed at hydrologic model confirmation sites likely can be attributed to the relatively small amount of periodically observed water-quality data, and the distribution of land-use types in the hydrologic model calibration and confirmation sub-watersheds. Water-quality parameter sets calibrated for Whittenhorse Creek and Davenport Creek represent the aggregated affects of the land-use types in those sub-watersheds. The percentage of the agriculture land-use type for the Davenport Creek sub-watershed is about twice that of other sub-watersheds (table 5). Land areas in the RCID contain greater percentages of the urban land-use type, which is not well represented in the Whittenhorse Creek and Davenport Creek sub-watersheds. Therefore, the aggregated affects of land-use types on water-quality reactions may be different for individual sub-watersheds.

Parameters developed from calibration of the model for various water-quality constituents for the Whittenhorse Creek and Davenport Creek sub-watersheds were applied to other land and water areas in the watershed and subsequently adjusted to obtain the best possible agreement between observed and simulated concentration values at hydrologic model confirmation sites. Parameter values used to simulate build-up and wash-off and interflow and ground-water flow contribution from land areas, and water-quality processes in a stream reach for the Reedy Creek watershed are listed in appendix C.

It was not possible to calibrate constituent values on a daily time step, with the exception of DO (at the Reedy Creek near Vineland site), because the remainder of the available observed data were discrete, not continuous. Discrete water-quality data represent samples collected at a specific time on a given day and, thus, constituent concentrations at a fixed point in time. The value at this fixed point in time may or may not be representative of the average constituent concentration for the entire day. Simulated daily values are mean values of constituent concentration simulated on an hourly basis. Simulated average stream conditions for a day may not be representative of a constituent concentration at any given time during that day. Therefore, it is unlikely that the simulated daily mean and instantaneous observed concentration of a given constituent will have the same value on any given day. Model fit was considered acceptable if the constituent concentration of simulated values fell within the range of observed values over the modeled period, and simulated values generally indicated similar long-term and monthly trends as those indicated by observed data.

Dissolved oxygen concentration was calibrated by adjusting model parameter values to obtain an acceptable fit between simulated and observed daily mean DO concentration at Reedy Creek near Vineland (fig. 2, map number 29). Simulated DO concentrations for Reedy Creek near Vineland indicated a tendency for the model to slightly overestimate the observed concentrations. The correlation coefficient between simulated and observed daily mean DO concentration values was 0.633. Overall simulated DO values followed the seasonal variation of observed values (fig. 19). Model parameters used to calibrate DO and applied to land-segments and channel reaches in the model are listed in appendix C.

Simulated time series of total phosphorus and phosphate phosphorus concentrations for Whittenhorse Creek generally over simulated the available observed concentrations (figs. 20 and 21, respectively). This over simulation indicated that processes

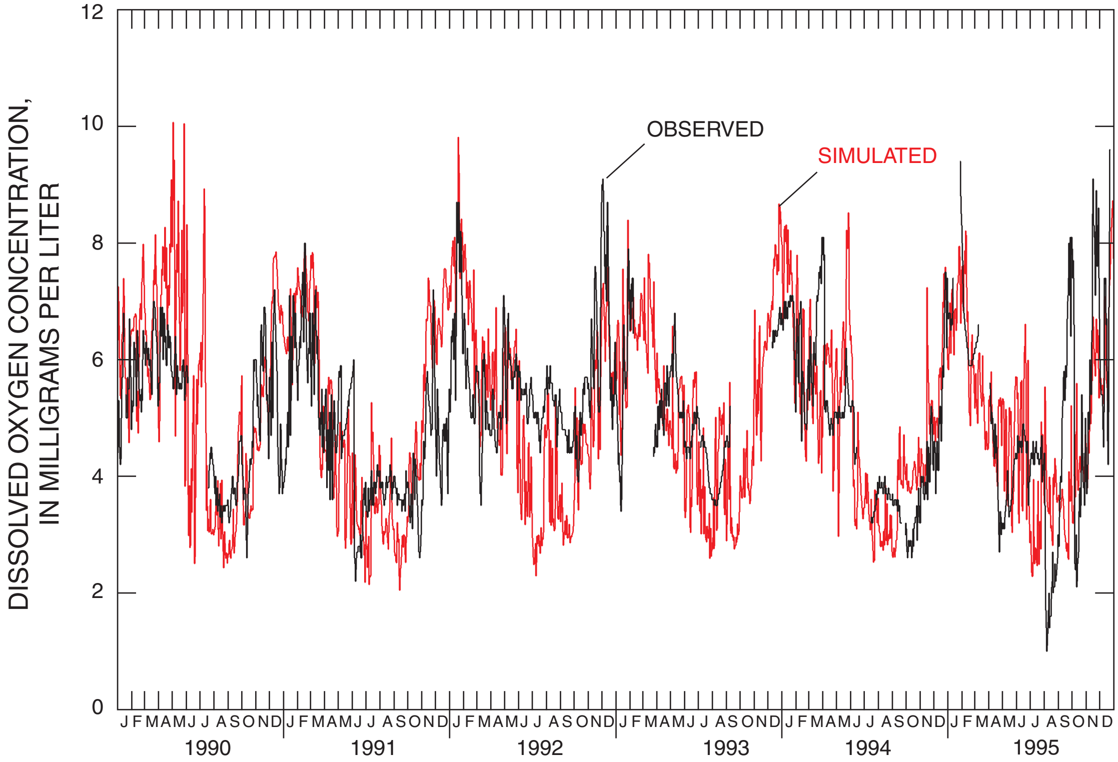


Figure 19. Simulated and observed daily mean dissolved oxygen concentration at Reedy Creek near Vineland, Florida.

in the large wetland area upstream from the site on Whittenhorse Creek may have been removing phosphorus entering the water from overland, subsurface, and upstream sources. Reach parameters in HSPF related to phosphorus uptake and settling were adjusted such that the observed concentrations matched as closely as possible to the simulated concentrations. Further adjustment of model parameters to improve the model fit adversely affected other modeled water-quality constituents. It was not possible to fully represent the wetlands processes without more specific knowledge of water-quality reactions, constituent concentrations, and constituent loadings from specific land-use types within the watershed.

Simulated time series of ammonia nitrogen concentrations for Whittenhorse Creek generally appeared to under simulate the available observed concentrations (fig. 22). The reach parameters in HSPF related to nitrogen uptake and settling were adjusted such that the observed ammonia nitrogen concentrations matched as closely as possible the observed data without adversely affecting other constituents. Simulated nitrate nitrogen concentrations more closely agreed with observed concentrations (fig. 23), and adjustment of parameters decreasing ammonia nitrogen decay could upset the nitrate balance. Undefined processes in the large wetland upstream from the site on Whittenhorse Creek likely are affecting chemical and biochemical reactions, which affect constituent concentrations in water samples at the gaging site.

Simulated time series of total phosphorus and phosphate phosphorus concentrations for Davenport Creek generally agreed well with the available observed concentrations (figs. 24 and 25, respectively). Based on the similarity to results for water-quality calibrations for the Potomac River (Camacho and Blasenstein, 1992) and for Walnut Creek, Iowa (Donigian and others, 1993), the calibration of total phosphorus and phosphate phosphorus concentrations for Davenport Creek is considered acceptable.

Simulated time series of ammonia nitrogen concentrations for Davenport Creek generally agreed with the available observed concentrations (fig. 26). The amount of observed periodic ammonia nitrogen concentration data is small for Davenport Creek and the effect of some over-simulated concentrations at times of low observed concentrations may cause some concern regarding the quality of the ammonia nitrogen simulation. However, simulated time series of nitrate nitrogen concentrations agreed well with the available observed concentrations (fig. 27). Adjustment of model parameters to reduce the possibility of over simulating ammonia nitrogen concentrations could result in reduced quality of the nitrate nitrogen simulation. Therefore, the ammonia nitrogen and nitrate nitrogen simulations are considered acceptable for Davenport Creek.

Simulated time series of total phosphorus concentrations for Reedy Creek near Vineland greatly under simulated observed concentrations from 1990-91, and slightly under simulated the observed concentrations from 1992-95 (fig. 28). Simulated time series of phosphate phosphorus concentrations for Reedy Creek near Vineland greatly under simulated observed concentrations from 1990-91, and slightly under simulated the observed concentrations from 1992-95 (fig. 29).

Simulated time series of ammonia nitrogen concentrations for Reedy Creek near Vineland agreed well with the observed concentrations (fig. 30). Conversely, the simulated time series of observed nitrate nitrogen concentrations greatly under simulated the observed nitrate nitrogen concentrations from 1990-91, and slightly under simulated the observed nitrate nitrogen concentrations from 1992-95 (fig. 31). Simulated concentrations of total phosphorus, phosphate, and nitrate nitrogen substantially less than observed concentrations during 1990-91 may be the result of increases in constituent concentrations in surface runoff, interflow, and ground water in the form of treated wastewater disposed into wetland areas draining to the stream channel upstream from the Reedy Creek near Vineland gaging station. Prior to 1992, the RCID discharged treated wastewater to wetland areas adjacent to Reedy Creek north of the gaging station at Reedy Creek near Vineland (fig. 2, map number 29). Reclaimed wastewater was pumped to wetland areas adjacent to Reedy Creek and aerated to elevate DO concentrations before the water was allowed to drain into Reedy Creek through surface runoff and shallow ground-water infiltration (T. McKim, Reedy Creek Improvement District, oral comm., 2000). Modeling the effects of disposing treated wastewater into wetland areas was not possible due to a lack of observed data relating to disposal rates, constituent concentrations in the treated wastewater, and specific information related to disposal location and methods.

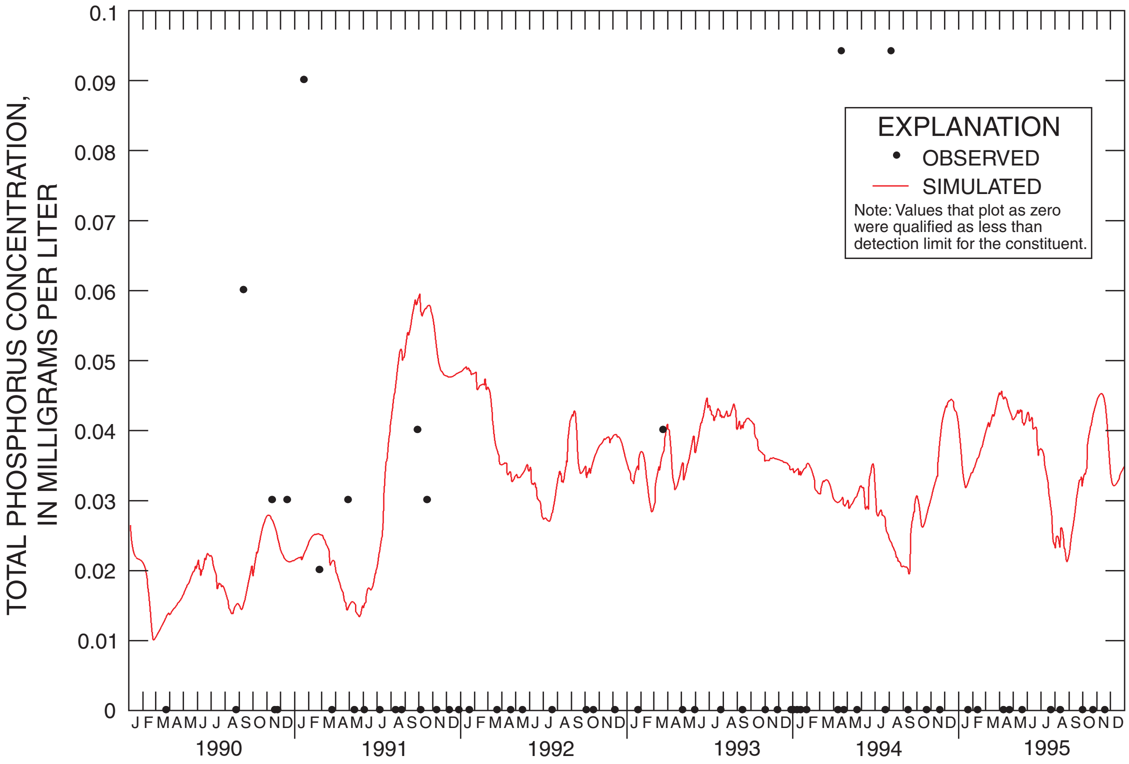


Figure 20. Simulated daily mean and observed periodic total phosphorus concentration values for Whittenhorse Creek near Vineland, Florida.

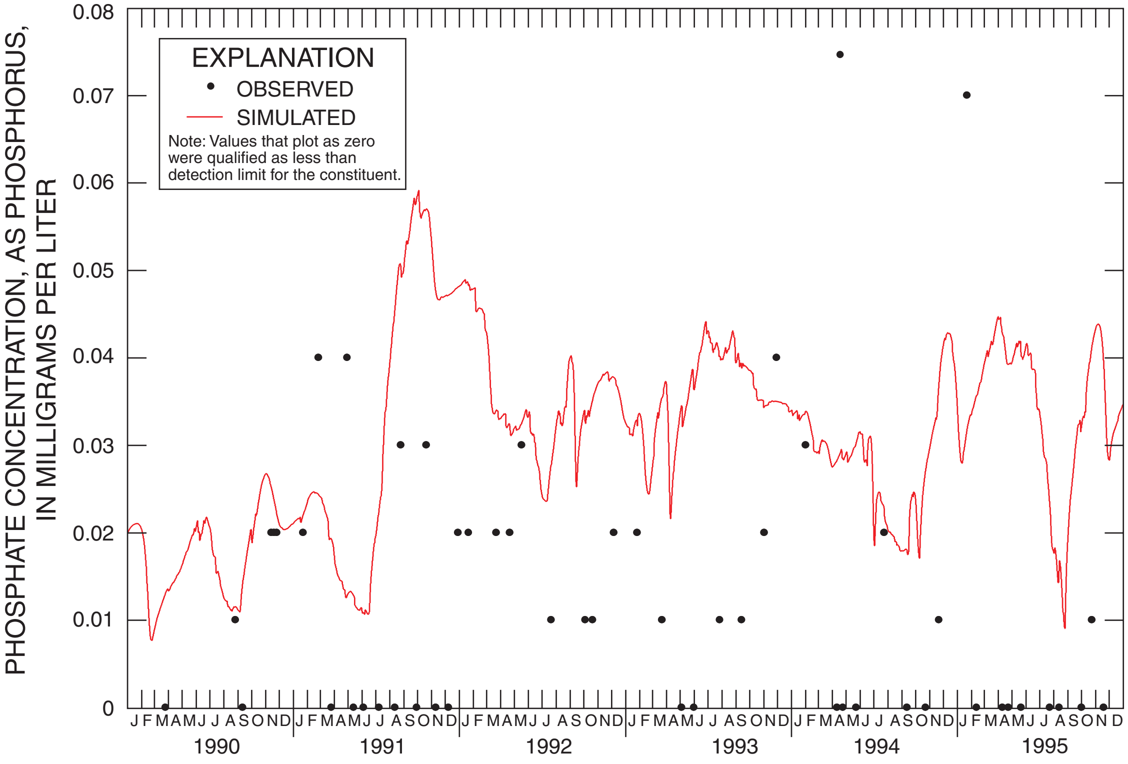


Figure 21. Simulated daily mean and observed periodic phosphate concentration values for Whittenhorse Creek near Vineland, Florida.

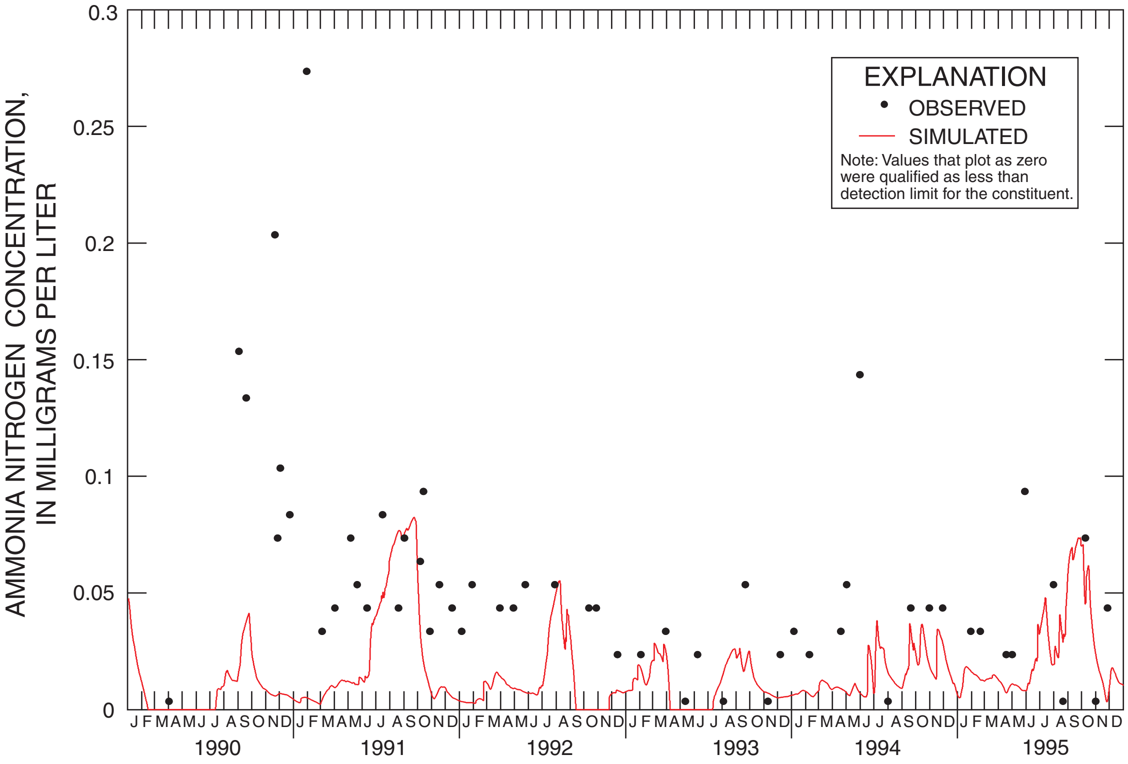


Figure 22. Simulated daily mean and observed periodic ammonia nitrogen concentration values for Whittenhorse Creek near Vineland, Florida.

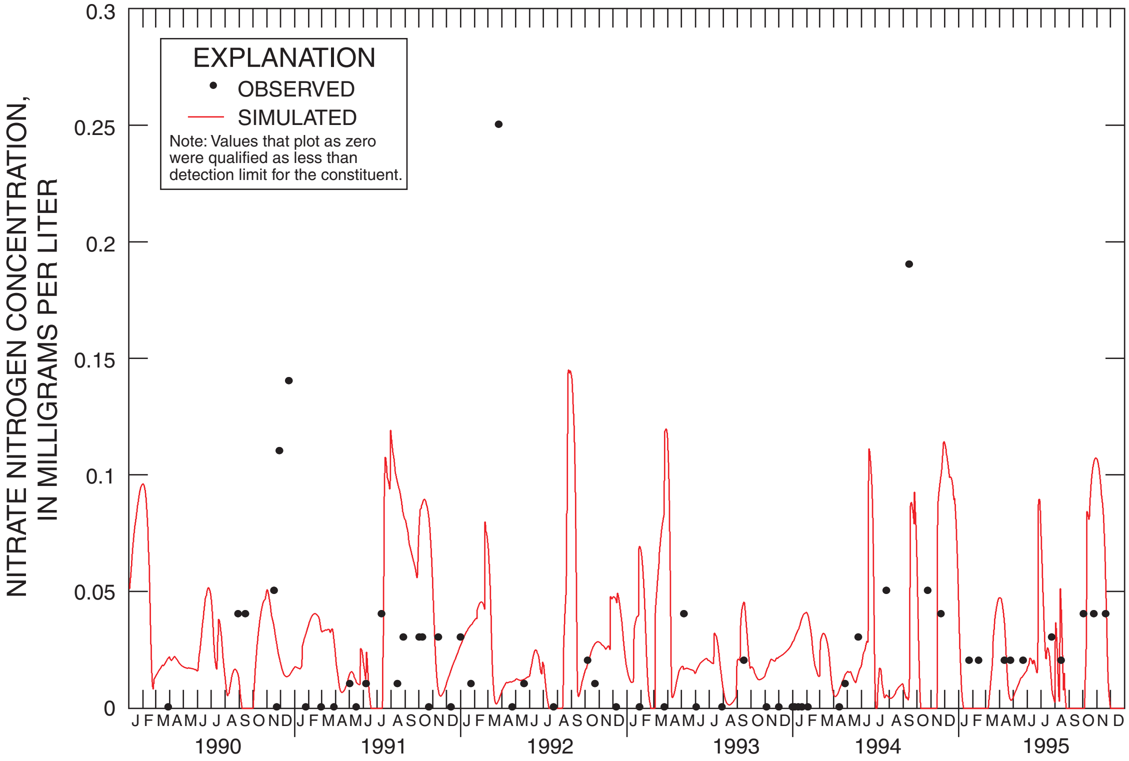


Figure 23. Simulated daily mean and observed periodic nitrate nitrogen concentration values for Whittenhorse Creek near Vineland, Florida.

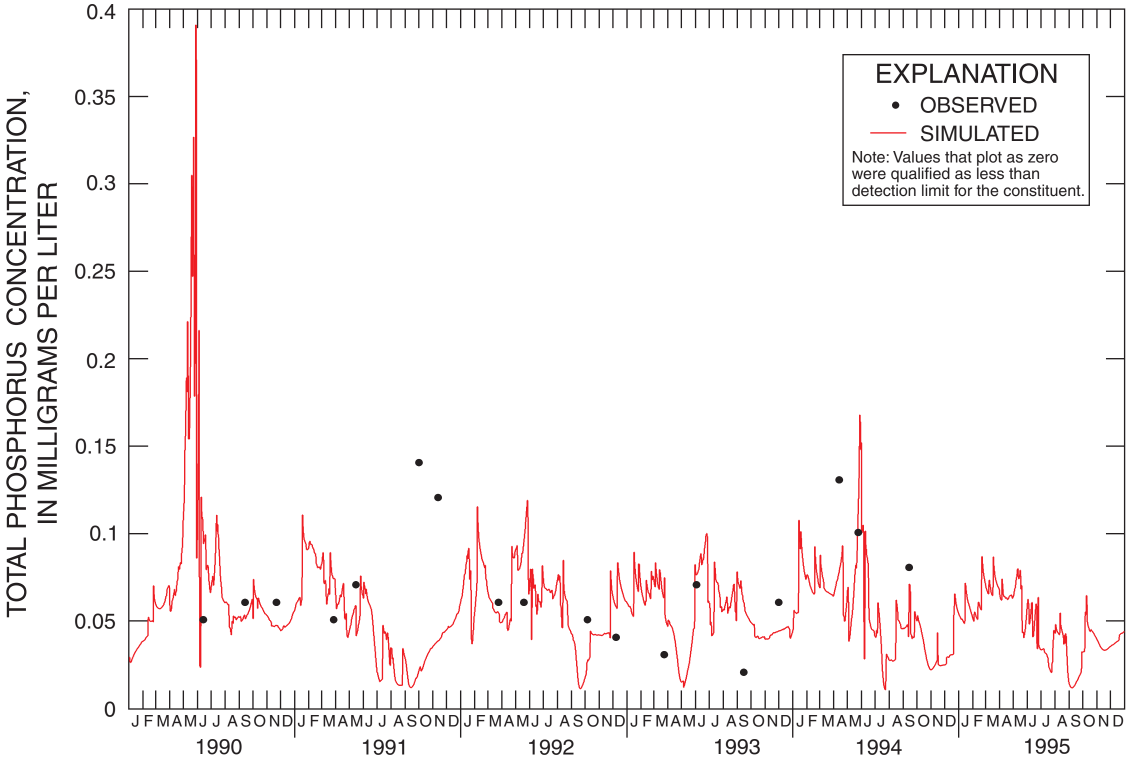


Figure 24. Simulated daily mean and observed periodic total phosphorus concentration values for Davenport Creek near Loughman, Florida.

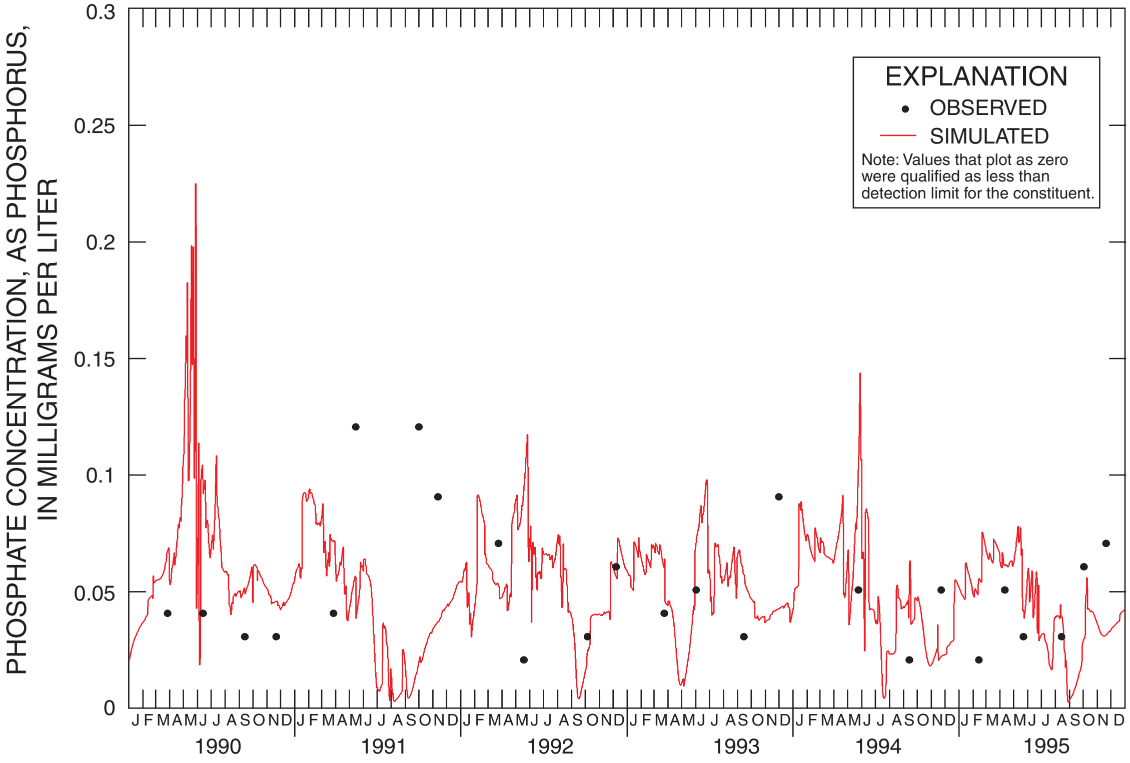


Figure 25. Simulated daily mean and observed periodic phosphate concentration values for Davenport Creek near Loughman, Florida.

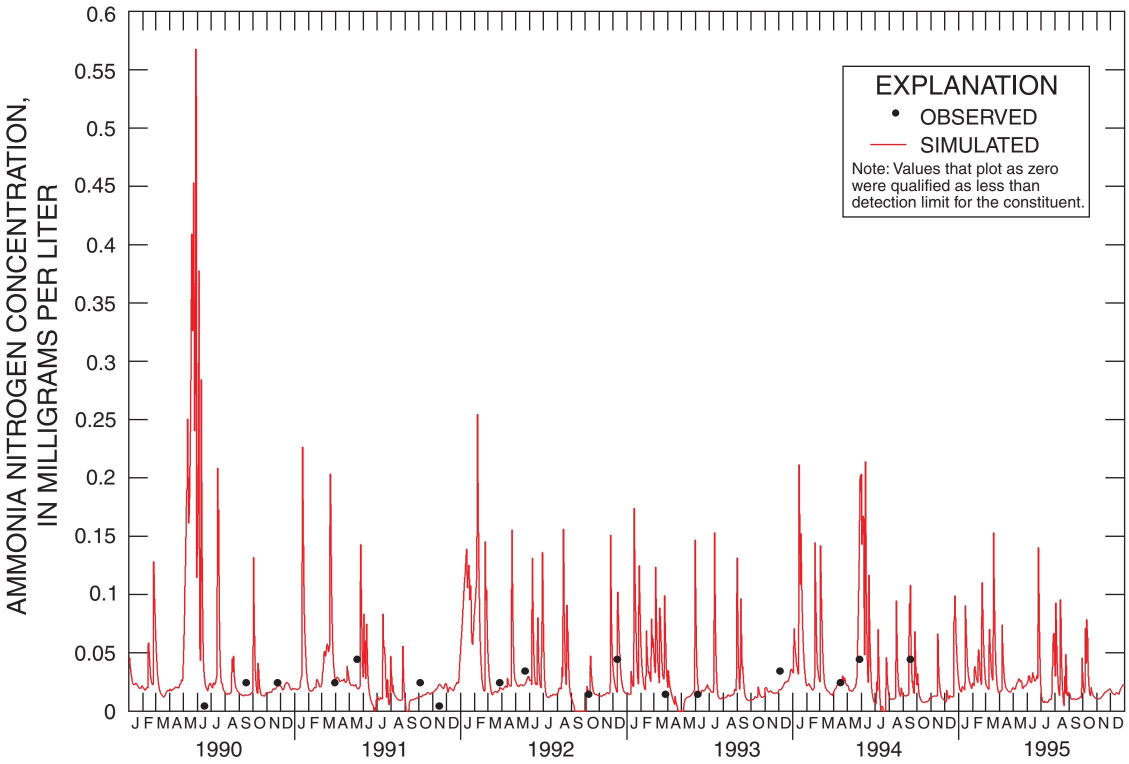


Figure 26. Simulated daily mean and observed periodic ammonia nitrogen concentration values for Davenport Creek near Loughman, Florida.

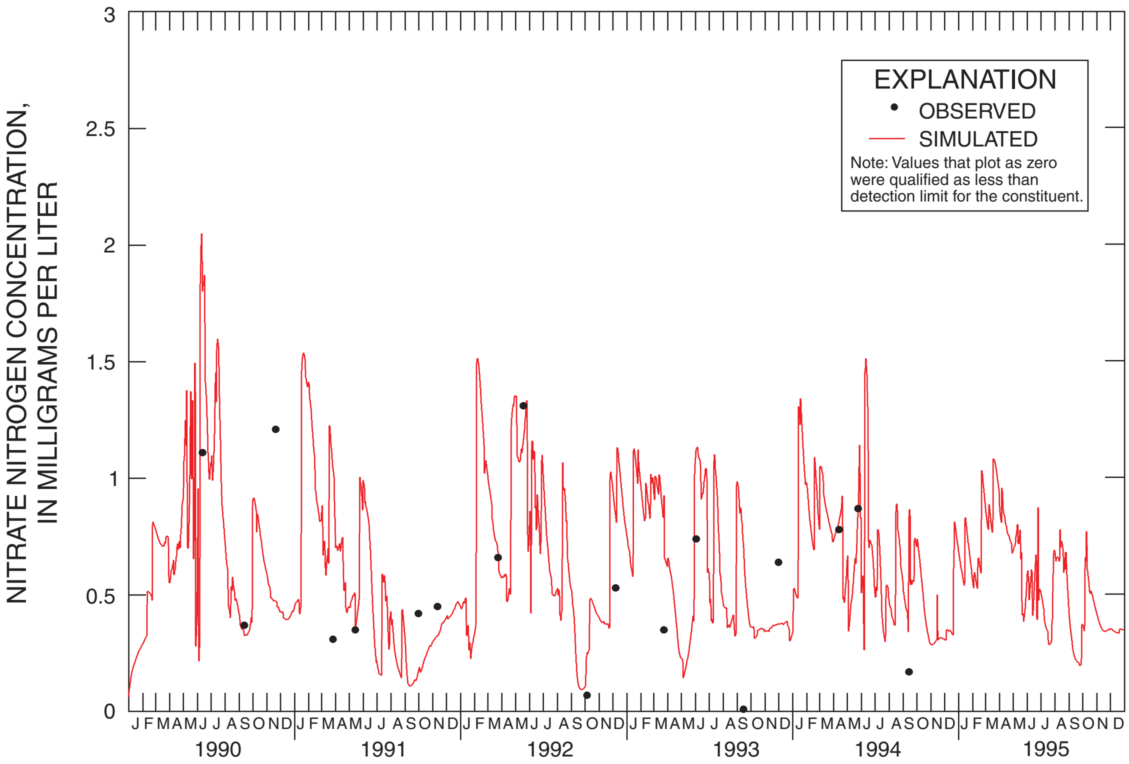


Figure 27. Simulated daily mean and observed periodic nitrate nitrogen concentration values for Davenport Creek near Loughman, Florida.

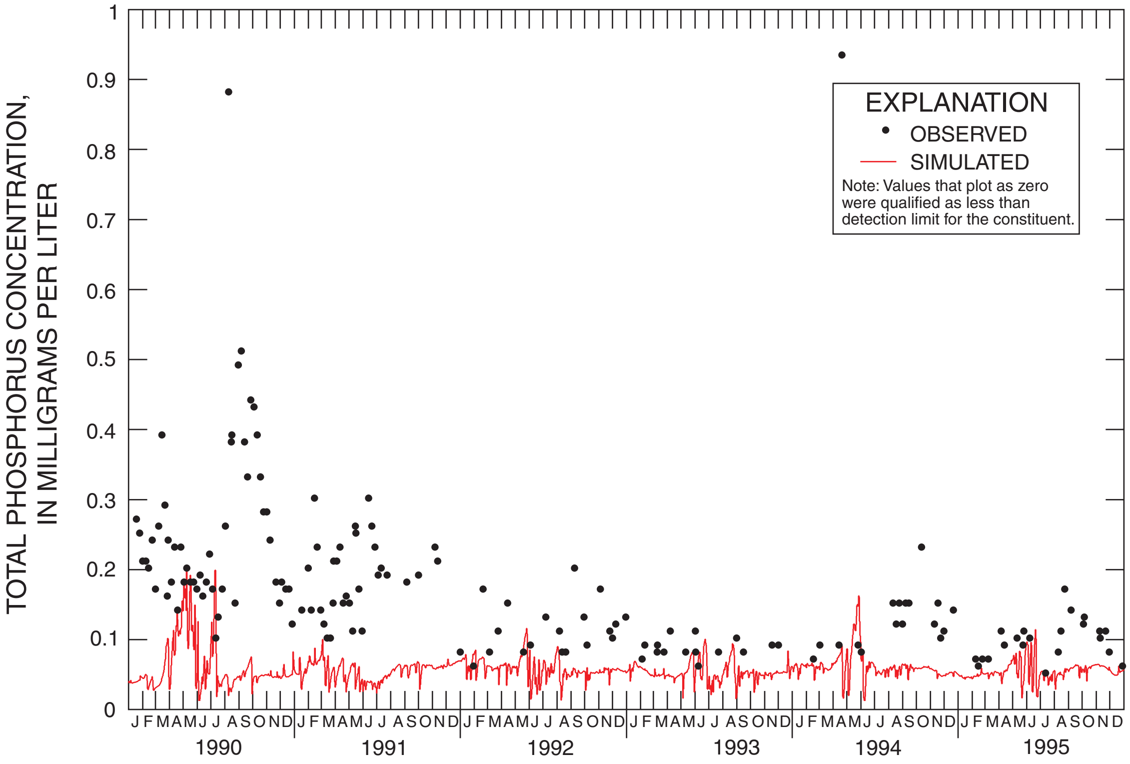


Figure 28. Simulated daily mean and observed periodic total phosphorus concentration values for Reedy Creek near Vineland, Florida.

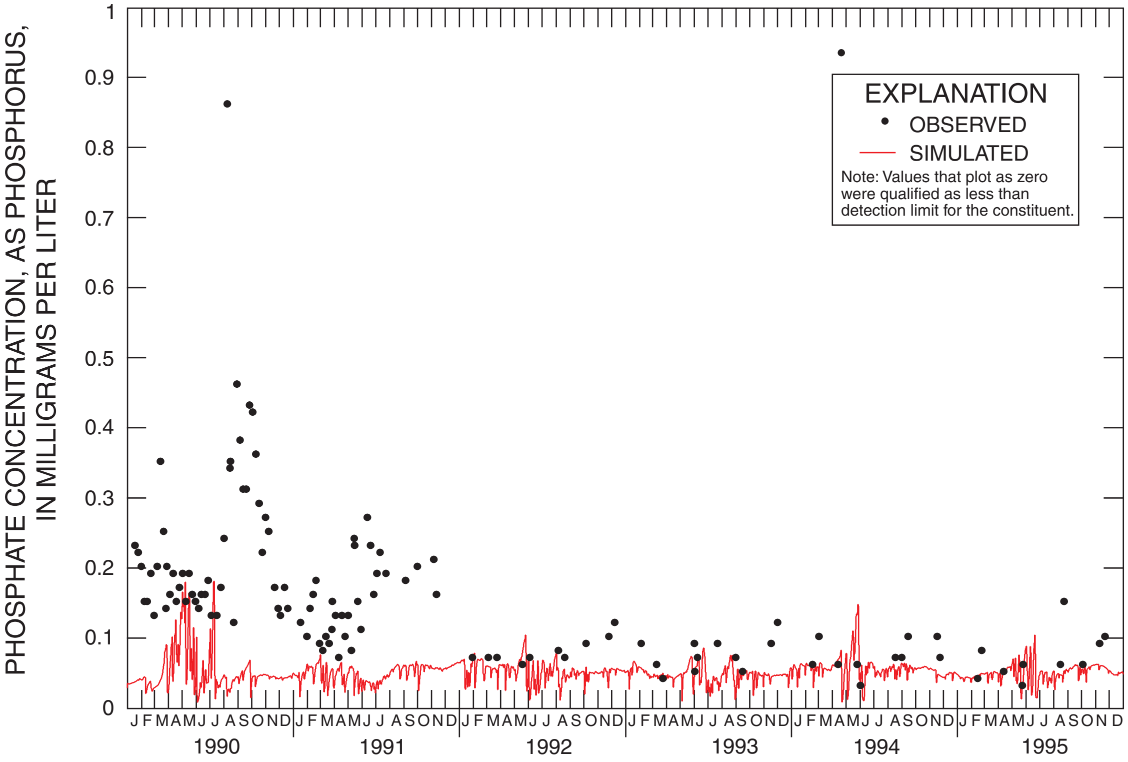


Figure 29. Simulated daily mean and observed periodic phosphate concentration values for Reedy Creek near Vineland, Florida.

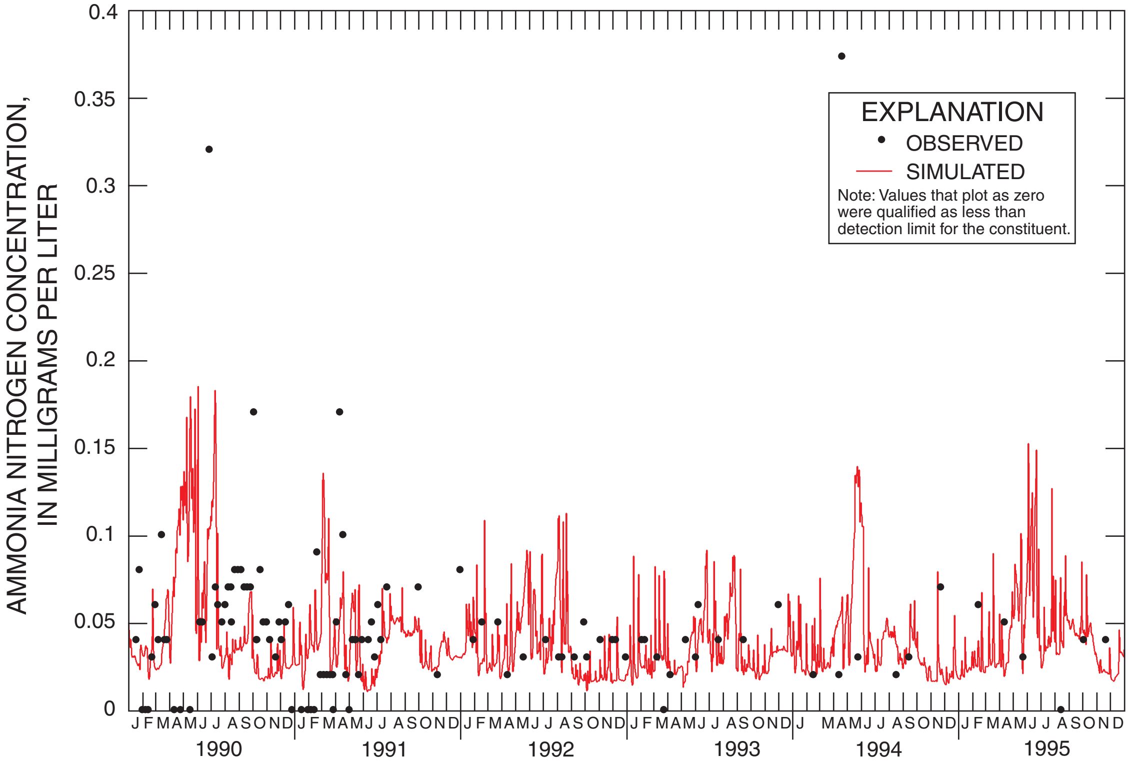


Figure 30. Simulated daily mean and observed periodic ammonia nitrogen concentration values for Reedy Creek near Vineland, Florida.

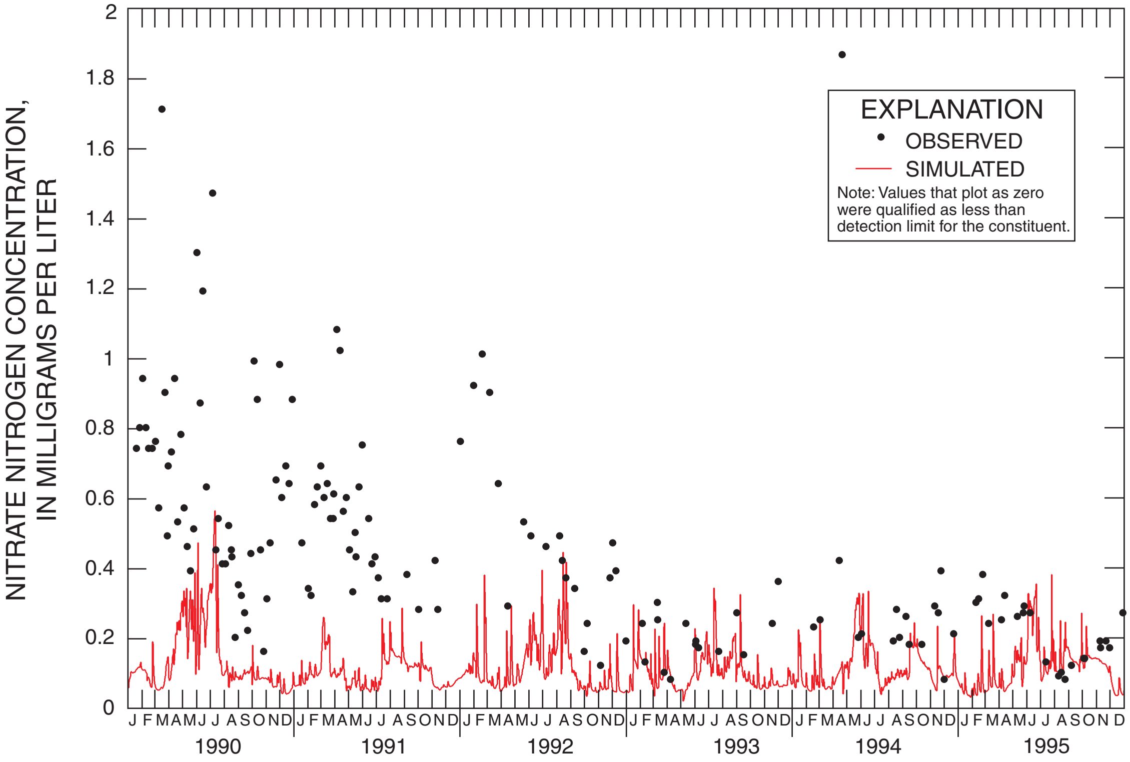


Figure 31. Simulated daily mean and observed periodic nitrate nitrogen concentration values for Reedy Creek near Vineland, Florida.

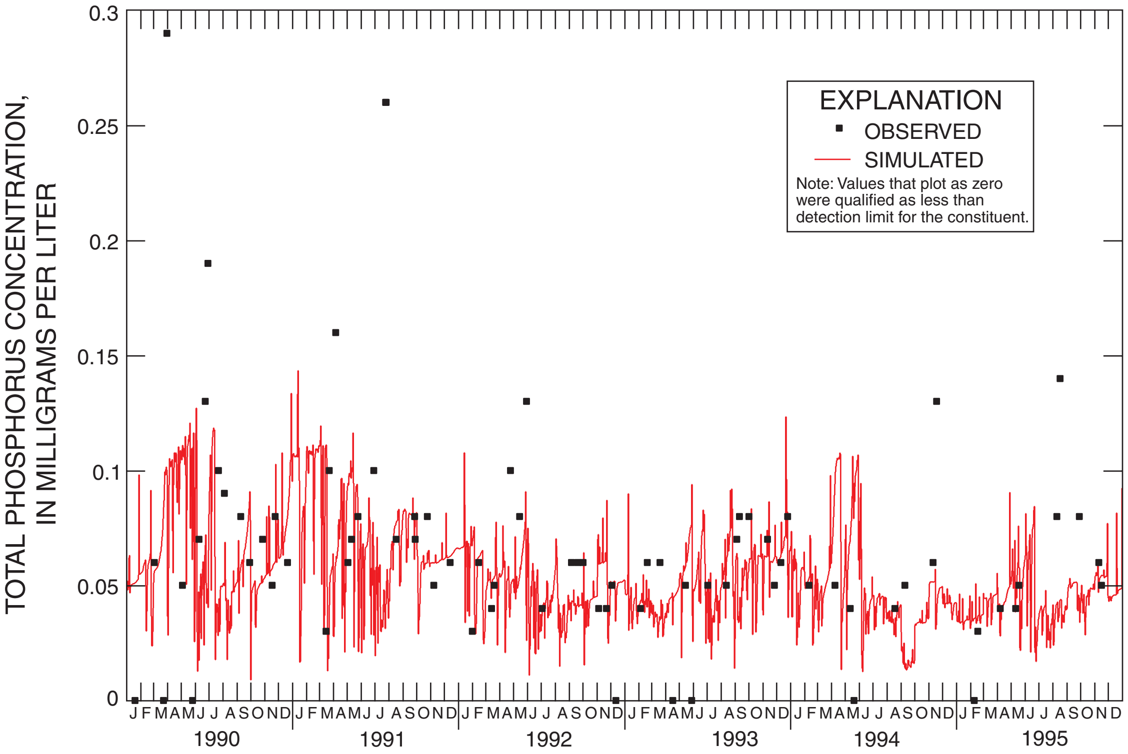


Figure 32. Simulated daily mean and observed periodic total phosphorus concentration values for Bonnet Creek near Vineland, Florida.

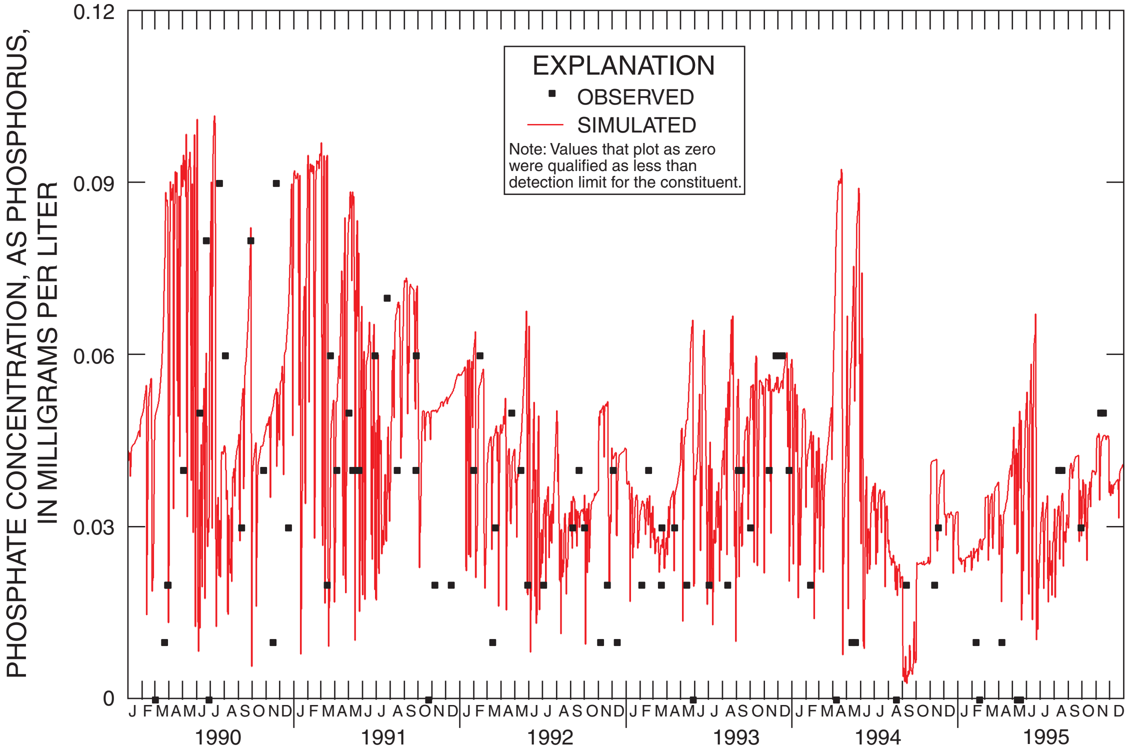


Figure 33. Simulated daily mean and observed periodic phosphate concentration values for Bonnet Creek near Vineland, Florida.

Simulated time series of total phosphorus for Bonnet Creek near Vineland agreed well with observed concentrations, and simulated phosphate phosphorus concentrations slightly over simulatedobserved concentrations (figs. 32 and 33, respectively). This result is similar to water-quality calibrations for the Potomac River (Camacho and Blasenstein, 1992) and for Walnut Creek, Iowa (Donigian and others, 1993).

Simulated time series of ammonia nitrogen concentrations for Bonnet Creek near Vineland agreed well with the observed concentrations, and simulated time series of nitrate nitrogen concentrations slightly over simulated the observed concentrations (figs. 34 and 35, respectively). Undefined water-quality processes in urban land-use areas upstream from the Bonnet Creek near Vineland gaging station may be affecting chemical and biochemical reactions, which affect constituent concentrations in water samples at the gaging site. It was not possible to fully represent the urban land-use types without more specific knowledge of water-quality reactions, constituent concentrations, and constituent loadings from specific land-use types within the watershed. The difficulties in representing the Bonnet Creek drainage between the Cypress Creek and Bonnet Creek gaging stations were previously discussed in the hydrologic model confirmation section of this report. Additional evaluation of the hydrologic and water-quality processes in this part of the watershed is beyond the scope of the current study.

Simulated time series of total phosphorus and phosphate phosphorus concentrations for Reedy Creek near Loughman slightly under simulated the available observed concentrations (figs. 36 and 37, respectively). Simulation of total phosphorus and phosphate phosphorus concentrations that were significantly less than observed concentrations during 1990-91 may have resulted from increases in constituent concentrations in surface runoff, interflow, and ground water from the discharge of treated wastewater into wetland areas draining to the stream channel upstream from the Reedy Creek near Vineland gaging station, as previously discussed.

Simulated time series of ammonia nitrogen concentrations for Reedy Creek near Loughman agreed well with observed concentrations (fig. 38). The general agreement between simulated, continuous values and observed, discrete values was similar to water-quality calibrations for the Potomac River (Camacho and Blasenstein, 1992) and for Walnut Creek, Iowa (Donigian and others, 1993). Simulated time series of nitrate nitrogen concentrations slightly over simulated observed concentrations (fig. 39).

The unknown amount and quality of water diverted from the Reedy Creek watershed at the Bonnet Creek near Kissimmee gaging station (fig. 2, map number 23) and undefined processes in the large wetland area upstream of the Reedy Creek at S-40 near Loughman gaging station (fig. 2, map number 32) may be affecting chemical and biochemical reactions, which affect constituent concentrations in water samples at the Reedy Creek near Loughman gaging station (fig. 2, map number 33). German (1989) reported that most of the processes affecting water quality in the Reedy Creek watershed south of Highway 192 probably occur in the wetland areas (fig. 6). Total nitrogen and phosphorus loads were reduced between Reedy Creek near Vineland and Reedy Creek at S-40 near Loughman by about 33 percent by water-quality reactions in the lower Reedy Creek wetland area (German, 1989). Wetland processes are not fully represented within the model because of insufficient data on water-quality reactions, constituent concentrations, and constituent loadings in the wetland areas of the Reedy Creek watershed. The simulation results at Reedy Creek near Loughman likely could be improved by further data collection and in-depth analysis of wetland processes, and by quantification of the volume and quality of water diverted from the watershed downstream from the Bonnet Creek near Vineland gaging site.

The water-quality calibration was further evaluated by validation of model-parameter values specified for the interflow and ground-water zone concentrations used to obtain a suitable fit between observed and simulated constituent concentrations. Dissolved phosphorus concentrations in ground water from the surficial aquifer system in both Orange County and the Reedy Creek watershed ranged from less than the reporting limit (0.02 milligrams per liter (mg/L)) to 0.07 mg/L, and dissolved orthophosphorus concentrations ranged from less than the reporting limit (0.01 mg/L) to 0.06 mg/L (J. Adamski, U.S. Geological Survey, oral comm., 1999). These values are in reasonable agreement with the concentrations specified in HSPF for the interflow and ground-water zone concentrations (appendix C), and generally support the model calibration for total phosphorus.

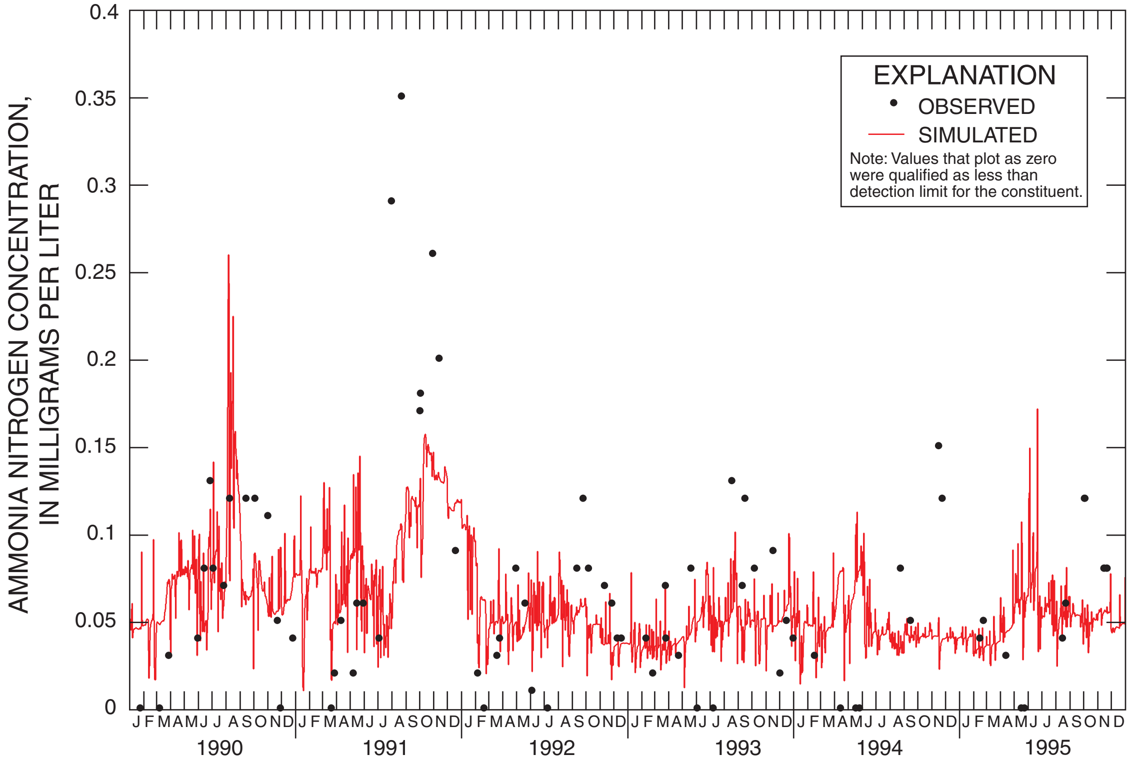


Figure 34. Simulated daily mean and observed periodic ammonia nitrogen concentration values for Bonnet Creek near Vineland, Florida.

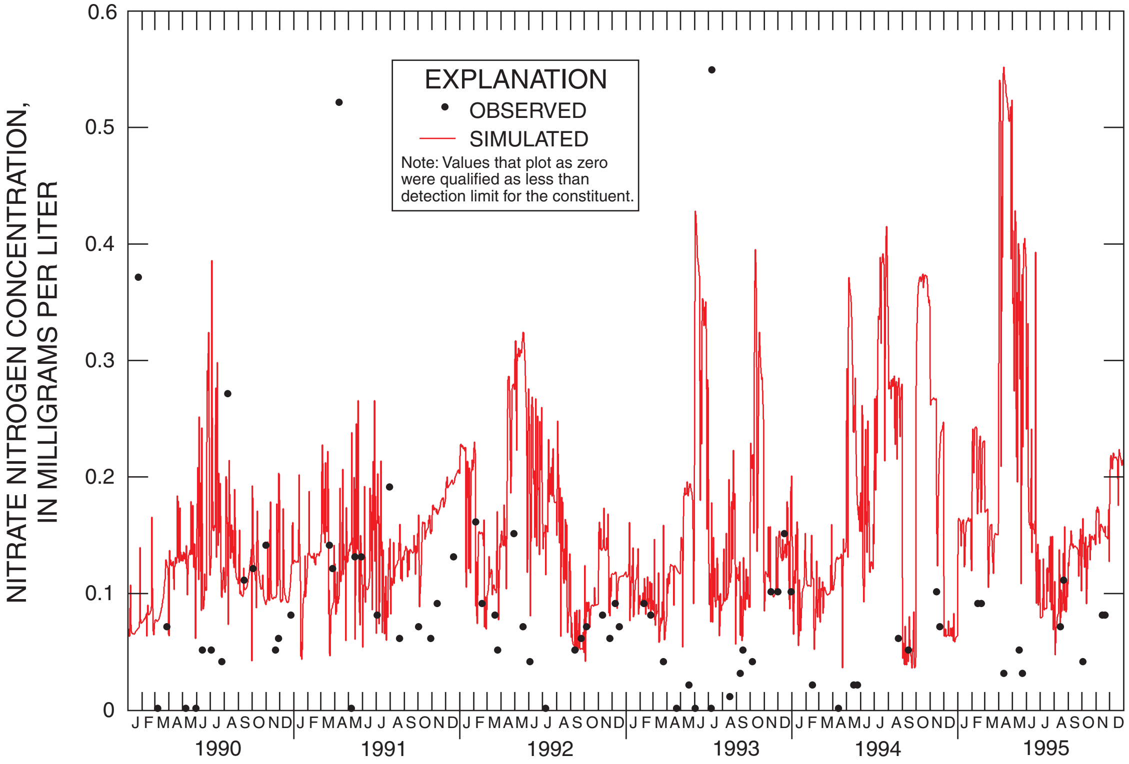


Figure 35. Simulated daily mean and observed periodic nitrate nitrogen concentration values for Bonnet Creek near Vineland, Florida.

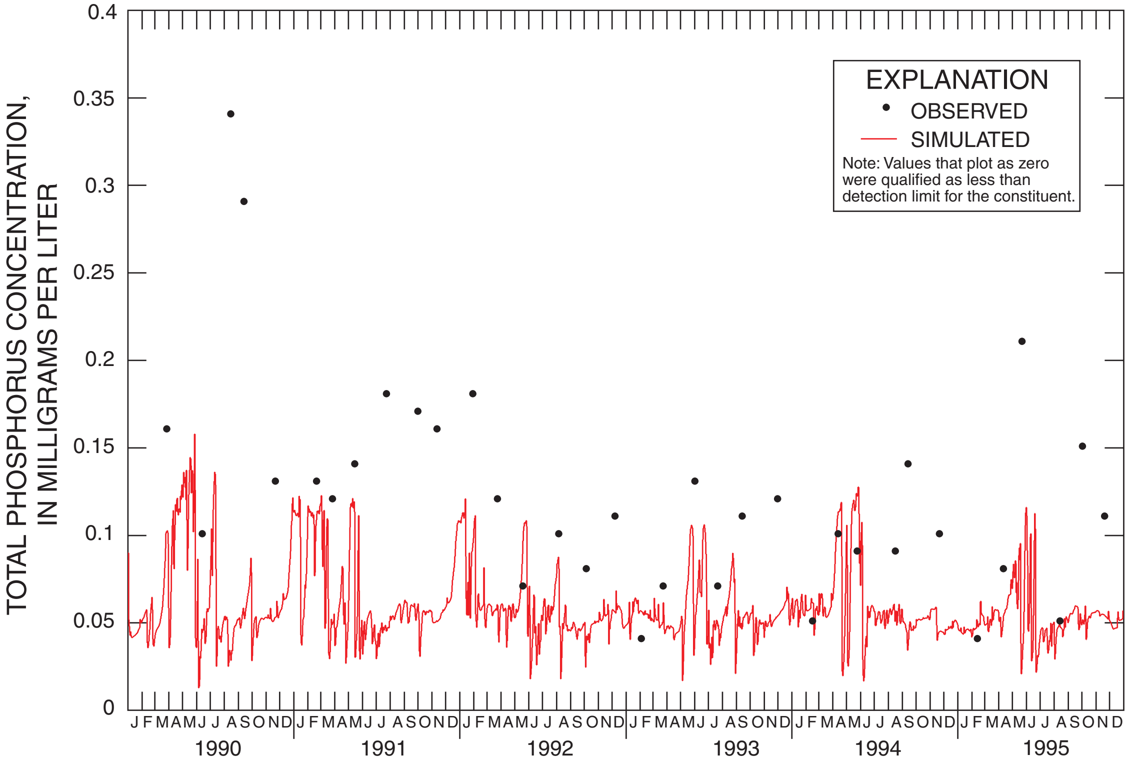


Figure 36. Simulated daily mean and observed periodic total phosphorus concentration values for Reedy Creek near Loughman, Florida.

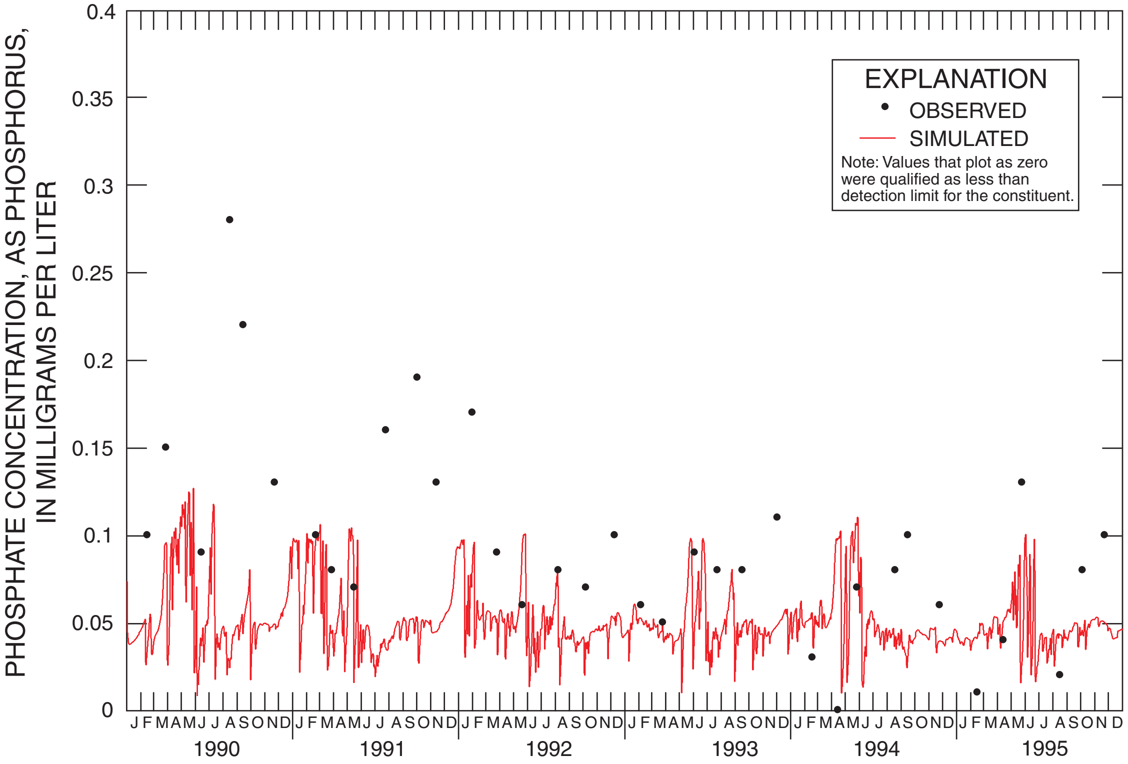


Figure 37. Simulated daily mean and observed periodic phosphate concentration values for Reedy Creek near Loughman, Florida.

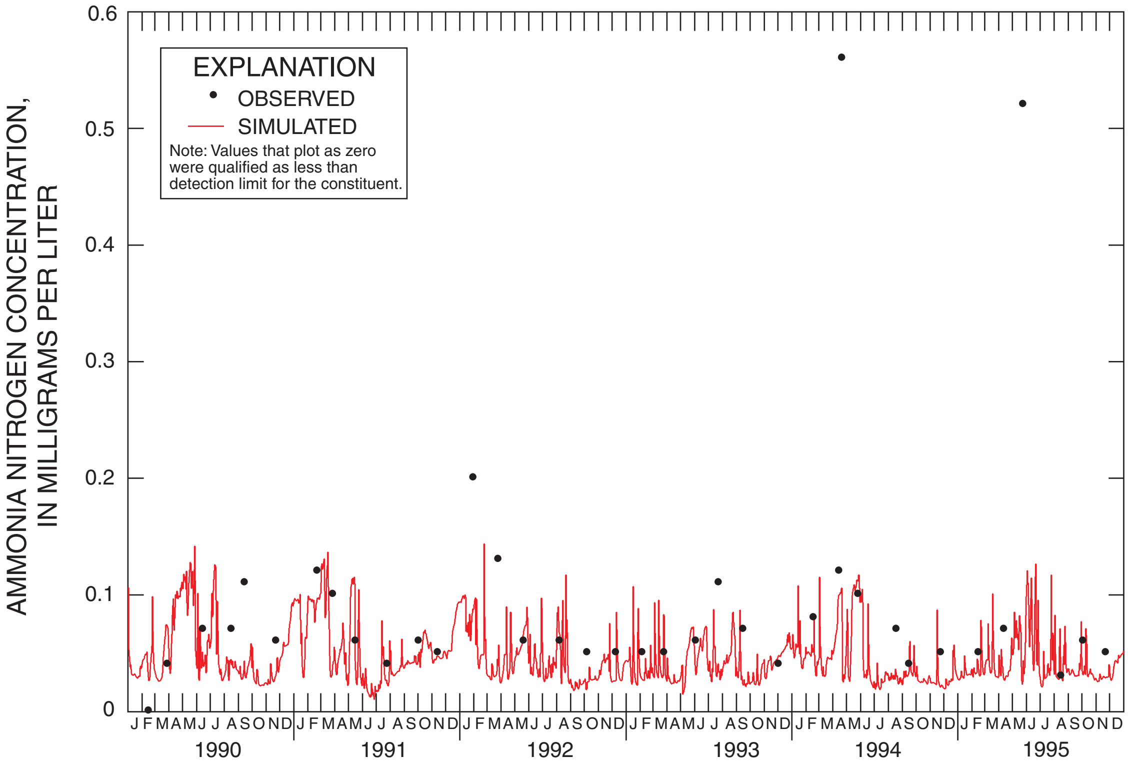


Figure 38. Simulated daily mean and observed periodic ammonia nitrogen concentration values for Reedy Creek near Loughman, Florida.

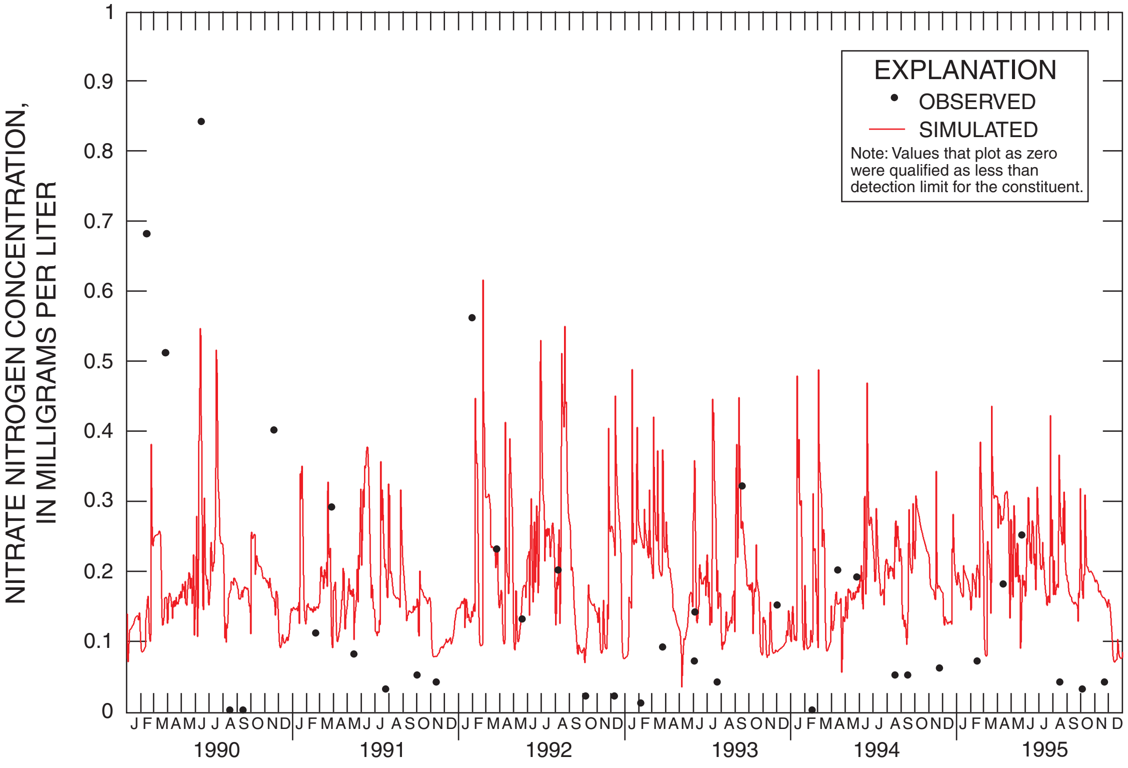


Figure 39. Simulated daily mean and observed periodic nitrate nitrogen concentration values for Reedy Creek near Loughman, Florida.

The samples from the surficial aquifer system also were analyzed for ammonia nitrogen and nitrate nitrogen. Ammonia nitrogen concentrations ranged from less than the reporting limit (0.01 mg/L) to 0.7 mg/L in Orange County, and less than the reporting limit to 0.44 mg/L in the Reedy Creek watershed. For these sites, nitrite plus nitrate nitrogen (mainly nitrate nitrogen) concentrations ranged from less than the reporting limit (0.02 mg/L) to 6.3 mg/L. Concentrations of nitrite plus nitrate nitrogen greater than the reporting limit were measured in the Reedy Creek watershed. Comparison of the observed instream and ground-water concentrations of ammonia nitrogen and nitrate nitrogen and the values for interflow and ground-water zone concentrations specified in HSPF, supports the calibration for ammonia nitrogen and nitrate nitrogen concentrations in the Reedy Creek watershed.

FUTURE LAND-USE SCENARIO SIMULATION

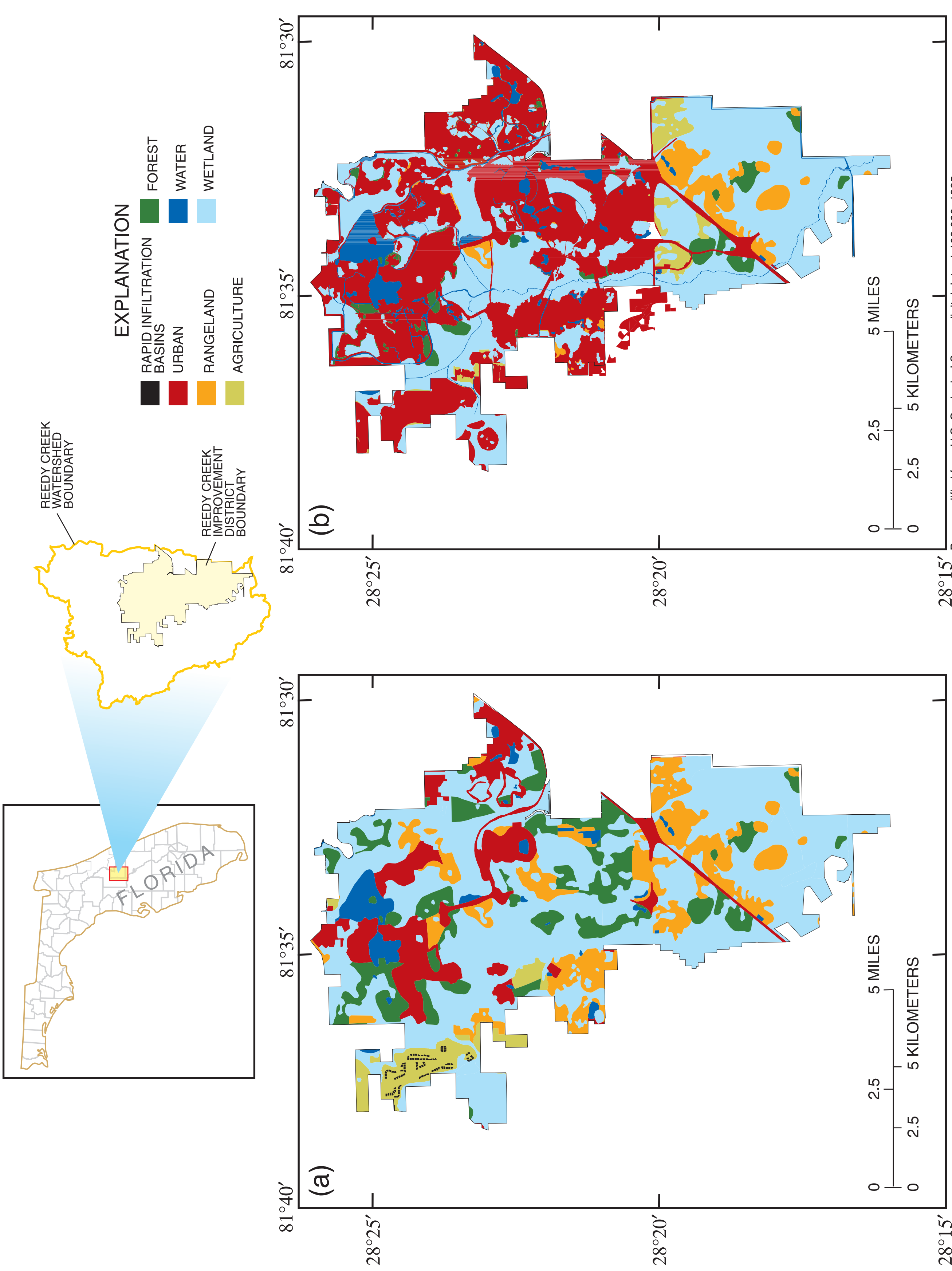
Simulation of a future land-use scenario for the Reedy Creek watershed was based on the hydrologic and water-quality simulations previously discussed in this report, projected future land use within the RCID, and existing land use for areas external to the RCID but within the Reedy Creek watershed. The time series input for the 6-year model simulation period remained unchanged, and all other input to the model (that is, parameters) remained the same except for land use. The user control input file for this scenario is given in appendix E. Errors associated with the calibration and confirmation processes of the existing land use also are present in the future land-use scenario. Therefore, relative changes observed between existing and future land use can be considered unbiased by errors associated with the calibration and confirmation process.

Scenario Development

Runoff and water quality for a future land-use scenario were simulated based only on projected land use within the RCID, assuming that characteristics of land-use types remained unchanged and no additional best management practices (BMPs) were implemented. Projected future land-use data for areas outside the RCID generally are not readily available. Therefore, in the future land-use scenario only planned land development in the RCID could be evaluated as a means to illustrate the effects of land development on water quality in Reedy Creek. If a true representation of possible future water quality in the Reedy Creek watershed is desired, estimates of future land development in the watershed outside of the RCID should be included. Future land-use data, including spatial distribution of land cover in the RCID, which represents 25.5 percent of the total land area of the Reedy Creek watershed, were obtained, based on the RCID City of Lake Buena Vista and City of Bay Lake Comprehensive Plan 2008 (Reedy Creek Improvement District, 1999).

Land-cover attributes from the RCID future land-use spatial data were correlated with the USGS land-use and land-cover classification system for use with remote sensor data (U.S. Geological Survey, 1990). Future land-use data provided by the RCID were adjusted, based on land-cover type, to conform to the six land-use types that characterize the Reedy Creek watershed: agriculture, rangeland, forest, wetlands, RIBS, and urban area (fig. 40). The RCID classification of future land-use types did not closely match the six land-use types used in the existing land-use watershed simulation. Difficulties in reclassification of the RCID land-use types to conform to the six existing land-use types may lead to improper classification of some land areas in the future land-use scenario. Land areas improperly classified were most likely classified as other land-use types with similar characteristics and have relatively little influence on the overall outcome of the future land-use simulation. Existing land-use data (fig. 6), representing the distribution of land use in the Reedy Creek watershed as it existed at the start of the modeling period (January 1990) for areas external to the RCID, were combined with the adjusted RCID future land-use data to produce a future land-use scenario spatial data set for the entire Reedy Creek watershed. Land-use types represented in the existing land use, that were changed to other land-use types in the future land-use scenario, accounted for approximately 20 percent of the total watershed area.

Percentages of modeled pervious and impervious land area for indicated land-use types of modeled sub-watersheds of the Reedy Creek watershed are listed in table 9. Percentages listed for the Bonnet Creek near Vineland and Reedy Creek near Loughman watersheds do not include land areas in the Cypress Creek sub-watershed because the Cypress Creek drainage was input as a point source and not modeled explicitly.



Base modified from U.S. Geological Survey digital data; 1:100,000, 1985
Albers Equal-Area Conic projection Standard parallels 29°30′ and 45°30′, central meridian -83°00′

Figure 40. Land use in the Reedy Creek Improvement District, Florida, (a) existing 1990 and (b) future 2008.

Table 9. Modeled percentages of pervious and impervious land areas based on geographic coverages from existing (1990) and future (2008) land use in the Reedy Creek Improvement District

[When the sum of percentages is less than 100 percent, the remaining area is covered by open water; RIBS, rapid infiltration basins]

	Pervious land area (percent)						Impervious land area (percent)
	Agriculture	Forest	Rangeland	Urban	Wetland	RIBS	
Whittenhorse Creek							
existing land use	27.5	2.4	19.0	1.3	43.6	0.4	0.6
future land use	25.7	2.2	17.9	2.1	41.1	.0	5.5
Davenport Creek							
existing land use	45.5	2.8	16.0	3.6	26.7	.0	1.5
future land use	45.5	2.8	16.0	3.6	26.7	.0	1.5
Reedy Creek near Vineland							
existing land use	20.3	5.5	21.5	5.3	34.4	.2	3.6
future land use	18.8	2.3	18.0	5.0	29.6	.0	16.3
Bonnet Creek near Vineland[1]							
existing land use	2.2	10.8	14.2	9.8	40.1	.0	13.2
future land use	2.1	4.3	11.8	7.5	27.1	.0	35.6
Reedy Creek near Loughman[1]							
existing land use	19.9	6.0	20.0	5.4	37.3	.1	4.1
future land use	19.9	2.9	16.6	5.1	32.6	.0	15.0

[1] Does not include land areas in the Cypress Creek sub-watershed.

Overall, the percentage of modeled forest and urban-impervious land-use types changed the most between existing and future land use: for areas upstream from the Reedy Creek near Loughman gaging station, there was a 50 percent reduction in the amount of forest area, and a 300 percent increase in the impervious land areas indicated (table 9). Drainage areas upstream from the Bonnet Creek near Vineland gaging station had the greatest differences in modeled pervious and impervious land areas between existing and future land use.

No change in land area for the Davenport Creek sub-watershed is indicated because all of the land areas in this sub-watershed are outside of the RCID; land use distribution is the same for the existing and future land use. As indicated in table 9, RIBS are a small percentage of the existing land use and are not represented as a land-use type in the future land-use scenario. Based on the RCID future land-use data, areas indicated as RIBS in the existing land use were changed to other land-use types in the future land-use scenario (fig. 40). Wastewater disposed to the RIBS land-use type in the RCID likely will be diverted for use as irrigation water, and the net effect on water quality in the watershed should be similar to that presented in this report. The greatest change in the future land-use scenario for all sub-watersheds was an increase in the impervious land use.

Hydrology

Annual mean discharge summaries at four sites indicated increased runoff in the future land-use scenario (table 10). Davenport Creek was not included in the comparison because no changes in land areas are projected between existing and future land use, and therefore, discharge would not change. Annual mean discharge increased at three of the four sites by about 30 percent or greater. These three sites also had the greatest change in impervious area between existing and future land use (table 9). Increases in the total runoff in each sub-watershed and in the entire Reedy Creek watershed, as simulated in the future land-use scenario, can likely be attributed to the overall increase in impervious areas.

Duration curves of daily mean discharge for existing and future land use also indicated an increase in total runoff from the Reedy Creek watershed for the future land-use scenario (fig. 41). An increase in overland flow and decrease in infiltration attributed to increases in impervious areas are indicated by increases in discharge duration. Three of the four duration curves (fig. 41) indicate an increase in discharges for all exceedance percentages in the future land-use scenario. This likely is the result of storage characteristics of the sub-watersheds. Storage of stormwater affects the flow distribution by

Table 10. Annual mean discharge summary for 6-year simulations using existing (1990) and future (2008) land use for the Reedy Creek watershed, Florida

[Discharge values are in cubic feet per second]

	Annual mean discharge						6-year mean discharge
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	
Whittenhorse Creek							
existing land use	2.19	10.0	6.17	7.50	11.9	11.4	8.20
future land use	3.37	11.7	7.71	8.88	13.4	12.8	9.64
Reedy Creek near Vineland							
existing land use	24.2	46.0	31.1	39.8	66.7	70.1	46.3
future land use	46.5	74.7	62.5	69.5	95.1	98.3	74.4
Bonnet Creek near Vineland							
existing land use	8.19	19.7	17.1	19.5	33.4	33.9	22.0
future land use	14.7	28.0	26.4	28.4	41.7	41.8	30.2
Reedy Creek near Loughman							
existing land use	21.0	59.6	33.9	45.0	84.6	96.9	56.8
future land use	51.9	100.5	79.6	87.9	126.0	138.2	97.4

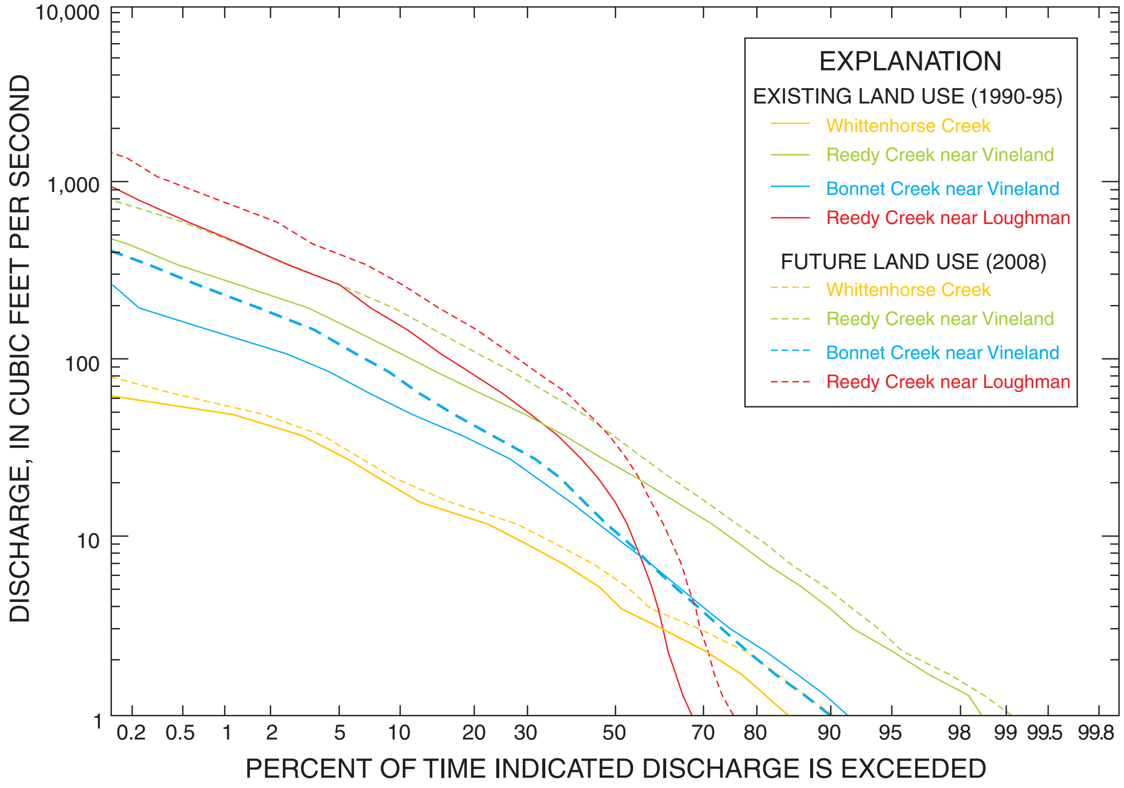


Figure 41. Daily mean discharge duration curves of simulated values for existing (1990) and future (2008) land use of the Reedy Creek watershed, Florida.

increasing flows throughout the range of flows. The future land-use scenario duration curve for Bonnet Creek indicates increases in discharge greater than about 8 ft^3/s and decreases in discharge less than about 8 ft^3/s. This is consistent with the changes in land-use percentage between the existing and future land use. The Bonnet Creek sub-watershed had the greatest decrease in percentage of pervious area, and thus, the greatest increase in percentage of impervious area. The resulting increase in impervious area will increase the amount of surface runoff, which is greater during storm events at a higher discharge range of the duration curve. The larger reduction in infiltration in Bonnet Creek relative to other sub-watersheds results in substantially reduced baseflow.

Water Quality

A rank-sum test (Mann, 1945; and Wilcoxon, 1945) was used to test whether the two watershed simulations (existing and future land use) produce populations of constituent concentrations that are identical (null hypothesis). The comparison between simulated mean constituent concentrations over the 6-year simulation period for existing and future land use indicated a difference in the mean value of a constituent for 14 of 20 possible site-constituent combinations (five sites and four constituents at each site) (table 11). The p-value associated with the mean constituent concentrations for existing and future land use is a measure of the likelihood that the mean constituent concentration values are the same (Ott, 1992, p. 230-233). A p-value of 0.000 indicates that there is no likelihood that values are the same; a p-value of 1.000 indicates that the values are identical. Six of the 20 site-constituent combinations had a significant difference at the 0.1 percent level (p-value less than 0.001), and eight of the 20 site-constituent combinations had a significant difference at the 1.0 percent level (p-value less than 0.01). For these site-constituent combinations this means that the null hypothesis can be rejected with a 99.9 and 99 percent confidence, respectively. Total phosphorus and phosphate phosphorus have the greatest tendency to reject the null hypothesis for the Reedy Creek near Vineland and Reedy Creek near Loughman sites. Ammonia nitrogen also had a statistically significant difference in concentration at Reedy Creek near Loughman. The difference between existing and future land use mean concentration values for all site-constituent combinations was less than 0.01 mg/L.

Simulation results for Reedy Creek near Loughman illustrate the effect land-use changes within the RCID have on simulated water-quality constituents at the outflow point of the study area. Changes in land use were based only on changes within the RCID boundaries, which represent about 25.5 percent of the total Reedy Creek watershed, and assuming that land characteristics remained unchanged and no additional BMPs were implemented. Duration curves of daily mean total phosphorus and phosphate phosphorus concentrations indicated a slight decrease in constituent concentration for the future land-use scenario throughout the range of values at Reedy Creek near Loughman (figs. 42 and 43, respectively). Duration curves of daily mean ammonia nitrogen and nitrate nitrogen concentrations indicated a slight decrease in constituent concentration for values having a likelihood of exceedance less than 15 percent and no change above an exceedance of about 20 percent (figs. 44 and 45, respectively).

Table 11. Mean constituent concentrations for 6-year simulations using existing (1990) and future (2008) land use in the Reedy Creek watershed, Florida

[p-value is the probability that mean concentration values for existing and for future land use are equal; all constituent concentration values are in milligrams per liter]

	Total phosphorus	Phosphate	Ammonia nitrogen	Nitrate nitrogen
Whittenhorse Creek				
existing land use	0.034	0.031	0.016	0.029
future land use	.033	.031	.017	.028
p-value	.0531	.1725	.0013	.0890
Davenport Creek				
existing land use	.056	.051	.034	.618
future land use	.056	.051	.034	.620
p-value	.8743	.8524	.9354	.8776
Reedy Creek near Vineland				
existing land use	.057	.051	.041	.117
future land use	.051	.044	.041	.118
p-value	.0000	.0000	.5848	.8904
Bonnet Creek near Vineland				
existing land use	.055	.043	.061	.160
future land use	.056	.043	.065	.170
p-value	.0479	.6185	.0000	.0000
Reedy Creek near Loughman				
existing land use	.059	.052	.046	.188
future land use	.053	.045	.045	.185
p-value	.0000	.0000	.0059	.1464

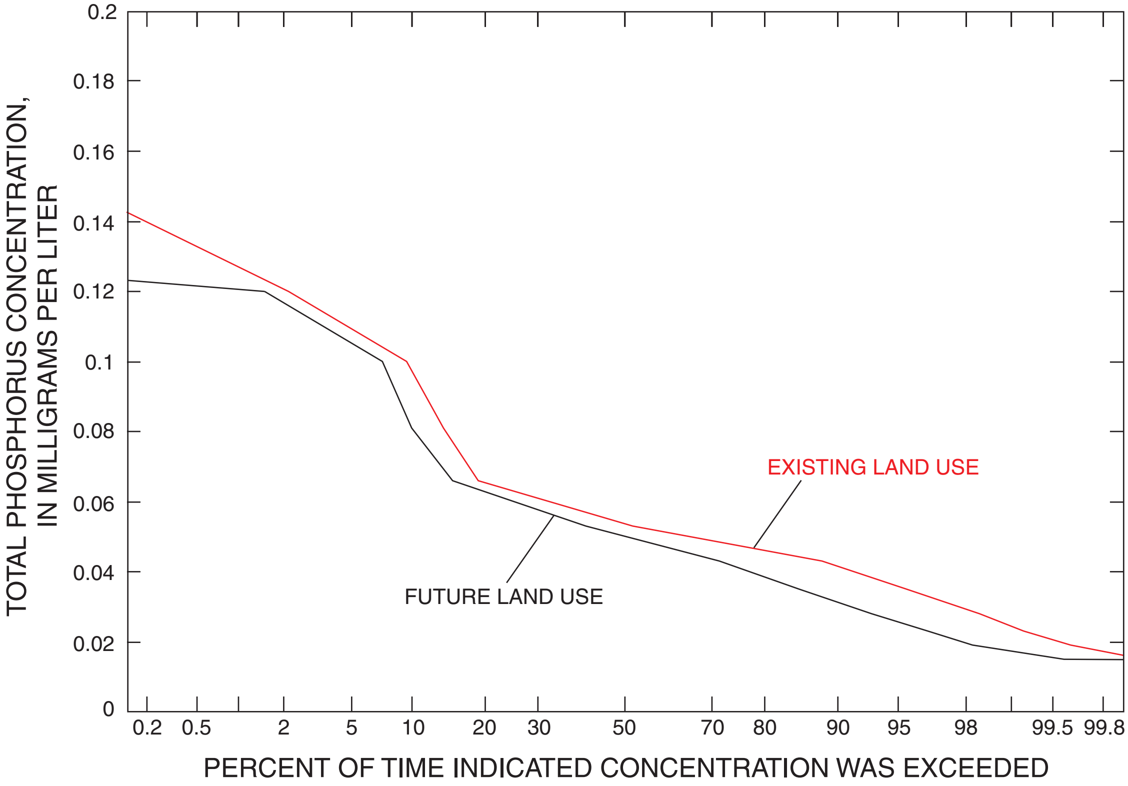


Figure 42. Duration curves of simulated daily mean total phosphorus concentration for existing (1990) and future (2008) land use for Reedy Creek near Loughman, Florida.

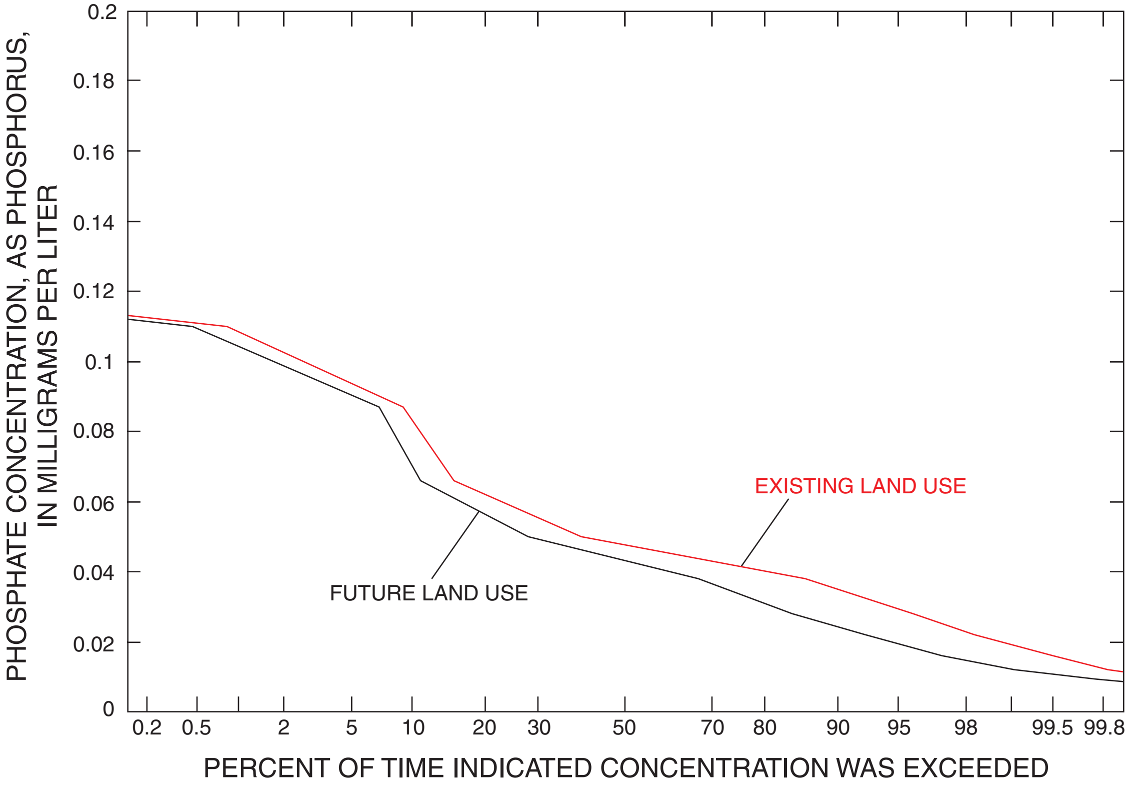


Figure 43. Duration curves of simulated daily mean phosphate concentration for existing (1990) and future (2008) land use for Reedy Creek near Loughman, Florida.

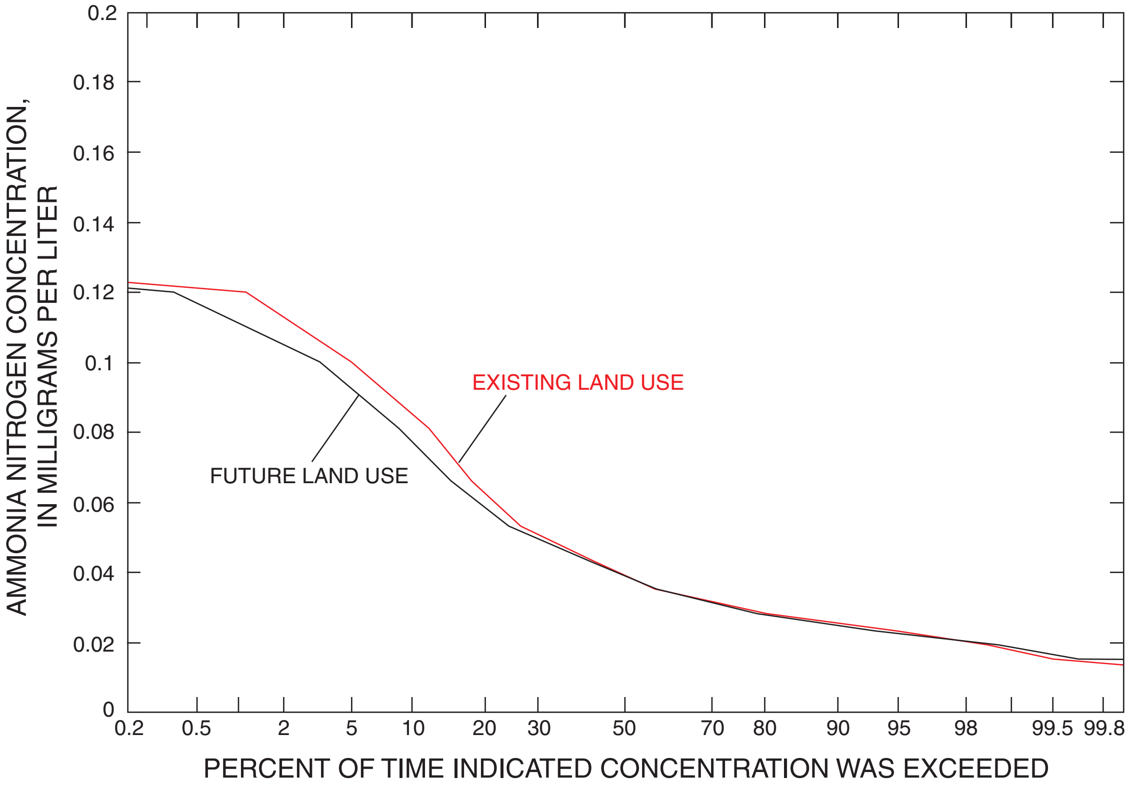


Figure 44. Duration curves of simulated daily mean ammonia nitrogen concentration for existing (1990) and future (2008) land use for Reedy Creek near Loughman, Florida.

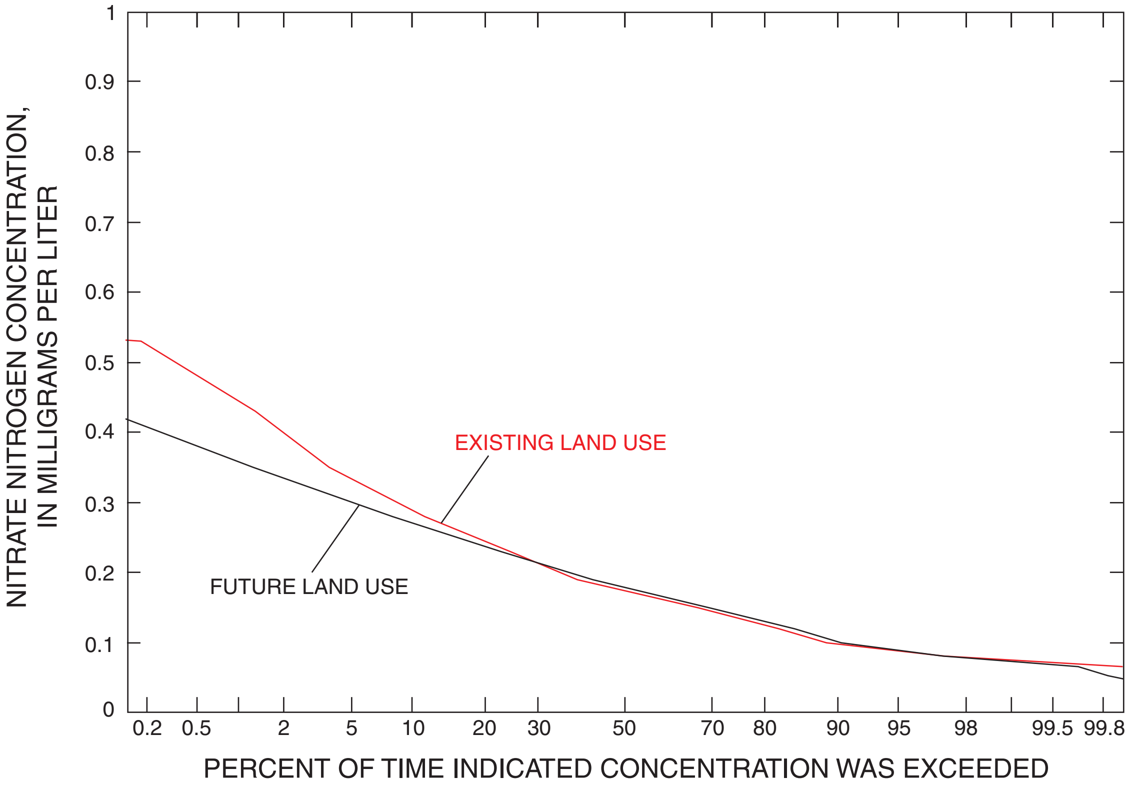


Figure 45. Duration curves of simulated daily mean nitrate nitrogen concentration for existing (1990) and future (2008) land use for Reedy Creek near Loughman, Florida.

Results were similar at Whittenhorse Creek, Reedy Creek, and Bonnet Creek near Vineland. Changes in the mean constituent concentrations are shown in table 11. Slight decreases in mean constituent concentrations and percent exceedance over the simulated period likely are due to dilution of streamwater resulting from increased discharges in the future land-use scenario. The relatively small changes in constituent concentrations between existing and future land use are reasonable relative to urban runoff quality observations made in the Nationwide Urban Runoff Project (NURP) as summarized by Novotny and Olem (1994, p. 491-493). The NURP project involved collecting intensive storm-runoff water-quality samples from 28 cities across the United States. Analysis of these data indicated that although land use has an overall effect on mean constituent concentrations, storm-to-storm variabilities eclipse these effects, thus rendering land-use categories useless in predicting urban runoff quality at unmonitored sites or in explaining site to site differences where monitoring data are available. Even though substantial land-use changes were simulated in the RCID, based on existing and projected future land use, it is not surprising that minimal changes in simulated concentrations result, given the weak relation between constituent concentrations in storm runoff and land use found in the NURP data. Therefore, comparison of constituent loads between current and future land-use conditions is a more reasonable approach to evaluate potential changes in water quality.

Water-Quality Loads

Constituent loadings are a function of both discharge and constituent concentration. In general, water-quality constituent concentrations are not correlated to discharge, and discharge is the primary factor in the determination of constituent loading. The ability of the model to simulate both discharge and concentration allows the calculation and comparison of amounts or loads of a constituent transported past a given point. Maximum daily and total annual constituent loads were calculated using simulated daily mean values of discharge and constituent concentration for Reedy Creek near Loughman (table 12). Constituent loads of total phosphorus, ammonia nitrogen, and nitrate nitrogen for Reedy Creek near Loughman calculated by German (1989) are similar in magnitude to total annual constituent loads calculated by using existing land use for the 6-year period. This is further confirmation that the Reedy Creek watershed model is a reasonable representation of water-quality processes within the watershed. The simulated maximum daily load increased for all constituents for future land use, as compared to existing land use. The maximum daily nitrate nitrogen load increased about 15 percent, which was the greatest increase of all daily constituent loads.

Table 12. Constituent load summary for Reedy Creek near Loughman, Florida, for 6-year (72-month) simulations using existing (1990) and future (2008) land use in the Reedy Creek watershed

[Load values are in pounds]

	Maximum daily load	Annual total load						6-year total load
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	
Total phosphorus as P								
existing land use	303	1,750	5,780	3,240	4,410	8,220	8,970	32,400
future land use	336	3,160	7,510	5,500	6,420	10,200	10,400	43,200
Phosphate, PO_4 as P								
existing land use	262	1,560	4,730	2,850	3,920	7,010	7,890	28,000
future land use	278	2,440	5,730	4,380	5,210	8,240	8,660	34,700
Ammonia, NH_3 as N								
existing land use	680	1,620	4,660	3,040	3,800	5,800	8,430	27,400
future land use	719	3,760	7,340	6,260	6,530	8,700	11,600	44,100
Nitrate, NO_3 as N								
existing land use	1,760	9,320	26,000	20,000	22,800	38,300	42,200	159,000
future land use	2,020	17,800	36,600	33,400	32,600	49,800	53,400	224,000

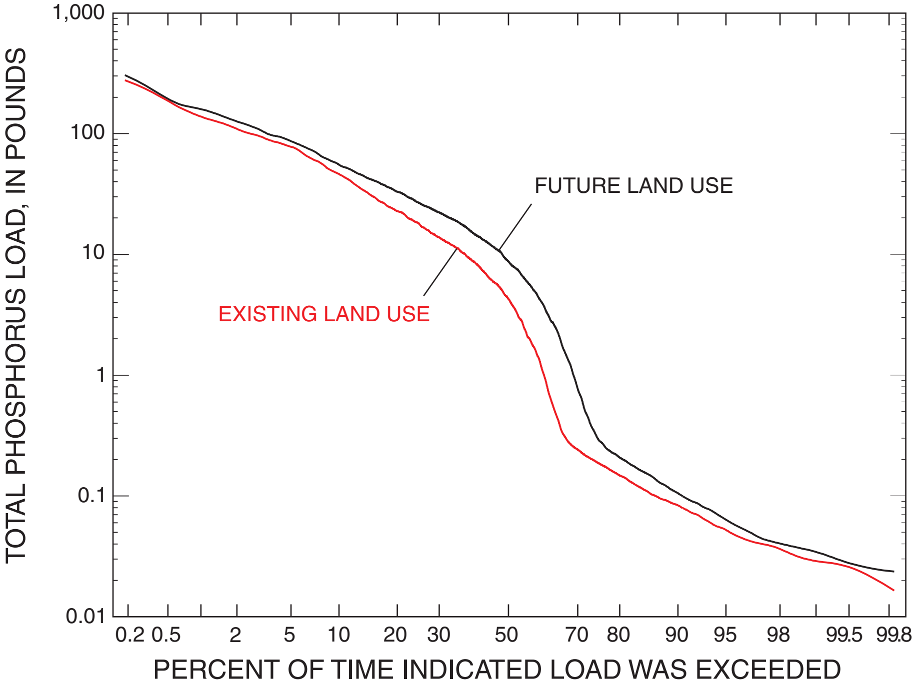


Figure 46. Duration curves of simulated daily total phosphorus load for existing (1990) and future (2008) land use for Reedy Creek near Loughman, Florida.

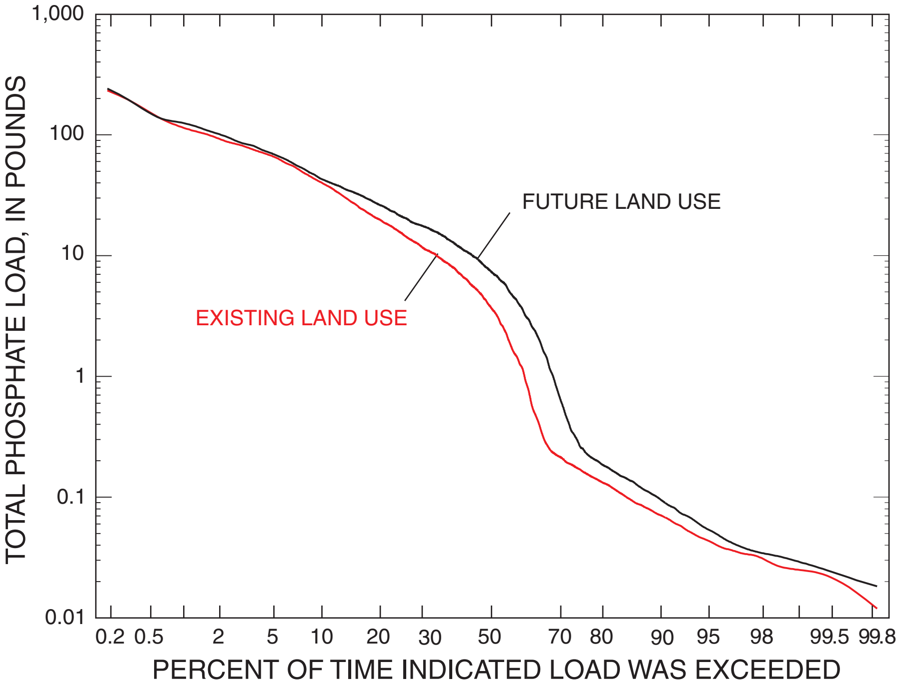


Figure 47. Duration curves of simulated daily phosphate load for existing (1990) and future (2008) land use for Reedy Creek near Loughman, Florida.

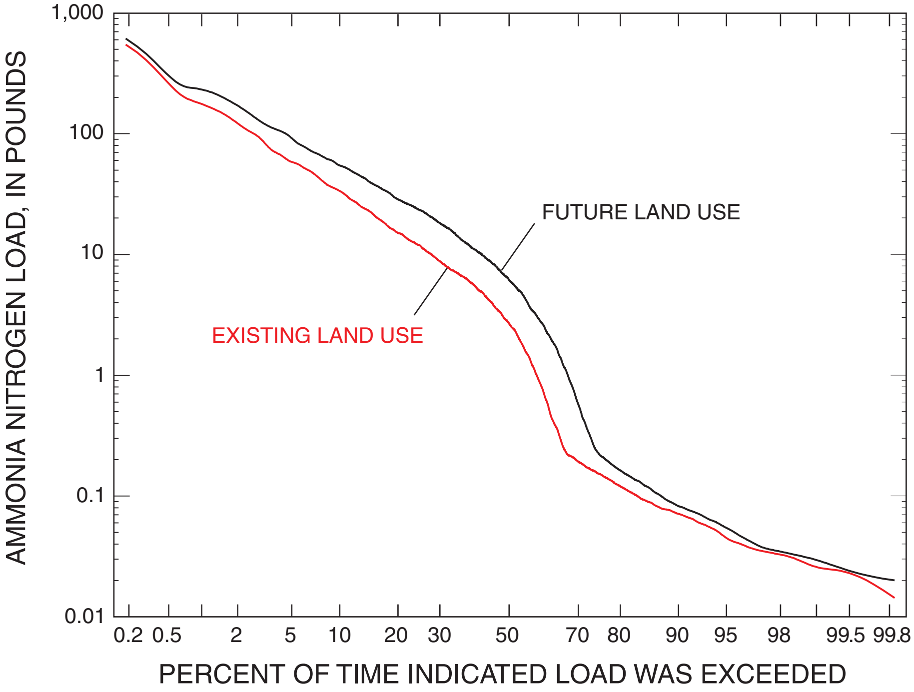


Figure 48. Duration curves of simulated daily ammonia nitrogen load for existing (1990) and future (2008) land use for Reedy Creek near Loughman, Florida.

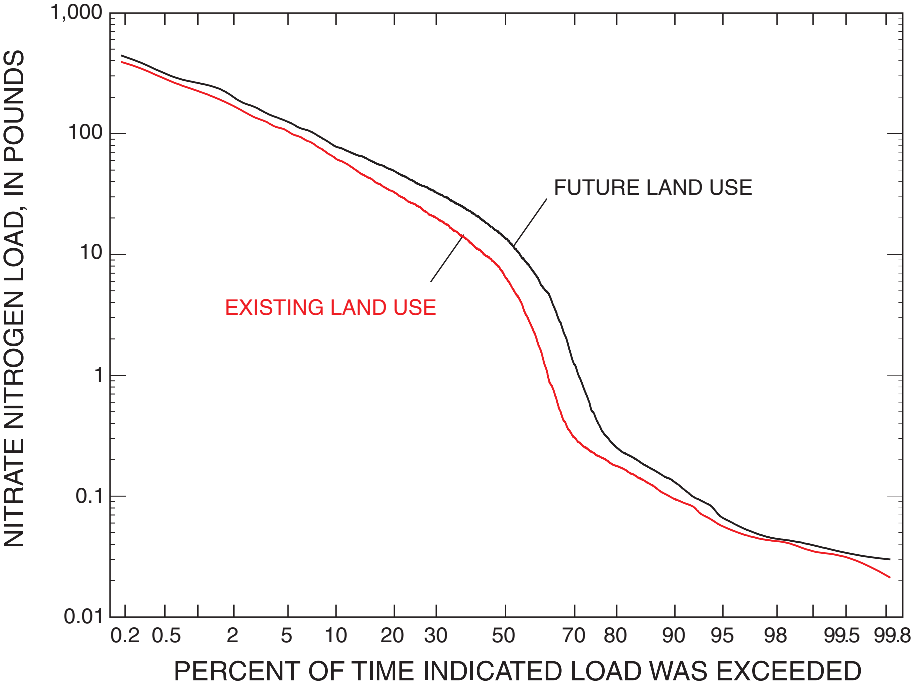


Figure 49. Duration curves of simulated daily nitrate nitrogen load for existing (1990) and future (2008) land use for Reedy Creek near Loughman, Florida.

On average, the maximum daily load increased 10 percent for all constituents. Similar to maximum daily loads, total annual loading of total phosphorus, phosphate phosphorus, ammonia nitrogen, and nitrate nitrogen increased for the future land-use scenario. Total annual ammonia nitrogen loading increased by about 61 percent, the greatest percentage increase of the four constituents. The smallest percentage increase of the four constituents was for total annual phosphate phosphorus loading (about 24 percent). The increases in daily and annual loads simulated for future land use are the result of increases in runoff. However, the implementation of additional BMPs potentially could mitigate some of these load increases.

Duration curves of daily total phosphorus, phosphate phosphorus, ammonia nitrogen, and nitrate nitrogen load indicated an increase in the likelihood of exceeding a given load throughout the range of daily constituent loads at Reedy Creek near Loughman (figs. 46-49). Duration curves of constituent loadings represent the percent of time a daily load is exceeded. All the duration curves indicate a slope change below a load of approximately 0.25 pounds per day (lb/day) for total phosphorus, phosphate phosphorus, and ammonia nitrogen, and 0.45 lb/day for nitrate nitrogen. The slope change corresponds to an exceedance for the existing and future land-use simulations of about 68 and 77 percent, respectively, corresponding to a daily mean discharge of about 1.0 ft^3/s for Reedy Creek near Loughman (fig. 41). Simulated daily mean discharges less than about 1.0 ft^3/s for Reedy Creek near Loughman differ significantly from observed discharges (fig. 18). Given the poor model fit of daily mean discharges less than 1.0 ft^3/s, load exceedance for existing and future land use above 68 and 77 percent, respectively, should be considered outside of the model's range of accurate prediction.

The simulation of loads of ammonia nitrogen, nitrate nitrogen, total phosphorus, and phosphate phosphorus also is acceptably reliable for Whittenhorse Creek, Davenport Creek, and Reedy Creek near Vineland. This conclusion is made on the basis of the acceptable hydrologic simulation and the reasonable match between observed and simulated constituent concentrations at these points. Reasonable matches between observed and simulated constituent concentrations also were obtained for Bonnet Creek near Vineland and Reedy Creek near Loughman. The loads, however, are questionable because of the questionable hydrologic simulations at these locations. The changes in simulated loads at Bonnet Creek near Vineland and Reedy Creek near Loughman as a result of projected changes in the watershed still may be useful for water-quality planning and management because the bias in the simulation of current conditions also is present in the simulation of scenarios reflecting changed land use. Therefore, the bias in each simulation will be cancelled in the comparison, and the resulting differences may be a reasonable estimate of expected changes in runoff and water quality.

In general, water-quality constituent concentrations are not correlated to discharge, and discharge is the primary factor used to determine constituent loading. Changes in land use within the RCID to a more impervious land-use type resulted in increased runoff across the study area. Because future land use outside of the RCID is difficult to predict, and because areas within the Reedy Creek watershed but external to RCID drain through the RCID, it is important to monitor changes in areas external to the RCID. Monitoring would include mapping changes in the land use of subwatersheds draining to Reedy Creek, and monitoring the quantity and quality of waters external to the RCID draining to Reedy Creek and into the RCID.

SUMMARY

Hydrologic and water-quality data have been collected within the 177-mi^2 Reedy Creek, Florida, watershed, beginning as early as 1939, but the data had not been used to evaluate the relations among land use, hydrology, and water quality. A model of the Reedy Creek watershed was developed and applied to the period from January 1990 to December 1995 to provide a computational foundation for evaluating the effects of future changes in land use on hydrology and water quality in the watershed.

The Hydrological Simulation Program-Fortran (HSPF) model was used to simulate hydrology and water quality of runoff for pervious land areas, impervious land areas, and stream reaches. Six land-use types were used to characterize the hydrology and water quality of pervious and impervious land areas in the Reedy Creek watershed: agriculture, rangeland, forest, wetlands, rapid infiltration basins (RIBS), and urban areas. Hydrologic routing and water-quality reactions were simulated to characterize hydrologic and water-quality processes and the movement of runoff and its constituents through the main stream channels and their tributaries.

Compilation of meteorologic, hydrologic, and water-quality time series data, and topographic, hydrologic, and land-use spatial data were part of the simulation plan and database development for the model. The Reedy Creek watershed was subdivided into five separate land areas representing different land characteristics and drainage features, and the stream channel system was divided into reaches based on measured channel cross-section data and topographic information. A total of 19 stream channel reaches were used to represent the movement of runoff, water-quality reactions, and constituent movement through the main stream channels and their tributaries.

Because of the complexity of the stream system within the Reedy Creek Improvement District (RCID) (hydraulic structures, retention ponds) and the anticipated difficulty of modeling the system, an approach of calibrating the model parameters for a subset of the gaged watersheds and confirming the usefulness of the parameters by simulating the remainder of the gaged sites was selected for this study. Two sub-watersheds (Whittenhorse Creek and Davenport Creek) were selected for calibration because both have similar land use to watersheds within the RCID (with the exception of urban areas).

The overall water balance for the Whittenhorse Creek calibration was very good, and the annual water balances ranged from very good to poor over the simulation period, based on the criteria of Donigian and others (1984). For Davenport Creek, the overall water balance was very good and the annual water balances ranged from very good to fair over the simulation period. Duration curves of observed and simulated daily mean discharge indicate good agreement for values at Whittenhorse Creek and an acceptable fit at Davenport Creek. Given the lack of available rainfall data for these sub-watersheds, the hydrologic calibrations of the Whittenhorse Creek and Davenport Creek sub-watersheds were considered acceptable.

The hydrologic model was tested by applying the parameter sets developed for Whittenhorse Creek and Davenport Creek to other land segments within the Reedy Creek watershed, and by comparing the simulated results to observed data sets for Reedy Creek near Vineland, Bonnet Creek near Vineland, and Reedy Creek near Loughman. The hydrologic model confirmation for Reedy Creek near Vineland (correlation coefficient, 0.91, and coefficient of model-fit efficiency, 0.78, for monthly flows) was acceptable. Flows for Bonnet Creek near Vineland were substantially under simulated. The total simulated runoff volume was about 71 percent of the total observed runoff volume over the study period. Thus, the difference in total simulated runoff volume was about 29 percent. Consideration of the ground-water contribution to Bonnet Creek could improve the water balance simulation for Bonnet Creek near Vineland; however, a thorough evaluation of the ground-water contribution is beyond the scope of the current study. On longer time scales (monthly or over the 72-month simulation period), the simulated discharges for Reedy Creek near Loughman agreed well with observed data (correlation coefficient, 0.88, and coefficient of model-fit efficiency, 0.77, for monthly flows). On a shorter time scale (less than a month), however, storm volumes were greatly over simulated and low flows (less than 8 cubic feet per second) were greatly under simulated. A primary reason for the poor results at low flows is the diversion of an unknown amount of water from the RCID at the Bonnet Creek near Kissimmee site.

Selection of water-quality constituents for simulation was based primarily on the availability of water-quality data for sites throughout the Reedy Creek watershed. Dissolved oxygen (DO), nitrogen, and phosphorus species were simulated because of the availability of observed continuous and periodic water-quality data. Representation of nutrient cycling in HSPF also required simulation of biochemical oxygen demand (BOD) and phytoplankton populations. Daily constituent loadings of DO, BOD, ammonia nitrogen, nitrate nitrogen, and total phosphorus were estimated from periodically observed constituent concentrations and input as a point source of inflow to the stream reach downstream from the Cypress Creek near Vineland gaging station.

The water-quality part of the model was calibrated in an iterative manner. Calibration of water-quality constituents was performed by visual comparison of observed and simulated constituent concentrations except for DO, which was calibrated using a statistical comparison. Parameters pertaining to DO were calibrated based on observed data for the site at Reedy Creek near Vineland; parameters pertaining to other constituents were calibrated based on observed data for Whittenhorse Creek, Davenport Creek, Reedy Creek near Vineland, Bonnet Creek near Vineland, and Reedy Creek near Loughman. The correlation coefficient for simulated and observed daily mean DO concentration values at Reedy Creek near Vineland was 0.633. Simulated time series of total phosphorus, phosphate, ammonia nitrogen, and nitrate nitrogen had acceptable agreement with periodic observed values for the Whittenhorse Creek and Davenport Creek calibration sites.

Agreement between simulated and observed constituent concentrations varied at sites in the watershed. At Reedy Creek near Vineland, simulated concentrations of total phosphorus, phosphate, and nitrate nitrogen concentrations substantially under estimated observed concentrations during 1990-91. This may be the result of increases in constituent concentrations in surface runoff, interflow, and ground water in the form of treated wastewater disposed into wetland areas draining to the stream channel upstream from the site. Simulated water-quality constituent concentrations for the Reedy Creek near Loughman site have a moderately acceptable agreement with observed constituent concentrations. The unknown amount and quality of water diverted from the Reedy Creek watershed at the Bonnet Creek near Kissimmee gaging station and undefined processes in the large wetland area upstream of the Reedy Creek at S-40 near Loughman gaging station may be affecting chemical and biochemical reactions, which affect constituent concentrations in water samples at the Reedy Creek near Loughman gaging station.

Simulation of a future land-use scenario for the Reedy Creek watershed was based on the hydrologic and water-quality simulations, projected future land use within the RCID, and existing land use for areas external to the RCID but within the Reedy Creek watershed. Future land-use data provided by the RCID were adjusted, based on land-cover type, to conform to the six land-use types that characterize the Reedy Creek watershed: agriculture, rangeland, forest, wetlands, RIBS, and urban areas. The percentage of forest and urban-impervious land use showed the most change between existing and future land use; forest decreased by 50 percent and urban-impervious area increased by 300 percent.

A comparison of daily mean discharge summaries indicated an increase in runoff at sites where a change in land use occurred. Increases in total runoff from each sub-watershed and the entire Reedy Creek watershed, as simulated in the future land-use scenario, likely can be attributed to an overall increase in impervious areas.

The simulated maximum daily load increased for all water-quality constituents for the future land-use scenario. The maximum daily nitrate nitrogen load increased about 15 percent, which was the greatest increase of all daily constituent loads. On average, the maximum daily load increased 10 percent. Duration curves of daily total phosphorus, phosphate, ammonia nitrogen, and nitrate nitrogen load indicated an increase in the likelihood of exceeding a given load throughout the range of daily constituent loads at Reedy Creek near Loughman. The increases in daily and annual loads simulated for future land use are the result of increases in runoff. However, the implementation of additional BMPs potentially could mitigate some of these load increases.

Because future land use outside the RCID is difficult to predict, and because areas within the Reedy Creek watershed but external to RCID drain through the RCID, it is important to monitor changes in areas external to the RCID. Monitoring would include mapping changes in the land use of sub-watersheds draining to Reedy Creek, and monitoring the quantity and quality of waters external to the RCID draining to Reedy Creek and into the RCID.

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Appendix A

Appendix A. Hydrological Simulation Program-Fortran (HSPF) subroutines and parameters used to simulate water-quality processes in a reach or mixed reservoir for the Reedy Creek watershed, Florida

[OXRX, subroutine for simulation of primary processes which determines dissolved oxygen concentration; NUTRX, subroutine for simulation of inorganic nitrogen and phosphorus balances; PLANK, subroutine for simulation of plankton populations and associated reactions; BOD, biochemical oxygen demand; DO, dissolved oxygen]

Abbreviation	Explanation	Water-quality subroutine
KBOD20	Unit BOD decay rate at 20 degrees Celsius	OXRX
TCBOD	Temperature correction coefficient for BOD decay	OXRX
KODSET	Rate of BOD settling	OXRX
SUPSAT	Maximum allowable DO supersaturation	OXRX
BENOD	Benthal oxygen demand at 20 degrees Celsius	OXRX
TCBEN	Temperature correction coefficient for benthal oxygen demand	OXRX
EXPOD	Exponential factor in the DO term of the benthal oxygen demand equation	OXRX
BRBOD (1)	Benthal release rate of BOD under aerobic conditions	OXRX
BRBOD (2)	Benthal release rate of BOD under anaerobic conditions	OXRX
EXPREL	Exponent in the DO term of the benthal BOD release equation	OXRX
TCGINV	Temperature correction coefficient for surface gas invasion	OXRX
REAK	Empirical constant in the equation used to calculate the reaeration coefficient	OXRX
EXPRED	Exponent of the depth	OXRX
EXPREV	Exponent of velocity in the reaeration coefficient equation	OXRX
BRTAM (1)	Benthal release rates of ammonia under aerobic conditions	NUTRX
BRTAM (2)	Benthal release rates of ammonia under anaerobic conditions	NUTRX
BRPO4 (1)	Benthal release rates of ortho-phosphorus under aerobic conditions	NUTRX
BRPO4 (2)	Benthal release rates of ortho-phosphorus under anaerobic conditions	NUTRX
ANAER	Concentration of DO below which anaerobic conditions are assumed to exist	NUTRX
KTAM20	Nitrification rate of ammonia at 20 degrees Celsius	NUTRX
KNO220	Nitrification rate of nitrite at 20 degrees Celsius	NUTRX
KNO320	Nitrate denitrification rate at 20 degrees Celsius	NUTRX
TCNIT	Temperature correction coefficient for nitrification	NUTRX
TCDEN	Temperature correction coefficient for denitrification	NUTRX
DENOXT	Dissolved oxygen concentration threshold for denitrification	NUTRX
EXPNVG	Exponent in the gas layer mass transfer coefficient equation for ammonia volatilization	NUTRX
EXPNVL	Exponent in the gas liquid layer mass transfer coefficient equation for ammonia volatilization	NUTRX
RATCLP	Ratio of chlorophyll-A content of biomass to phosphorus content	PLANK
NONREF	Non-refractory fraction of algae and zooplankton biomass	PLANK
LITSED	Multiplication factor for total sediment concentration used to determine sediment contribution to light extinction	PLANK
ALNRP	Fraction of nitrogen requirements for phytoplankton growth that is satisfied by nitrate	PLANK
EXTB	Base extinction coefficient for light	PLANK
MALGR	Maximum unit algal growth rate	PLANK
CMMLT	Michaelis-Menton constant for light limited growth	PLANK
CMMN	Nitrate Michaelis-Menton constant for nitrogen-limited growth	PLANK
CMMNP	Nitrate Michaelis-Menton constant for phosphorus-limited growth	PLANK
CMMP	Phosphate Michaelis-Menton constant for phosphorus-limited growth	PLANK
TALGRH	Temperature above which algal growth ceases	PLANK
TALGRL	Temperature below which algal growth ceases	PLANK
TALGRM	Temperature below which algal growth is retarded	PLANK
ALR20	Algal unit respiration rate at 20 degrees Celsius	PLANK
ALDH	High algal unit death rate	PLANK
ALDL	Low algal unit death rate	PLANK
OXALD	Increment to the phytoplankton unit death rate due to anaerobic conditions	PLANK
NALDH	Inorganic nitrogen concentration below which high algal death rate occurs	PLANK
PALDH	Inorganic phophorus concentration below which high algal death rate occurs	PLANK
SEED	Minimum concentration of phytoplankton not subject to advection	PLANK
MXSTAY	Concentration of phytoplankton not subject to advection at very low flow	PLANK
OREF	Outflow at which the concentration of phytoplankton not subject to advection is midway between SEED and MXSTAY	PLANK
CLALDH	Chlorophyll-A concentration above which high algal death rate occurs	PLANK
PHYSET	Rate of phytoplankton settling	PLANK
REFSET	Rate of settling for dead refractory organics	PLANK

Appendix B

Appendix B1. Hydrological Simulation Program-Fortran parameter values for pervious land areas used to simulate hydrology for the Reedy Creek watershed, Florida

[in., inches; mm, millimeters; hr, hour; ft, feet; m, meters. Explanation of parameter abbreviations is given in table 1]

Land segment	Land-use type	LZSN (in.)	INFILT (in./hr)	LSUR (ft)	SLSUR (none)	KVARY (/in.)	AGWRC (/day)	INFEXP (none)	INFILD (none)	DEEPFR (none)	BASETP (none)	AGWETP (none)	CEPSC (in.)	UZSN (in.)	NSUR[1]	INTFW (none)	IRC (/day)
1	Agriculture	2.0	0.08	1,252.9	0.008	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.08	0.26	0.2	0.5	0.8
1	Forest	2.0	0.2	855.2	0.005	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.10	0.73	0.35	0.6	0.8
1	Rangeland	2.0	0.2	1,182.0	0.011	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.05	0.42	0.15	0.5	0.8
1	Urban	2.0	0.06	1,144.8	0.007	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.05	0.42	0.10	0.5	0.8
1	Wetland	1.5	0.2	943.8	0.004	0.0	0.97	2.0	2.0	0.4	0.0	0.1	0.20	0.46	0.35	0.7	0.8
1	RIBS	2.0	0.25	100.0	0.001	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.00	0.70	0.10	0.6	0.8
3	Agriculture	2.0	0.2	795.3	0.014	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.08	0.20	0.20	1.0	0.9
3	Forest	2.0	0.25	1,372.0	0.028	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.10	0.56	0.35	1.0	0.9
3	Rangeland	2.0	0.25	1,147.1	0.020	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.05	0.32	0.15	1.0	0.9
3	Urban	2.0	0.07	1,223.6	0.016	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.05	0.32	0.10	1.0	0.9
3	Wetland	1.5	0.25	690.7	0.004	0.0	0.97	2.0	2.0	0.4	0.0	0.1	0.20	0.35	0.35	1.0	0.9
3	RIBS	2.0	0.25	100.0	0.001	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.00	0.70	0.10	1.0	0.9
4	Agriculture	2.0	0.2	481.9	0.013	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.08	0.20	0.20	1.0	0.9
4	Forest	2.0	0.25	433.0	0.026	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.10	0.56	0.35	1.0	0.9
4	Rangeland	2.0	0.25	1,937.8	0.028	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.05	0.32	0.15	1.0	0.9
4	Urban	2.0	0.07	1,311.2	0.031	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.05	0.32	0.1	1.0	0.9
4	Wetland	1.5	0.25	510.7	0.004	0.0	0.97	2.0	2.0	0.4	0.0	0.1	0.20	0.35	0.35	1.0	0.9
4	RIBS	2.0	0.25	100.0	0.001	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.00	0.7	0.10	1.0	0.9
5	Agriculture	2.0	0.08	792.0	0.016	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.08	0.26	0.20	0.5	0.8
5	Forest	2.0	0.2	318.6	0.016	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.10	0.73	0.35	0.6	0.8
5	Rangeland	2.0	0.2	847.8	0.015	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.05	0.42	0.15	0.5	0.8
5	Urban	2.0	0.06	642.1	0.010	0.0	0.97	2.0	2.0	0.5	0.0	0.0	0.05	0.42	0.10	0.5	0.8
5	Wetland	1.5	0.2	662.2	0.005	0.0	0.97	2.0	2.0	0.4	0.0	0.1	0.20	0.46	0.35	0.7	0.8

[1] **NSUR is Manning's n coefficient (dimensionless).**

Appendix B2. Hydrological Simulation Program-Fortran monthly index values for density of deep-rooted vegetation for pervious land areas used to simulate hydrology for the Reedy Creek watershed, Florida

Land segment	Land-use type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Agriculture	0.1	0.2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.1
1	Forest	0.2	0.3	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.2
1	Rangeland	0.2	0.3	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.2
1	Urban	0.2	0.3	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.2
1	Wetland	0.5	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.5
1	RIBS	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
3	Agriculture	0.1	0.2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.1
3	Forest	0.2	0.3	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.2
3	Rangeland	0.2	0.3	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.2
3	Urban	0.2	0.3	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.2
3	Wetland	0.5	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.5
3	RIBS	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
4	Agriculture	0.1	0.2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.1
4	Forest	0.2	0.3	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.2
4	Rangeland	0.2	0.3	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.2
4	Urban	0.2	0.3	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.2
4	Wetland	0.5	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.5
4	RIBS	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
5	Agriculture	0.1	0.2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.1
5	Forest	0.2	0.3	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.2
5	Rangeland	0.2	0.3	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.2
5	Urban	0.2	0.3	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.2
5	Wetland	0.5	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.5

Appendix B3. Hydrological Simulation Program-Fortran parameter values for impervious land areas used to simulate hydrology for the Reedy Creek watershed, Florida

[ft, feet; in., inches; explanation of parameter abbreviations is given in table 1]

Land segment	LSUR (ft)	SLSUR (none)	NSUR[1]	RETSC (in.)
1	200	0.01015	0.015	0.05
3	200	0.01015	0.015	0.05
4	200	0.01015	0.015	0.05
5	200	0.01015	0.015	0.05

[1] NSUR is Manning's n coefficient (dimensionless).

Appendix C

Appendix C1. Hydrological Simulation Program-Fortran (HSPF) pervious land area parameter values used to simulate build-up and wash-off of constituents from the land surface, and interflow and ground-water constituent contribution for the Reedy Creek watershed, Florida

[NH4, ammonia nitrogen; NO3, nitrate nitrogen; PO4, ortho-phosphate; BOD, biochemical oxygen demand; all units are milligrams per liter]

Land seg-ment	Land-use type	Monthly accumulation rate				Monthly accumulation limit				Interflow concentration				Ground-water concentration			
		NH4	NO3	PO4	BOD	NH4	NO3	PO4	BOD	NH4	NO3	PO4	BOD	NH4	NO3	PO4	BOD
1	Forest	0.002	0.005	0.002	0.20	0.008	0.010	0.004	0.45	0.02	0.05	0.025	2.0	0.02	0.05	0.025	2.0
1	Rangeland	0.006	0.050	0.004	0.35	0.024	0.100	0.012	0.70	0.10	0.15	0.100	3.0	0.10	0.15	0.100	3.0
1	Urban	0.008	0.030	0.004	0.30	0.032	0.060	0.012	0.60	0.10	0.10	0.160	5.0	0.10	0.15	0.160	5.0
1	Wetland	0.002	0.002	0.002	0.10	0.008	0.004	0.004	0.20	0.03	0.02	0.010	1.0	0.03	0.01	0.010	1.0
1	RIBS	0.002	0.010	0.004	0.50	0.012	0.020	0.012	1.00	0.10	5.00	0.010	1.0	0.10	5.00	0.010	1.0
3	Agriculture	0.02	0.100	0.004	0.50	0.040	0.200	0.012	1.00	0.10	0.30	0.120	5.0	0.10	0.30	0.120	5.0
3	Forest	0.002	0.005	0.002	0.20	0.008	0.010	0.004	0.45	0.02	0.05	0.025	2.0	0.02	0.05	0.025	2.0
3	Rangeland	0.006	0.050	0.004	0.35	0.024	0.100	0.012	0.70	0.10	0.15	0.100	3.0	0.10	0.15	0.100	3.0
3	Urban	0.008	0.030	0.004	0.30	0.032	0.060	0.012	0.60	0.10	0.10	0.160	5.0	0.10	0.15	0.160	5.0
3	Wetland	0.002	0.002	0.002	0.10	0.008	0.004	0.004	0.20	0.03	0.01	0.010	1.0	0.03	0.01	0.010	1.0
3	RIBS	0.002	0.0100	0.004	0.50	0.012	0.020	0.012	1.00	0.10	5.00	0.010	1.0	0.10	5.00	0.010	1.0
4	Agriculture	0.020	0.100	0.004	0.50	0.040	0.200	0.012	1.00	0.10	0.30	0.120	5.0	0.10	0.30	0.120	5.0
4	Forest	0.002	0.005	0.002	0.20	0.008	0.010	0.004	0.45	0.02	0.05	0.025	2.0	0.02	0.05	0.025	2.0
4	Rangeland	0.006	0.050	0.004	0.35	0.024	0.100	0.012	0.70	0.10	0.15	0.100	3.0	0.10	0.15	0.100	3.0
4	Urban	0.008	0.030	0.004	0.30	0.032	0.060	0.012	0.60	0.10	0.10	0.160	5.0	0.10	0.15	0.160	5.0
4	Wetland	0.002	0.002	0.002	0.10	0.008	0.004	0.004	0.20	0.03	0.01	0.010	1.0	0.03	0.01	0.010	1.0
4	RIBS	0.002	0.010	0.004	0.50	0.012	0.020	0.012	1.00	0.10	5.00	0.010	1.0	0.10	5.00	0.010	1.0
5	Agriculture	0.020	0.100	0.004	0.50	0.040	0.200	0.012	1.00	0.10	0.30	0.060	5.0	0.10	0.30	0.060	5.0
5	Forest	0.002	0.005	0.002	0.20	0.008	0.010	0.004	0.45	0.02	0.05	0.012	2.0	0.02	0.05	0.012	2.0
5	Rangeland	0.006	0.050	0.004	0.35	0.024	0.100	0.012	0.70	0.10	0.15	0.005	3.0	0.10	0.15	0.005	3.0
5	Urban	0.008	0.030	0.004	0.30	0.032	0.060	0.012	0.60	0.10	0.10	0.080	5.0	0.10	0.15	0.080	5.0
5	Wetland	0.002	0.002	0.002	0.10	0.008	0.004	0.004	0.20	0.03	0.01	0.005	1.0	0.03	0.01	0.005	1.0

Appendix C2. Hydrological Simulation Program-Fortran (HSPF) parameters used to simulate build-up and wash-off of constituent from impervious land areas for the Reedy Creek watershed, Florida

[NO3, nitrate nitrogen; PO4, ortho-phosphate; BOD, biochemical oxygen demand; qty, quantity; ac, acre; in., inches]

Abbreviation	Explanation	Units	Constituent		
			NO3	PO4	BOD
SQO	Initial storage of constituent directly associated with overland flow on the surface of the impervious land surface.	qty/ac	0.007	0.002	1.000
POTFW	Washoff potency factor.	qty/ton	0.000	0.000	0.000
ACQOP	Ratio of constituent yield to sediment outflow.	qty/ac/day	0.006	0.001	0.150
SQOLIM	Maximum storage of of constituent directly associated with overland flow on the surface.	qty/ac	0.009	0.002	2.000
WSQOP	Rate of surface runoff that will remove 90 percent of stored constituent directly associated with overland flow per hour.	in./hr	0.5	0.5	0.5

Appendix C3. Hydrological Simulation Program-Fortran (HSPF) parameter values used to simulate water-quality processes in a reach or mixed reservoir for the Reedy Creek watershed, Florida

[OXRX, subroutine for simulation of primary processes which determine dissolved oxygen concentration; NUTRX, subroutine for simulation of inorganic nitrogen and phosphorus balances; PLANK, subroutine for simulation of plankton populations and associated reactions; hr, hour; ft, feet; mg, milligrams; L, liter; mg/L milligrams per liter; ly, langleys; min, minute; degF, degrees Fahrenheit; ft^3, cubic feet; s, second; µg, micrograms. Explanation of parameter abbreviations is given in appendix A; see table 6 for listing of stream reaches]

Water-quality subroutine	Abbreviation	Units	Stream reach					
			2-15	16	31	41	51	61
OXRX	KBOD20	/hr	0.01	0.01	0.01	0.01	0.01	0.01
OXRX	KODSET	ft/hr	0.005	0.005	0.005	0.005	0.005	0.005
OXRX	BENOD	mg/m^2-hr	40.0	20.0	80.0	80.0	80.0	40.0
OXRX	TCBEN	none	1.1	1.1	1.1	1.1	1.1	1.1
OXRX	EXPOD	none	1.2	1.2	1.2	1.2	1.2	1.2
OXRX	BRBOD (1)	mg/m^2-hr	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
OXRX	BRBOD (2)	mg/m^2-hr	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
OXRX	EXPREL	none	2.82	2.82	2.82	2.82	2.82	2.82
OXRX	REAK	/hr	0.2	0.2	0.2	0.2	0.2	0.2
OXRX	EXPRED	none	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1
OXRX	EXPREV	none	1.1	1.1	1.1	1.1	1.1	1.1
NUTRX	BRTAM(1)	mg/m^2-hr	0.0	0.0	0.0	0.0	0.0	0.0
NUTRX	BRTAM(2)	mg/m^2-hr	0.0	0.0	0.0	0.0	0.0	0.0
NUTRX	BRPO4(1)	mg/m^2-hr	0.0	0.0	0.0	0.0	0.0	0.0
NUTRX	BRPO4(2)	mg/m^2-hr	0.0	0.0	0.0	0.0	0.0	0.0
NUTRX	ANAER	mg/L	0.005	0.005	0.005	0.005	0.005	0.005
NUTRX	KTAM20	/hr	0.015	0.015	0.003	0.003	0.003	0.015
NUTRX	KNO220	/hr	0.002	0.002	0.002	0.002	0.002	0.002
NUTRX	TCNIT	none	1.07	1.07	1.07	1.07	1.07	1.07
NUTRX	KNO320	/hr	0.001	0.001	0.001	0.001	0.001	0.001
NUTRX	TCDEN	none	1.04	1.04	1.04	1.04	1.04	1.04
NUTRX	DENOXT	mg/L	5.00	5.00	5.00	5.00	5.00	5.00
NUTRX	EXPNVG	none	0.5	0.5	0.5	0.5	0.5	0.5
NUTRX	EXPNVL	none	0.6667	0.6667	0.6667	0.6667	0.6667	0.6667
PLANK	RATCLP	none	0.6	0.6	0.6	0.6	0.6	0.6
PLANK	NONREF	none	0.5	0.5	0.5	0.5	0.5	0.5
PLANK	LITSED	L/mg-ft	0.0	0.0	0.0	0.0	0.0	0.0
PLANK	ALNPR	none	0.7	0.7	0.7	0.7	0.7	0.7
PLANK	EXTB	/ft	1.0	1.0	1.0	1.0	1.0	1.0
PLANK	MALGR	/hr	0.07	0.07	0.07	0.07	0.07	0.07
PLANK	CMMLT	ly/min	0.01	0.01	0.01	0.01	0.01	0.01
PLANK	CMMN	mg/L	0.025	0.025	0.025	0.025	0.025	0.025
PLANK	CMMNP	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
PLANK	CMMP	mg/L	0.005	0.005	0.005	0.005	0.005	0.005
PLANK	TALGRH	degF	95.0	95.0	95.0	95.0	95.0	95.0
PLANK	TALGRL	degF	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0
PLANK	TALGRM	degF	86.0	86.0	86.0	86.0	86.0	86.0
PLANK	ALR20	/hr	0.005	0.005	0.005	0.005	0.005	0.005
PLANK	ALDH	/hr	0.01	0.01	0.01	0.01	0.01	0.01
PLANK	ALDL	/hr	0.001	0.001	0.001	0.001	0.001	0.001

Appendix C3. Hydrological Simulation Program-Fortran (HSPF) parameter values used to simulate water-quality processes in a reach or mixed reservoir for the Reedy Creek watershed, Florida--Continued

[OXRX, subroutine for simulation of primary processes which determine dissolved oxygen concentration; NUTRX, subroutine for simulation of inorganic nitrogen and phosphorus balances; PLANK, subroutine for simulation of plankton populations and associated reactions; hr, hour; ft, feet; mg, milligrams; L, liter; mg/L milligrams per liter; ly, langleys; min, minute; degF, degrees Fahrenheit; ft^3, cubic feet; s, second; µg, micrograms. Explanation of parameter abbreviations is given in appendix A; see table 6 for listing of stream reaches]

Water-quality subroutine	Abbreviation	Units	Stream reach					
			2-15	16	31	41	51	61
PLANK	OXALD	/hr	0.03	0.03	0.03	0.03	0.03	0.03
PLANK	NALDH	mg/L	0.01	0.01	0.01	0.01	0.01	0.01
PLANK	PALDH	mg/L	0.002	0.002	0.002	0.002	0.002	0.002
PLANK	SEED	mg/L	0.5	0.5	0.5	0.5	0.5	0.5
PLANK	MXSTAY	mg/L	2.0	2.0	2.0	2.0	2.0	2.0
PLANK	OREF	ft^3/s	20.0	20.0	20.0	20.0	20.0	20.0
PLANK	CLALDH	µg/L	20.0	20.0	20.0	20.0	20.0	20.0
PLANK	PHYSET	ft/hr	0.02	0.02	0.02	0.02	0.02	0.02
PLANK	REFSET	ft/hr	0.02	0.02	0.02	0.02	0.02	0.02
PLANK	RATCLP	none	0.6	0.6	0.6	0.6	0.6	0.6

Appendixes D-E, pages 75-221,
are included on the CDROM
located in the pocket on the back cover.
WRIR 02-4018

Note to users:

Appendixes D and E are included with the online version of WRIR 02-4018.

Appendix D

APPENDIX D

User control input file for simulating existing land use with the Hydrological Simulation Program-Fortran

```
-------------------- Reedy.uci  --------------------***
RUN

GLOBAL
 Reedy Creek, Orange and Osceola Counties, Florida
  START       1990  1  1  0  0  END    1995 12 31 24  0
  RUN INTERP OUTPUT LEVEL    4    1
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<type>  <fun>***<------------fname--------------------------------------------->
MESSU      25   reedy.ech
WDM        27   reedy.wdm
           90   reedy.out
           91   totrept1.out
           93   totrept3.out
           95   totrept5.out
           96   totrept6.out
           81   acrrept1.out
           83   acrrept3.out
           85   acrrept5.out
           86   acrrept6.out
           71   pctrept1.out
           73   pctrept3.out
           75   pctrept5.out
           76   pctrept6.out
           51   rchflux.out
END FILES

OPN SEQUENCE
    INGRP              INDELT  1: 0
      PERLND      31
      PERLND      32
      PERLND      33
      PERLND      34
      PERLND      39
      PERLND      35
      IMPLND      34
      RCHRES      31
      RCHRES      41

      PERLND      51
      PERLND      52
      PERLND      53
      PERLND      54
      PERLND      55
      PERLND      59
      IMPLND      54
      RCHRES      51
      COPY       102
```

```
      PERLND      61
      PERLND      62
      PERLND      63
      PERLND      64
      PERLND      65
      IMPLND      64
      RCHRES      61
      COPY       103

      PERLND      11
      PERLND      12
      PERLND      13
      PERLND      14
      PERLND      15
      PERLND      16
      PERLND      17
      PERLND      18
      PERLND      19
      IMPLND      14
      RCHRES       2
      RCHRES       3
      RCHRES       4
      RCHRES       5
      RCHRES       6
      RCHRES       7
      RCHRES       8
      RCHRES       9
      RCHRES      10
      RCHRES      11
      RCHRES      12
      RCHRES      13
      RCHRES      14
      RCHRES      15
      RCHRES      16
      REPORT       1
      REPORT       3
      REPORT       5
      REPORT       6
      REPORT      11
      REPORT      13
      REPORT      15
      REPORT      16
      REPORT      21
      REPORT      23
      REPORT      25
      REPORT      26
      REPORT     100
      COPY       104
      COPY       105
      COPY       106
      COPY         1
      COPY         2
      COPY         3
      COPY         4
END OPN SEQUENCE
```

```
REPORT
  REPORT-FLAGS
  Rept-opn***
*** x -  x REPT NCON NSRC FORM CWID PWID PLIN PCOD  PYR
    1        91    9    7    2   12 1000 1000    5   12
    3        93    9    7    2   12 1000 1000    5   12
    5        95    9    7    2   12 1000 1000    5   12
    6        96    9    7    2   12 1000 1000    5   12
   11        81    9    7    1   12 1000 1000    5   12
   13        83    9    7    1   12 1000 1000    5   12
   15        85    9    7    1   12 1000 1000    5   12
   16        86    9    7    1   12 1000 1000    5   12
   21        71    9    7    2   12 1000 1000    5   12
   23        73    9    7    2   12 1000 1000    5   12
   25        75    9    7    2   12 1000 1000    5   12
   26        76    9    7    2   12 1000 1000    5   12
  100        51   40   19    1   12 1000 1000    5   12
  END REPORT-FLAGS
  REPORT-TITLE
  Rept-opn***
*** x -  x<--------------------------title--------------------------->
    1     Land Surface total-loads
    3     Land Surface total-loads
    5     Land Surface total-loads
    6     Land Surface total-loads
   11     Land Surface total-loads
   13     Land Surface total-loads
   15     Land Surface total-loads
   16     Land Surface total-loads
   21     Land Surface total-loads
   23     Land Surface total-loads
   25     Land Surface total-loads
   26     Land Surface total-loads
  100     Instream Process Fluxes
  END REPORT-TITLE
  REPORT-SRC
  Rept-opn***
*** x -  x<---source-name---->
    1     Agric
    1     Forest
    1     Range
    1     Urban P
    1     Wetland
    1     RIBs
    1     Impervious
    3     Agric
    3     Forest
    3     Range
    3     Urban P
    3     Wetland
    3     RIBs
    3     Impervious
    5     Agric
    5     Forest
    5     Range
```

```
   5     Urban P
   5     Wetland
   5     RIBs
   5     Impervious
   6     Agric
   6     Forest
   6     Range
   6     Urban P
   6     Wetland
   6     RIBs
   6     Impervious
  11     Agric
  11     Forest
  11     Range
  11     Urban P
  11     Wetland
  11     RIBs
  11     Impervious
  13     Agric
  13     Forest
  13     Range
  13     Urban P
  13     Wetland
  13     RIBs
  13     Impervious
  15     Agric
  15     Forest
  15     Range
  15     Urban P
  15     Wetland
  15     RIBs
  15     Impervious
  16     Agric
  16     Forest
  16     Range
  16     Urban P
  16     Wetland
  16     RIBs
  16     Impervious
  21     Agric
  21     Forest
  21     Range
  21     Urban P
  21     Wetland
  21     RIBs
  21     Impervious
  23     Agric
  23     Forest
  23     Range
  23     Urban P
  23     Wetland
  23     RIBs
  23     Impervious
  25     Agric
  25     Forest
```

```
    25     Range
    25     Urban P
    25     Wetland
    25     RIBs
    25     Impervious
    26     Agric
    26     Forest
    26     Range
    26     Urban P
    26     Wetland
    26     RIBs
    26     Impervious
   100     Rch 31
   100     Rch 41
   100     Rch 51
   100     Rch 61
   100     Rch  2
   100     Rch  3
   100     Rch  4
   100     Rch  5
   100     Rch  6
   100     Rch  7
   100     Rch  8
   100     Rch  9
   100     Rch 10
   100     Rch 11
   100     Rch 12
   100     Rch 13
   100     Rch 14
   100     Rch 15
   100     Rch 16
   END REPORT-SRC
   REPORT-CON
   Rept-opn***
*** x -  x<-----con-name-----> TRAN SIGD DECP
     1     NH3                  SUM     5    3
     1     NO3                  SUM     5    3
     1     Organic N            SUM     5    3
     1     Total N              SUM     5    3
     1     PO4                  SUM     5    3
     1     Organic P            SUM     5    3
     1     Total P              SUM     5    3
     1     BOD                  SUM     5    3
     1     TOC                  SUM     5    3
     3     NH3                  SUM     5    3
     3     NO3                  SUM     5    3
     3     Organic N            SUM     5    3
     3     Total N              SUM     5    3
     3     PO4                  SUM     5    3
     3     Organic P            SUM     5    3
     3     Total P              SUM     5    3
     3     BOD                  SUM     5    3
     3     TOC                  SUM     5    3
     5     NH3                  SUM     5    3
     5     NO3                  SUM     5    3
```

```
 5     Organic N            SUM     5    3
 5     Total N              SUM     5    3
 5     PO4                  SUM     5    3
 5     Organic P            SUM     5    3
 5     Total P              SUM     5    3
 5     BOD                  SUM     5    3
 5     TOC                  SUM     5    3
 6     NH3                  SUM     5    3
 6     NO3                  SUM     5    3
 6     Organic N            SUM     5    3
 6     Total N              SUM     5    3
 6     PO4                  SUM     5    3
 6     Organic P            SUM     5    3
 6     Total P              SUM     5    3
 6     BOD                  SUM     5    3
 6     TOC                  SUM     5    3
11     NH3                  SUM     5    3
11     NO3                  SUM     5    3
11     Organic N            SUM     5    3
11     Total N              SUM     5    3
11     PO4                  SUM     5    3
11     Organic P            SUM     5    3
11     Total P              SUM     5    3
11     BOD                  SUM     5    3
11     TOC                  SUM     5    3
13     NH3                  SUM     5    3
13     NO3                  SUM     5    3
13     Organic N            SUM     5    3
13     Total N              SUM     5    3
13     PO4                  SUM     5    3
13     Organic P            SUM     5    3
13     Total P              SUM     5    3
13     BOD                  SUM     5    3
13     TOC                  SUM     5    3
15     NH3                  SUM     5    3
15     NO3                  SUM     5    3
15     Organic N            SUM     5    3
15     Total N              SUM     5    3
15     PO4                  SUM     5    3
15     Organic P            SUM     5    3
15     Total P              SUM     5    3
15     BOD                  SUM     5    3
15     TOC                  SUM     5    3
16     NH3                  SUM     5    3
16     NO3                  SUM     5    3
16     Organic N            SUM     5    3
16     Total N              SUM     5    3
16     PO4                  SUM     5    3
16     Organic P            SUM     5    3
16     Total P              SUM     5    3
16     BOD                  SUM     5    3
16     TOC                  SUM     5    3
21     NH3                  SUM     5    3
21     NO3                  SUM     5    3
21     Organic N            SUM     5    3
```

```
 21     Total N              SUM     5    3
 21     PO4                  SUM     5    3
 21     Organic P            SUM     5    3
 21     Total P              SUM     5    3
 21     BOD                  SUM     5    3
 21     TOC                  SUM     5    3
 23     NH3                  SUM     5    3
 23     NO3                  SUM     5    3
 23     Organic N            SUM     5    3
 23     Total N              SUM     5    3
 23     PO4                  SUM     5    3
 23     Organic P            SUM     5    3
 23     Total P              SUM     5    3
 23     BOD                  SUM     5    3
 23     TOC                  SUM     5    3
 25     NH3                  SUM     5    3
 25     NO3                  SUM     5    3
 25     Organic N            SUM     5    3
 25     Total N              SUM     5    3
 25     PO4                  SUM     5    3
 25     Organic P            SUM     5    3
 25     Total P              SUM     5    3
 25     BOD                  SUM     5    3
 25     TOC                  SUM     5    3
 26     NH3                  SUM     5    3
 26     NO3                  SUM     5    3
 26     Organic N            SUM     5    3
 26     Total N              SUM     5    3
 26     PO4                  SUM     5    3
 26     Organic P            SUM     5    3
 26     Total P              SUM     5    3
 26     BOD                  SUM     5    3
 26     TOC                  SUM     5    3
100     DO-Inflow            SUM     4    2
100     DO-Reaeration        SUM     4    2
100     DO-BOD Decay         SUM     4    2
100     DO-Benthal demand    SUM     4    2
100     DO-Nitrification     SUM     4    2
100     DO-Phyto. growth     SUM     4    2
100     BOD-Inflow           SUM     4    2
100     BOD-Decay            SUM     4    2
100     BOD-Benthal release  SUM     4    2
100     BOD-Sink             SUM     4    2
100     BOD-Denitrification  SUM     4    2
100     BOD-Phyto. death     SUM     4    2
100     NH3-Inflow           SUM     4    2
100     NH3-Nitrification    SUM     4    2
100     NH3-Volatilization   SUM     4    2
100     NH3-Benthal release  SUM     4    2
100     NH3-BOD Decay        SUM     4    2
100     NH3-Phyto. growth    SUM     4    2
100     NO3-Inflow           SUM     4    2
100     NO3-Nitrification    SUM     4    2
100     NO3-Denitrification  SUM     4    2
100     NO3-BOD Decay        SUM     4    2
```

```
  100     NO3-Phyto. growth    SUM     4    2
  100     PO4-Inflow           SUM     4    2
  100     PO4-Benthal release  SUM     4    2
  100     PO4-BOD Decay        SUM     4    2
  100     PO4-Phyto. growth    SUM     4    2
  100     PHY-Inflow           SUM     4    2
  100     PHY-Sink             SUM     4    2
  100     PHY-Death            SUM     4    2
  100     PHY-Growth           SUM     4    2
  100     ORN-Inflow           SUM     4    2
  100     ORN-Sink             SUM     4    2
  100     ORN-Phyto. death     SUM     4    2
  100     ORP-Inflow           SUM     4    2
  100     ORP-Sink             SUM     4    2
  100     ORP-Phyto. death     SUM     4    2
  100     ORC-Inflow           SUM     4    2
  100     ORC-Sink             SUM     4    2
  100     ORC-Phyto. death     SUM     4    2
  END REPORT-CON

  REPORT-SUMM
  Rept-opn***
*** x -  x<--src-sum-header--> STRN <--tim-sum-header--> TTRN STTR
    1           Total Load     SUM  Average              AVER    1
    3           Total Load     SUM  Average              AVER    1
    5           Total Load     SUM  Average              AVER    1
    6           Total Load     SUM  Average              AVER    1
   11        Per acre Load     SUM  Average              AVER    1
   13        Per acre Load     SUM  Average              AVER    1
   15        Per acre Load     SUM  Average              AVER    1
   16        Per acre Load     SUM  Average              AVER    1
   21         Percent Load     PCT  Average              AVER    1
   23         Percent Load     PCT  Average              AVER    1
   25         Percent Load     PCT  Average              AVER    1
   26         Percent Load     PCT  Average              AVER    1
  100                          SUM  Average              AVER    1
  END REPORT-SUMM
END REPORT

PERLND

  ACTIVITY
    <PLS >               Active Sections                               ***
    x -  x ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   11   65    1         1         1    1    1
  END ACTIVITY

  PRINT-INFO
     <PLS> ********************* Print-flags ************************* PIVL  PYR
    x -  x ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC *********
   11   65    5         5         5    5    5                                 12
  END PRINT-INFO
```

```
  GEN-INFO
    <PLS >      Name                  Unit-systems   Printer***
    x -  x                                t-series Engl Metr***
                                           in  out          ***
   11     AGRICULTURE- CENTRAL              1    1   90
   12     FOREST- CENTRAL                   1    1   90
   13     RANGELAND                         1    1   90
   14     URBAN                             1    1   90
   15     WETLAND                           1    1   90
   16     WETLAND-AQ Q RCH 4,6              1    1   90
   17     WETLAND-AQ Q RCH 14               1    1   90
   18     WETLAND-AQ Q 8,15,16              1    1   90
   19     RIBS                              1    1   90
   31     AGRICULTURE- UPPER RC             1    1   90
   32     FOREST                            1    1   90
   33     RANGELAND                         1    1   90
   34     URBAN                             1    1   90
   35     WETLAND                           1    1   90
   39     RIBS                              1    1   90
   51     AGRICULTURE- WHIT                 1    1   90
   52     FOREST                            1    1   90
   53     RANGELAND                         1    1   90
   54     URBAN                             1    1   90
   55     WETLAND                           1    1   90
   59     RIBS                              1    1   90
   61     AGRICULTURE- DAV                  1    1   90
   62     FOREST                            1    1   90
   63     RANGELAND                         1    1   90
   64     URBAN                             1    1   90
   65     WETLAND                           1    1   90
  END GEN-INFO

  PWAT-PARM1
*** <PLS >                   Flags
*** x -  x CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE IFFC  HWT
   11         0    1    1    0    0    0    0    0    1    0    0
   12         0    1    1    0    0    0    0    0    1    0    0
   13         0    1    1    0    0    0    0    0    1    0    0
   14         0    1    1    0    0    0    0    0    1    0    0
   15         0    1    1    0    0    0    0    0    1    0    0
   16         0    1    1    0    0    0    0    0    1    0    0
   17         0    1    1    0    0    0    0    0    1    0    0
   18         0    1    1    0    0    0    0    0    1    0    0
   19         0    1    1    0    0    0    0    0    0    0    0
   31         0    1    1    0    0    0    0    0    1    0    0
   32         0    1    1    0    0    0    0    0    1    0    0
   33         0    1    1    0    0    0    0    0    1    0    0
   34         0    1    1    0    0    0    0    0    1    0    0
   35         0    1    1    0    0    0    0    0    1    0    0
   39         0    1    1    0    0    0    0    0    0    0    0
   51         0    1    1    0    0    0    0    0    1    0    0
   52         0    1    1    0    0    0    0    0    1    0    0
   53         0    1    1    0    0    0    0    0    1    0    0
   54         0    1    1    0    0    0    0    0    1    0    0
   55         0    1    1    0    0    0    0    0    1    0    0
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   59         0    1    1    0    0    0    0    0    0    0    0
   61         0    1    1    0    0    0    0    0    1    0    0
   62         0    1    1    0    0    0    0    0    1    0    0
   63         0    1    1    0    0    0    0    0    1    0    0
   64         0    1    1    0    0    0    0    0    1    0    0
   65         0    1    1    0    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
***  <PLS>    FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
***  x - x                (in)   (in/hr)      (ft)   (ft/ft)    (1/in)   (1/day)
   11            0.0     2.000     0.100    1252.9     0.008     0.000     0.970
   12            0.0     2.000     0.250     855.2     0.005     0.000     0.970
   13            0.0     2.000     0.250    1182.0     0.011     0.000     0.970
   14            0.0     2.000     0.070    1144.8     0.007     0.000     0.970
   15            0.0     1.500     0.250     943.8     0.004     0.000     0.970
   16            0.0     1.500     0.250     943.8     0.004     0.000     0.970
   17            0.0     1.500     0.250     943.8     0.004     0.000     0.970
   18            0.0     1.500     0.250     943.8     0.004     0.000     0.970
   19            0.0     2.000     0.250     100.0     0.001     0.000     0.970
   31            0.0     2.000     0.200     795.3     0.014     0.000     0.970
   32            0.0     2.000     0.250    1372.0     0.028     0.000     0.970
   33            0.0     2.000     0.250    1147.1     0.020     0.000     0.970
   34            0.0     2.000     0.070    1223.6     0.016     0.000     0.970
   35            0.0     1.500     0.250     690.7     0.004     0.000     0.970
   39            0.0     2.000     0.250     100.0     0.001     0.000     0.970
   51            0.0     2.000     0.200     481.9     0.013     0.000     0.970
   52            0.0     2.000     0.250     433.0     0.026     0.000     0.970
   53            0.0     2.000     0.250    1937.8     0.028     0.000     0.970
   54            0.0     2.000     0.070    1311.2     0.031     0.000     0.970
   55            0.0     1.500     0.250     510.7     0.004     0.000     0.970
   59            0.0     2.000     0.250     100.0     0.001     0.000     0.970
   61            0.0     2.000     0.100     792.0     0.016     0.000     0.970
   62            0.0     2.000     0.250     318.6     0.016     0.000     0.970
   63            0.0     2.000     0.250     847.8     0.015     0.000     0.970
   64            0.0     2.000     0.070     642.1     0.010     0.000     0.970
   65            0.0     1.500     0.250     662.2     0.005     0.000     0.970
  END PWAT-PARM2

  PWAT-PARM3
***  <PLS>    PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
***  x - x   (deg F)   (deg F)
   11           40.0      35.0       2.0       2.0     0.500     0.000     0.000
   12           40.0      35.0       2.0       2.0     0.500     0.000     0.000
   13           40.0      35.0       2.0       2.0     0.500     0.000     0.000
   14           40.0      35.0       2.0       2.0     0.500     0.000     0.000
   15           40.0      35.0       2.0       2.0     0.400     0.000     0.100
   16           40.0      35.0       2.0       2.0     0.400     0.000     0.100
   17           40.0      35.0       2.0       2.0     0.400     0.000     0.100
   18           40.0      35.0       2.0       2.0     0.400     0.000     0.100
   19           40.0      35.0       2.0       2.0     0.500     0.000     0.000
   31           40.0      35.0       2.0       2.0     0.500     0.000     0.000
   32           40.0      35.0       2.0       2.0     0.500     0.000     0.000
   33           40.0      35.0       2.0       2.0     0.500     0.000     0.000
   34           40.0      35.0       2.0       2.0     0.500     0.000     0.000
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   35          40.0      35.0       2.0       2.0     0.400     0.000     0.100
   39          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   51          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   52          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   53          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   54          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   55          40.0      35.0       2.0       2.0     0.400     0.000     0.100
   59          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   61          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   62          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   63          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   64          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   65          40.0      35.0       2.0       2.0     0.400     0.000     0.100
  END PWAT-PARM3

  PWAT-PARM4
*** <PLS >     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP
*** x -  x      (in)      (in)                         (1/day)
   11          0.080     0.200      0.20     0.500     0.800     0.600
   12          0.100     0.560      0.35     0.600     0.800     0.600
   13          0.050     0.320      0.15     0.500     0.800     0.600
   14          0.050     0.320      0.10     0.500     0.800     0.600
   15          0.200     0.350      0.35     0.700     0.800     0.600
   16          0.200     0.350      0.35     0.700     0.800     0.600
   17          0.200     0.350      0.35     0.700     0.800     0.600
   18          0.200     0.350      0.35     0.700     0.800     0.600
   19          0.000     0.700      0.10     0.600     0.800     0.500
   31          0.080     0.200      0.20     1.000     0.900     0.600
   32          0.100     0.560      0.35     1.000     0.900     0.600
   33          0.050     0.320      0.15     1.000     0.900     0.600
   34          0.050     0.320      0.10     1.000     0.900     0.600
   35          0.200     0.350      0.35     1.000     0.900     0.600
   39          0.000     0.700      0.10     1.000     0.900     0.500
   51          0.080     0.200      0.20     1.000     0.900     0.600
   52          0.100     0.560      0.35     1.000     0.900     0.600
   53          0.050     0.320      0.15     1.000     0.900     0.600
   54          0.050     0.320      0.10     1.000     0.900     0.600
   55          0.200     0.350      0.35     1.000     0.900     0.600
   59          0.000     0.700      0.10     1.000     0.900     0.500
   61          0.080     0.200      0.20     0.500     0.800     0.600
   62          0.100     0.560      0.35     0.600     0.800     0.600
   63          0.050     0.320      0.15     0.500     0.800     0.600
   64          0.050     0.320      0.10     0.500     0.800     0.600
   65          0.200     0.350      0.35     0.700     0.800     0.600
  END PWAT-PARM4

  MON-LZETPARM
*** <PLS >  Lower zone evapotransp parameter at start of each month
   11        .1   .2   .8   .8   .8   .8   .8   .8   .8   .8   .6   .1
   12        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   13        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   14        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   15        .5   .6   .8   .8   .8   .8   .8   .8   .8   .8   .6   .5
   16        .5   .6   .8   .8   .8   .8   .8   .8   .8   .8   .6   .5
   17        .5   .6   .8   .8   .8   .8   .8   .8   .8   .8   .6   .5
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   18        .5   .6   .8   .8   .8   .8   .8   .8   .8   .8   .6   .5
   31        .1   .2   .8   .8   .8   .8   .8   .8   .8   .8   .6   .1
   32        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   33        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   34        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   35        .5   .6   .8   .8   .8   .8   .8   .8   .8   .8   .6   .5
   51        .1   .2   .8   .8   .8   .8   .8   .8   .8   .8   .6   .1
   52        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   53        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   54        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   55        .5   .6   .8   .8   .8   .8   .8   .8   .8   .8   .6   .5
   61        .1   .2   .8   .8   .8   .8   .8   .8   .8   .8   .6   .1
   62        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   63        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   64        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   65        .5   .6   .8   .8   .8   .8   .8   .8   .8   .8   .6   .5
  END MON-LZETPARM

  PWAT-STATE1
***  <PLS>  PWATER state variables (in)
***  x - x      CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   11            0.0       0.0     0.408     0.001      3.21     0.712       0.0
   12            0.0       0.0     0.778     0.001      3.09     0.704       0.0
   13            0.0       0.0     0.407     0.001      2.95     0.734       0.0
   14            0.0       0.0     0.405     0.001      2.74      0.49       0.0
   15            0.0       0.0     0.582     0.001      2.35     0.749       0.0
   16            0.0       0.0     0.582     0.001      2.35     0.749       0.0
   17            0.0       0.0     0.582     0.001      2.35     0.749       0.0
   18            0.0       0.0     0.582     0.001      2.35     0.749       0.0
   19            0.0       0.0     0.703     0.001       2.6     0.974       0.0
   31            0.0       0.0     0.401     0.001      3.38     0.818       0.0
   32            0.0       0.0     0.886     0.001      3.28     0.683       0.0
   33            0.0       0.0     0.407     0.001         3     0.715       0.0
   34            0.0       0.0     0.514     0.001      2.84     0.455       0.0
   35            0.0       0.0     0.661     0.001      2.55     0.721       0.0
   39            0.0       0.0     0.724     0.001      2.68     1.013       0.0
   51            0.0       0.0      0.04     0.001      1.70      0.18       0.0
   52            0.0       0.0      0.03     0.001      0.40      0.09       0.0
   53            0.0       0.0      0.01     0.001      0.33      0.09       0.0
   54            0.0       0.0      0.01     0.001      0.37      0.07       0.0
   55            0.0       0.0      0.02     0.001      0.32      0.02       0.0
   59            0.0       0.0      0.02     0.001      0.81      0.17       0.0
   61            0.0       0.0     0.407     0.001      3.20     0.707       0.0
   62            0.0       0.0     0.858     0.001      3.19     0.785       0.0
   63            0.0       0.0     0.442     0.001      3.03     0.825       0.0
   64            0.0       0.0     0.502     0.001      2.75     0.489       0.0
   65            0.0       0.0     0.618     0.001      2.45     0.861       0.0
  END PWAT-STATE1
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  PSTEMP-PARM1
*** <PLS >  Flags for section PSTEMP
*** x -  x SLTV ULTV LGTV TSOP
   11         1    1    1    1
   12         1    1    1    1
   13         1    1    1    1
   14         1    1    1    1
   15         1    1    1    1
   16         1    1    1    1
   17         1    1    1    1
   18         1    1    1    1
   19         1    1    1    1
   31         1    1    1    1
   32         1    1    1    1
   33         1    1    1    1
   34         1    1    1    1
   35         1    1    1    1
   39         1    1    1    1
   51         1    1    1    1
   52         1    1    1    1
   53         1    1    1    1
   54         1    1    1    1
   55         1    1    1    1
   59         1    1    1    1
   61         1    1    1    1
   62         1    1    1    1
   63         1    1    1    1
   64         1    1    1    1
   65         1    1    1    1
  END PSTEMP-PARM1

  PSTEMP-PARM2
*** <PLS >      ASLT      BSLT     ULTP1     ULTP2     LGTP1     LGTP2
*** x -  x   (deg F)   (degF/F             (degF/F             (deg F)
   11           32.0      1.00      32.0       1.0      60.8
   12           32.0      1.00      32.0       1.0      60.8
   13           32.0      1.00      32.0       1.0      60.8
   14           32.0      1.00      32.0       1.0      60.8
   15           32.0      1.00      32.0       1.0      60.8
   16           32.0      1.00      32.0       1.0      60.8
   17           32.0      1.00      32.0       1.0      60.8
   18           32.0      1.00      32.0       1.0      60.8
   19           32.0      1.00      32.0       1.0      60.8
   31           32.0      1.00      32.0       1.0      60.8
   32           32.0      1.00      32.0       1.0      60.8
   33           32.0      1.00      32.0       1.0      60.8
   34           32.0      1.00      32.0       1.0      60.8
   35           32.0      1.00      32.0       1.0      60.8
   39           32.0      1.00      32.0       1.0      60.8
   51           32.0      1.00      32.0       1.0      60.8
   52           32.0      1.00      32.0       1.0      60.8
   53           32.0      1.00      32.0       1.0      60.8
   54           32.0      1.00      32.0       1.0      60.8
   55           32.0      1.00      32.0       1.0      60.8
   59           32.0      1.00      32.0       1.0      60.8
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   61           32.0      1.00      32.0       1.0      60.8
   62           32.0      1.00      32.0       1.0      60.8
   63           32.0      1.00      32.0       1.0      60.8
   64           32.0      1.00      32.0       1.0      60.8
   65           32.0      1.00      32.0       1.0      60.8
  END PSTEMP-PARM2

  MON-ASLT
*** <PLS >  Value of ASLT at start of each month (deg F)
*** x -  x  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC
   11      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0
   12      33.0 33.0 35.0 41.0 52.0 54.0 55.0 55.0 53.0 47.0 40.0 35.0
   13      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0
   14      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   15      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   16      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   17      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   18      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   19      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0

   31      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0
   32      33.0 33.0 35.0 41.0 52.0 54.0 55.0 55.0 53.0 47.0 40.0 35.0
   33      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0
   34      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   35      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   39      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0

   51      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0
   52      33.0 33.0 35.0 41.0 52.0 54.0 55.0 55.0 53.0 47.0 40.0 35.0
   53      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0
   54      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   55      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   59      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0

   61      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0
   62      33.0 33.0 35.0 41.0 52.0 54.0 55.0 55.0 53.0 47.0 40.0 35.0
   63      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0
   64      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   65      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
  END MON-ASLT

  MON-BSLT
*** <PLS >  Value of BSLT at start of each month (deg F/F)
*** x -  x  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC
   11       .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60
   12       0.4  .40  .42  .50  .55  .60  .60  .60  .60  .55  .45  .42
   13       .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60
   14       0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   15       0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   16       0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   17       0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   18       0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   19       .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60

   31       .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60
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   32        0.4  .40  .42  .50  .55  .60  .60  .60  .60  .55  .45  .42
   33        .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60
   34        0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   35        0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   39        .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60

   51        .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60
   52        0.4  .40  .42  .50  .55  .60  .60  .60  .60  .55  .45  .42
   53        .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60
   54        0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   55        0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   59        .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60

   61        .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60
   62        0.4  .40  .42  .50  .55  .60  .60  .60  .60  .55  .45  .42
   63        .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60
   64        0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   65        0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
  END MON-BSLT

  MON-ULTP1
*** <PLS >  Value of ULTP1 at start of each month in deg F (TSOPFG=1)
*** x -  x  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC
   11      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0
   12      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   13      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0
   14      35.0 35.0 36.0 39.0 43.0 48.0 50.0 50.0 50.0 44.0 38.0 36.0
   15      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   16      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   17      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   18      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   19      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0

   31      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0
   32      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   33      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0
   34      35.0 35.0 36.0 39.0 43.0 48.0 50.0 50.0 50.0 44.0 38.0 36.0
   35      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   39      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0

   51      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0
   52      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   53      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0
   54      35.0 35.0 36.0 39.0 43.0 48.0 50.0 50.0 50.0 44.0 38.0 36.0
   55      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   59      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0

   61      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0
   62      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   63      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0
   64      35.0 35.0 36.0 39.0 43.0 48.0 50.0 50.0 50.0 44.0 38.0 36.0
   65      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
  END MON-ULTP1
```

```
  MON-ULTP2
*** <PLS >  Value of ULTP2 at start of each month in Deg F/F (TSOPFG=1)
*** x -  x  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC
   11       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35
   12       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   13       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35
   14       .25  .25  0.3  .40  0.5  .60  .65  .65  .65  .55  .45  .30
   15       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   16       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   17       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   18       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   19       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35

   31       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35
   32       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   33       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35
   34       .25  .25  0.3  .40  0.5  .60  .65  .65  .65  .55  .45  .30
   35       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   39       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35

   51       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35
   52       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   53       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35
   54       .25  .25  0.3  .40  0.5  .60  .65  .65  .65  .55  .45  .30
   55       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   59       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35

   61       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35
   62       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   63       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35
   64       .25  .25  0.3  .40  0.5  .60  .65  .65  .65  .55  .45  .30
   65       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
  END MON-ULTP2

  MON-LGTP1
*** <PLS >  Value of LGTP1 at start of each month in Deg F (TSOPFG=1)
*** x -  x  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC

   11      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
   12      38.0 38.0 38.0 43.0 50.0 55.0 61.0 63.0 62.0 60.0 50.0 40.0
   13      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
   14      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
   15      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
   16      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
   17      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
   18      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
   19      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0

   31      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
   32      38.0 38.0 38.0 43.0 50.0 55.0 61.0 63.0 62.0 60.0 50.0 40.0
   33      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
   34      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
   35      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
   39      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
```

```
  51      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
  52      38.0 38.0 38.0 43.0 50.0 55.0 61.0 63.0 62.0 60.0 50.0 40.0
  53      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
  54      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
  55      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
  59      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0

  61      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
  62      38.0 38.0 38.0 43.0 50.0 55.0 61.0 63.0 62.0 60.0 50.0 40.0
  63      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
  64      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
  65      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
 END MON-LGTP1

 PSTEMP-TEMPS
<PLS> Initial Conditions for Section PSTEMP ***
   #    #     AIRTC      SLTMP      ULTMP      LGTMP  ***
   1   65      56.0       56.0       56.0       68.0
 END PSTEMP-TEMPS

 PWT-PARM1
<PLS> Flags for Section PWTGAS ***
   #    #  IDV  ICV  GDV  GCV  ***
  11         1    0    1    0
  12         1    0    1    0
  13         1    0    1    0
  14         1    0    1    0
  15         1    0    1    0
  16         1    0    1    0
  17         1    0    1    0
  18         1    0    1    0
  19         1    0    1    0
  31         1    0    1    0
  32         1    0    1    0
  33         1    0    1    0
  34         1    0    1    0
  35         1    0    1    0
  39         1    0    1    0
  51         1    0    1    0
  52         1    0    1    0
  53         1    0    1    0
  54         1    0    1    0
  55         1    0    1    0
  59         1    0    1    0
  61         1    0    1    0
  62         1    0    1    0
  63         1    0    1    0
  64         1    0    1    0
  65         1    0    1    0
 END PWT-PARM1
```

```
PWT-PARM2
  #    #       ELEV     IDOXP     ICO2P     ADOXP     ACO2P  ***
 11           80.00         6      0.00         4      0.00
 12           80.00         6      0.00         4      0.00
 13           80.00         6      0.00         4      0.00
 14           80.00         6      0.00         4      0.00
 15           80.00         6      0.00         4      0.00
 16           80.00         6      0.00         4      0.00
 17           80.00         6      0.00         4      0.00
 18           80.00         6      0.00         4      0.00
 19           80.00         6      0.00         4      0.00
 31          120.00         6      0.00         4      0.00
 32          120.00         6      0.00         4      0.00
 33          120.00         6      0.00         4      0.00
 34          120.00         6      0.00         4      0.00
 35          120.00         6      0.00         4      0.00
 39          120.00         6      0.00         4      0.00
 51          110.00         6      0.00         4      0.00
 52          110.00         6      0.00         4      0.00
 53          110.00         6      0.00         4      0.00
 54          110.00         6      0.00         4      0.00
 55          110.00         6      0.00         4      0.00
 59          110.00         6      0.00         4      0.00
 61          100.00         6      0.00         4      0.00
 62          100.00         6      0.00         4      0.00
 63          100.00         6      0.00         4      0.00
 64          100.00         6      0.00         4      0.00
 65          100.00         6      0.00         4      0.00
END PWT-PARM2

MON-IFWDOX
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11   65  8.0  8.0  7.5  7.0  6.5  6.0  6.0  6.0  6.5  7.0  7.5  8.0
END MON-IFWDOX

MON-GRNDDOX
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11   65  6.0  6.0  5.5  5.0  4.0  4.0  4.0  4.0  4.5  5.0  5.5  6.0
END MON-GRNDDOX

PWT-GASES
  #    #      SODOX     SOCO2     IODOX     IOCO2     AODOX     AOCO2  ***
  1   65       10.0       0.0       8.0       0.0       6.0       0.0
END PWT-GASES

NQUALS
*** NQAL - NH3, NO2+NO3, ORTHO P, AND BOD ***
  #    # NQAL  ***
  1   65    4
END NQUALS
```

```
PQL-AD-FLAGS
           Atmospheric Deposition Flags ***
  <PLS >  QUAL1  QUAL2  QUAL3  QUAL4  ***
  # -  #   F  C   F  C   F  C   F  C  ***
 11       -1  0  -1  0   0  0   0  0
 12       -1  0  -1  0   0  0   0  0
 13       -1  0  -1  0   0  0   0  0
 14       -1  0  -1  0   0  0   0  0
 15       -1  0  -1  0   0  0   0  0
 16       -1  0  -1  0   0  0   0  0
 17       -1  0  -1  0   0  0   0  0
 18       -1  0  -1  0   0  0   0  0
 19       -1  0  -1  0   0  0   0  0
 31       -1  0  -1  0   0  0   0  0
 32       -1  0  -1  0   0  0   0  0
 33       -1  0  -1  0   0  0   0  0
 34       -1  0  -1  0   0  0   0  0
 35       -1  0  -1  0   0  0   0  0
 39       -1  0  -1  0   0  0   0  0
 51       -1  0  -1  0   0  0   0  0
 52       -1  0  -1  0   0  0   0  0
 53       -1  0  -1  0   0  0   0  0
 54       -1  0  -1  0   0  0   0  0
 55       -1  0  -1  0   0  0   0  0
 59       -1  0  -1  0   0  0   0  0
 61       -1  0  -1  0   0  0   0  0
 62       -1  0  -1  0   0  0   0  0
 63       -1  0  -1  0   0  0   0  0
 64       -1  0  -1  0   0  0   0  0
 65       -1  0  -1  0   0  0   0  0
END PQL-AD-FLAGS

QUAL-PROPS
  #    #<--QUALID-->    QTID  QSD VPFW VPFS  QSO  VQO QIFW VIQC QAGW VAQC  ***
 11     NH3             LBS      0    0    0    1    1    1    3    1    3
 12     NH3             LBS      0    0    0    1    1    1    3    1    3
 13     NH3             LBS      0    0    0    1    1    1    3    1    3
 14     NH3             LBS      0    0    0    1    1    1    3    1    3
 15     NH3             LBS      0    0    0    1    1    1    3    1    3
 16     NH3             LBS      0    0    0    1    1    1    3    1    3
 17     NH3             LBS      0    0    0    1    1    1    3    1    3
 18     NH3             LBS      0    0    0    1    1    1    3    1    3
 19     NH3             LBS      0    0    0    1    1    1    3    1    3
 31     NH3             LBS      0    0    0    1    1    1    3    1    3
 32     NH3             LBS      0    0    0    1    1    1    3    1    3
 33     NH3             LBS      0    0    0    1    1    1    3    1    3
 34     NH3             LBS      0    0    0    1    1    1    3    1    3
 35     NH3             LBS      0    0    0    1    1    1    3    1    3
 39     NH3             LBS      0    0    0    1    1    1    3    1    3
 51     NH3             LBS      0    0    0    1    1    1    3    1    3
 52     NH3             LBS      0    0    0    1    1    1    3    1    3
 53     NH3             LBS      0    0    0    1    1    1    3    1    3
 54     NH3             LBS      0    0    0    1    1    1    3    1    3
 55     NH3             LBS      0    0    0    1    1    1    3    1    3
 59     NH3             LBS      0    0    0    1    1    1    3    1    3
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```
 61     NH3             LBS     0    0    0    1    1    1    3    1    3
 62     NH3             LBS     0    0    0    1    1    1    3    1    3
 63     NH3             LBS     0    0    0    1    1    1    3    1    3
 64     NH3             LBS     0    0    0    1    1    1    3    1    3
 65     NH3             LBS     0    0    0    1    1    1    3    1    3
END QUAL-PROPS

QUAL-INPUT
  #    #     SQO   POTFW   POTFS   ACQOP  SQOLIM   WSQOP    IOQC    AOQC   ***
 11         .004                            .012     0.5
 12         .002                            .004     0.5
 13         .004                            .012     0.5
 14         .004                            .012     0.5
 15         .002                            .004     0.5
 16         .002                            .004     0.5
 17         .002                            .004     0.5
 18         .002                            .004     0.5
 19         .004                            .012     0.5

 31         .004                            .012     0.5
 32         .002                            .004     0.5
 33         .004                            .012     0.5
 34         .004                            .012     0.5
 35         .002                            .004     0.5
 39         .004                            .012     0.5

 51         .004                            .012     0.5
 52         .002                            .004     0.5
 53         .004                            .012     0.5
 54         .004                            .012     0.5
 55         .002                            .004     0.5
 59         .004                            .012     0.5

 61         .004                            .012     0.5
 62         .002                            .004     0.5
 63         .004                            .012     0.5
 64         .004                            .012     0.5
 65         .002                            .004     0.5
END QUAL-INPUT

MON-ACCUM
          ACCUMULATION RATE OF NH4 (lb NH4-N/AC.DAY)            ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
 12      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 13      .006 .006 .006 .006 .006 .006 .006 .006 .006 .006 .006 .006
 14      .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 15   18 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 19      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002

 31      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
 32      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 33      .006 .006 .006 .006 .006 .006 .006 .006 .006 .006 .006 .006
 34      .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 35      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
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 39      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002

 51      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
 52      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 53      .006 .006 .006 .006 .006 .006 .006 .006 .006 .006 .006 .006
 54      .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 55      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 59      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002

 61      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
 62      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 63      .006 .006 .006 .006 .006 .006 .006 .006 .006 .006 .006 .006
 64      .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 65      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
END MON-ACCUM

MON-SQOLIM
          STORAGE LIMIT OF NH4 (lb NH4-N/AC)                       ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11      .040 .040 .040 .040 .040 .040 .040 .040 .040 .040 .040 .040
 12      .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 13      .024 .024 .024 .024 .024 .024 .024 .024 .024 .024 .024 .024
 14      .032 .032 .032 .032 .032 .032 .032 .032 .032 .032 .032 .032
 15   18 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 19      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012

 31      .040 .040 .040 .040 .040 .040 .040 .040 .040 .040 .040 .040
 32      .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 33      .024 .024 .024 .024 .024 .024 .024 .024 .024 .024 .024 .024
 34      .032 .032 .032 .032 .032 .032 .032 .032 .032 .032 .032 .032
 35      .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 39      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012

 51      .040 .040 .040 .040 .040 .040 .040 .040 .040 .040 .040 .040
 52      .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 53      .024 .024 .024 .024 .024 .024 .024 .024 .024 .024 .024 .024
 54      .032 .032 .032 .032 .032 .032 .032 .032 .032 .032 .032 .032
 55      .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 59      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012

 61      .040 .040 .040 .040 .040 .040 .040 .040 .040 .040 .040 .040
 62      .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 63      .024 .024 .024 .024 .024 .024 .024 .024 .024 .024 .024 .024
 64      .032 .032 .032 .032 .032 .032 .032 .032 .032 .032 .032 .032
 65      .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
END MON-SQOLIM
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MON-IFLW-CONC
          Interflow Concentration of NH4-N (mg/l)                     ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 12      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
 13      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 14      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 15   18 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030
 19      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100

 31      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 32      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
 33      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 34      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 35      .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030
 39      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100

 51      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 52      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
 53      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 54      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 55      .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030
 59      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100

 61      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 62      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
 63      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 64      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 65      .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030
END MON-IFLW-CONC

MON-GRND-CONC
          Active Groundwater Concentration of NH4-N (mg/l)            ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 12      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
 13      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 14      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 15   18 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030
 19      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100

 31      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 32      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
 33      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 34      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 35      .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030
 39      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100

 51      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 52      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
 53      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 54      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 55      .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030
 59      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
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 61      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 62      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
 63      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 64      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 65      .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030
END MON-GRND-CONC

QUAL-PROPS
  #    #<--QUALID-->    QTID  QSD VPFW VPFS  QSO  VQO QIFW VIQC QAGW VAQC  ***
 11     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 12     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 13     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 14     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 15     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 16     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 17     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 18     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 19     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 31     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 32     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 33     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 34     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 35     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 39     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 51     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 52     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 53     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 54     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 55     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 59     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 61     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 62     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 63     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 64     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 65     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
END QUAL-PROPS

QUAL-INPUT
  #    #     SQO   POTFW   POTFS   ACQOP  SQOLIM   WSQOP    IOQC    AOQC   ***
 11         .040                            .120      .5
 12         .005                            .010      .5
 13         .040                            .120      .5
 14         .040                            .120      .5
 15   18    .005                            .010      .5
 19         .040                            .120      .5

 31         .040                            .120      .5
 32         .005                            .010      .5
 33         .040                            .120      .5
 34         .040                            .120      .5
 35         .005                            .010      .5
 39         .040                            .120      .5
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 51         .040                            .480      .5
 52         .005                            .100      .5
 53         .040                            .480      .5
 54         .040                            .480      .5
 55         .005                            .100      .5
 59         .040                            .480      .5

 61         .040                            .480      .5
 62         .005                            .100      .5
 63         .040                            .480      .5
 64         .040                            .480      .5
 65         .005                            .100      .5
END QUAL-INPUT

MON-ACCUM
          ACCUMULATION RATE   NO2 NO3 (lb NO3-N/AC.DAY)               ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11         0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
 12       0.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.005
 13        0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 14        0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03
 15     180.0020.0020.0020.0020.0020.0020.0020.0020.0020.0020.0020.002
 19        0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

 31         0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
 32       0.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.005
 33        0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 34        0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03
 35       0.0020.0020.0020.0020.0020.0020.0020.0020.0020.0020.0020.002
 39        0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

 51         0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
 52       0.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.005
 53        0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 54        0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03
 55       0.0020.0020.0020.0020.0020.0020.0020.0020.0020.0020.0020.002
 59        0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

 61         0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
 62       0.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.005
 63        0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 64        0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03
 65       0.0020.0020.0020.0020.0020.0020.0020.0020.0020.0020.0020.002
END MON-ACCUM

MON-SQOLIM
          STORAGE LIMIT OF    NO2 NO3 (lb NO3-N/AC)                   ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11        0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20
 12        .010 .010 .010 .010 .010 .010 .010 .010 .010 .010 .010 .010
 13        0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 14        0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
 15     18 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 19        .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
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 31      0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20
 32      .010 .010 .010 .010 .010 .010 .010 .010 .010 .010 .010 .010
 33      0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 34      0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
 35      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 39      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020

 51      0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20
 52      .010 .010 .010 .010 .010 .010 .010 .010 .010 .010 .010 .010
 53      0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 54      0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
 55      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 59      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020

 61      0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20
 62      .010 .010 .010 .010 .010 .010 .010 .010 .010 .010 .010 .010
 63      0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 64      0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
 65      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
END MON-SQOLIM

MON-IFLW-CONC
          Interflow Concentration of NO3-N (mg/l)                     ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11       0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
 12      0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 13      0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 14      0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 15   18 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02
 19         5    5    5    5    5    5    5    5    5    5    5    5

 31       0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
 32      0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 33      0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 34      0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 35      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 39         5    5    5    5    5    5    5    5    5    5    5    5

 51       0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
 52      0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 53      0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 54      0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 55      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 59         5    5    5    5    5    5    5    5    5    5    5    5

 61       0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
 62      0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 63      0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 64      0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 65      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
END MON-IFLW-CONC
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MON-GRND-CONC
          Active Groundwater Concentration of NO3-N (mg/l)            ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11        0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
 12       0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 13       0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 14       0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 15       0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 16       0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 17       0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 18       0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 19          5    5    5    5    5    5    5    5    5    5    5    5

 31        0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
 32       0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 33       0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 34       0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 35       0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 39          5    5    5    5    5    5    5    5    5    5    5    5

 51        0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
 52       0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 53       0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 54       0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 55       0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 59          5    5    5    5    5    5    5    5    5    5    5    5

 61        0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
 62       0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 63       0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 64       0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 65       0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
END MON-GRND-CONC

QUAL-PROPS
  #    #<--QUALID-->    QTID  QSD VPFW VPFS  QSO  VQO QIFW VIQC QAGW VAQC  ***
 11     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 12     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 13     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 14     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 15     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 16     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 17     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 18     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 19     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 31     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 32     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 33     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 34     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 35     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 39     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
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 51     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 52     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 53     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 54     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 55     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 59     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 61     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 62     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 63     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 64     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 65     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
END QUAL-PROPS

QUAL-INPUT
  #    #     SQO   POTFW   POTFS   ACQOP  SQOLIM   WSQOP    IOQC    AOQC   ***
 11         .004                            .012      .5
 12         .002                            .004      .5
 13         .004                            .012      .5
 14         .004                            .012      .5
 15   18    .002                            .004      .5
 19         .004                            .012      .5

 31         .004                            .012      .5
 32         .002                            .004      .5
 33         .004                            .012      .5
 34         .004                            .012      .5
 35         .002                            .004      .5
 39         .004                            .012      .5

 51         .004                            .012      .5
 52         .002                            .004      .5
 53         .004                            .012      .5
 54         .004                            .012      .5
 55         .002                            .004      .5
 59         .004                            .012      .5

 61         .004                            .012      .5
 62         .002                            .004      .5
 63         .004                            .012      .5
 64         .004                            .012      .5
 65         .002                            .004      .5
END QUAL-INPUT

MON-ACCUM
          ACCUMULATION RATE OF PO4 (lb PO4-P/AC.DAY)            ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 12      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 13      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 14      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 15   18 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 19      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
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 31      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 32      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 33      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 34      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 35      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 39      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004

 51      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 52      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 53      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 54      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 55      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 59      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004

 61      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 62      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 63      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 64      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 65      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
END MON-ACCUM

MON-SQOLIM
          STORAGE LIMIT OF PO4 (lb PO4-P/AC)                       ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 12      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 13      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 14      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 15   18 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 19      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012

 31      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 32      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 33      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 34      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 35      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 39      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012

 51      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 52      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 53      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 54      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 55      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 59      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012

 61      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 62      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 63      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 64      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 65      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
END MON-SQOLIM
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MON-IFLW-CONC
          Interflow Concentration of PO4-P (mg/l)                     ***
  #    # JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
 12     0.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.025
 13       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
 14      0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16
 15   18 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 19      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

 31      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
 32     0.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.025
 33       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
 34      0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16
 35      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 39      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

 51      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
 52     0.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.025
 53       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
 54      0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16
 55      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 59      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

 61      0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
 62     0.0120.0120.0120.0120.0120.0120.0120.0120.0120.0120.0120.012
 63     0.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.005
 64      0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08
 65     0.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.005
END MON-IFLW-CONC

MON-GRND-CONC
          Active Groundwater Concentration of PO4-P (mg/l)            ***
  #    # JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
 12     0.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.025
 13       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
 14      0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16
 15   18 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 19      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

 31      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
 32     0.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.025
 33       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
 34      0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16
 35      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 39      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

 51      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
 52     0.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.025
 53       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
 54      0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16
 55      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 59      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
```

```
 61      0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
 62     0.0120.0120.0120.0120.0120.0120.0120.0120.0120.0120.0120.012
 63     0.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.005
 64      0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08
 65     0.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.005
END MON-GRND-CONC

QUAL-PROPS
  #    #<--QUALID-->    QTID  QSD VPFW VPFS  QSO  VQO QIFW VIQC QAGW VAQC  ***
 11     BOD             LBS     0    0    0    1    1    1    3    1    3
 12     BOD             LBS     0    0    0    1    1    1    3    1    3
 13     BOD             LBS     0    0    0    1    1    1    3    1    3
 14     BOD             LBS     0    0    0    1    1    1    3    1    3
 15     BOD             LBS     0    0    0    1    1    1    3    1    3
 16     BOD             LBS     0    0    0    1    1    1    3    1    3
 17     BOD             LBS     0    0    0    1    1    1    3    1    3
 18     BOD             LBS     0    0    0    1    1    1    3    1    3
 19     BOD             LBS     0    0    0    1    1    1    3    1    3
 31     BOD             LBS     0    0    0    1    1    1    3    1    3
 32     BOD             LBS     0    0    0    1    1    1    3    1    3
 33     BOD             LBS     0    0    0    1    1    1    3    1    3
 34     BOD             LBS     0    0    0    1    1    1    3    1    3
 35     BOD             LBS     0    0    0    1    1    1    3    1    3
 39     BOD             LBS     0    0    0    1    1    1    3    1    3
 51     BOD             LBS     0    0    0    1    1    1    3    1    3
 52     BOD             LBS     0    0    0    1    1    1    3    1    3
 53     BOD             LBS     0    0    0    1    1    1    3    1    3
 54     BOD             LBS     0    0    0    1    1    1    3    1    3
 55     BOD             LBS     0    0    0    1    1    1    3    1    3
 59     BOD             LBS     0    0    0    1    1    1    3    1    3
 61     BOD             LBS     0    0    0    1    1    1    3    1    3
 62     BOD             LBS     0    0    0    1    1    1    3    1    3
 63     BOD             LBS     0    0    0    1    1    1    3    1    3
 64     BOD             LBS     0    0    0    1    1    1    3    1    3
 65     BOD             LBS     0    0    0    1    1    1    3    1    3
END QUAL-PROPS

QUAL-INPUT
  #    #     SQO   POTFW   POTFS   ACQOP  SQOLIM   WSQOP    IOQC    AOQC   ***
 11          .35                             5.0      .5
 12          .15                             .75      .5
 13          .35                             5.0      .5
 14          .60                             6.0      .5
 15   18     .15                             1.5      .5
 19          .35                             5.0      .5

 31          .35                             5.0      .5
 32          .15                             .75      .5
 33          .35                             5.0      .5
 34          .60                             6.0      .5
 35          .15                             1.5      .5
 39          .35                             5.0      .5
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```
 51         .35                             5.0      .5
 52         .15                             .75      .5
 53         .35                             5.0      .5
 54         .60                             6.0      .5
 55         .15                             1.5      .5
 59         .35                             5.0      .5

 61         .35                             5.0      .5
 62         .15                             .75      .5
 63         .35                             5.0      .5
 64         .60                             6.0      .5
 65         .15                             1.5      .5
END QUAL-INPUT

MON-ACCUM
       ACCUMULATION RATE FOR BOD/Organics (lb /AC.DAY)  ***
 #     #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC   ***
 11        0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5
 12        0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2
 13       0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35
 14       0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30
 15   18 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 19        0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5

 31        0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5
 32        0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2
 33       0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35
 34       0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30
 35       0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 39        0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5

 51        0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5
 52        0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2
 53       0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35
 54       0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30
 55       0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 59        0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5

 61        0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5
 62        0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2
 63       0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35
 64       0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30
 65       0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
END MON-ACCUM

MON-SQOLIM
       STORAGE RATE FOR BOD/Organics (lb /AC)     ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC   ***
 11        1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
 12        .45  .45  .45  .45  .45  .45  .45  .45  .45  .45  .45  .45
 13        0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7
 14        0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6
 15   18   .20  .20  .20  .20  .20  .20  .20  .20  .20  .20  .20  .20
 19        1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
```

```
 31       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
 32       .45  .45  .45  .45  .45  .45  .45  .45  .45  .45  .45  .45
 33       0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7
 34       0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6
 35       .20  .20  .20  .20  .20  .20  .20  .20  .20  .20  .20  .20
 39       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0

 51       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
 52       .45  .45  .45  .45  .45  .45  .45  .45  .45  .45  .45  .45
 53       0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7
 54       0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6
 55       .20  .20  .20  .20  .20  .20  .20  .20  .20  .20  .20  .20
 59       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0

 61       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
 62       .45  .45  .45  .45  .45  .45  .45  .45  .45  .45  .45  .45
 63       0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7
 64       0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6
 65       .20  .20  .20  .20  .20  .20  .20  .20  .20  .20  .20  .20
END MON-SQOLIM

MON-IFLW-CONC
          Interflow Concentration of BOD/Organics (mg/l)   ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 12       2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0
 13       3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0
 14       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 15   18  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
 19       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0

 31       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 32       2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0
 33       3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0
 34       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 35       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
 39       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0

 51       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 52       2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0
 53       3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0
 54       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 55       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
 59       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0

 61       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 62       2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0
 63       3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0
 64       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 65       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
END MON-IFLW-CONC
```

```
  MON-GRND-CONC
         Active Groundwater Concentration of BOD/Organics (mg/l)  ***
    #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   11       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
   12       2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0
   13       3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0
   14       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
   15   18  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
   19       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0

   31       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
   32       2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0
   33       3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0
   34       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
   35       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
   39       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0

   51       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
   52       2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0
   53       3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0
   54       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
   55       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
   59       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0

   61       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
   62       2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0
   63       3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0
   64       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
   65       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
  END MON-GRND-CONC
END PERLND

IMPLND
  ACTIVITY
    #    # ATMP SNOW IWAT  SLD  IWG IQAL  ***
   14   64    1    0    1    0    1    1
  END ACTIVITY

  PRINT-INFO
    #    # ATMP SNOW IWAT  SLD  IWG IQAL PIVL  PYR  ***
   14   64    5    0    5    0    5    5    1   12
  END PRINT-INFO

  GEN-INFO
*** <ILS >      Name             Unit-systems   Printer
*** <ILS >                           t-series Engl Metr
*** x -  x                            in  out
   14      URBAN                       1    1   90    0
   34      URBAN                       1    1   90    0
   54      URBAN                       1    1   90    0
   64      URBAN                       1    1   90    0
  END GEN-INFO
```

```
  IWAT-PARM1
*** <ILS >        Flags
*** x -  x CSNO RTOP  VRS  VNN RTLI
   14         0    1    0    0    0
   34         0    1    0    0    0
   54         0    1    0    0    0
   64         0    1    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
*** <ILS >      LSUR     SLSUR       NSUR     RETSC
*** x -  x      (ft)                          (ft)
   14          200.0   0.01015     0.015      0.05
   34          200.0   0.01015     0.015      0.05
   54          200.0   0.01015     0.015      0.05
   64          200.0   0.01015     0.015      0.05
  END IWAT-PARM2

  IWAT-PARM3
*** <ILS >    PETMAX    PETMIN
*** x -  x   (deg F)   (deg F)
   14   64      40.0      35.0
  END IWAT-PARM3

  IWAT-STATE1
*** <ILS >  IWATER state variables (inches)
*** x -  x      RETS      SURS
   14   64       0.0       0.0
  END IWAT-STATE1

  IWT-PARM1
    #    # WTFV CSNO  ***
   14   64    1    0
  END IWT-PARM1

  IWT-PARM2
    #    #      ELEV      AWTF      BWTF  ***
   14          80.00      34.0       0.3
   34         120.00      34.0       0.3
   54         110.00      34.0       0.3
   64         100.00      34.0       0.3
  END IWT-PARM2

  MON-AWTF
*** <ILS >  Values of AWTF at start of each month (oF)
*** x -  x  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC
   14   64 29.0 29.0 30.0 34.0 40.0 50.0 50.0 50.0 45.0 40.0 35.0 30.0
  END MON-AWTF

  MON-BWTF
*** <ILS >  Values of BWTF at start of each month (F/F)
*** x -  x  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC
   14   64  .55  .55  .60  .60  .65  .65  .65  .65  .60  .55  .55  .55
  END MON-BWTF
```

```
NQUALS
  #    # NQAL  ***
 14   64    4
END NQUALS

IQL-AD-FLAGS
           Atmospheric Deposition Flags ***
  <ILS >  QUAL1  QUAL2  QUAL3  QUAL4  ***
  # -  #   F  C   F  C   F  C   F  C  ***
 14       -1  0  -1  0   0  0   0  0
 34       -1  0  -1  0   0  0   0  0
 54       -1  0  -1  0   0  0   0  0
 64       -1  0  -1  0   0  0   0  0
END IQL-AD-FLAGS

QUAL-PROPS
  #    #<--QUALID-->    QTID  QSD VPFW  QSO  VQO  ***
 14     NH3             LBS     0    0    1    0
 34     NH3             LBS     0    0    1    0
 54     NH3             LBS     0    0    1    0
 64     NH3             LBS     0    0    1    0
END QUAL-PROPS

QUAL-INPUT
  #    #     SQO   POTFW   ACQOP  SQOLIM   WSQOP  ***
 14        0.001       0   0.004   0.005     0.5
 34        0.001       0   0.004   0.005     0.5
 54        0.001       0   0.004   0.005     0.5
 64        0.001       0   0.004   0.005     0.5
END QUAL-INPUT

QUAL-PROPS
  #    #<--QUALID-->    QTID  QSD VPFW  QSO  VQO  ***
 14     NO2 NO3         LBS     0    0    1    0
 34     NO2 NO3         LBS     0    0    1    0
 54     NO2 NO3         LBS     0    0    1    0
 64     NO2 NO3         LBS     0    0    1    0
END QUAL-PROPS

QUAL-INPUT
  #    #     SQO   POTFW   ACQOP  SQOLIM   WSQOP  ***
 14        0.007       0   0.006   0.009     0.5
 34        0.007       0   0.006   0.009     0.5
 54        0.007       0   0.006   0.009     0.5
 64        0.007       0   0.006   0.009     0.5
END QUAL-INPUT

QUAL-PROPS
  #    #<--QUALID-->    QTID  QSD VPFW  QSO  VQO  ***
 14     ORTHO P         LBS     0    0    1    0
 34     ORTHO P         LBS     0    0    1    0
 54     ORTHO P         LBS     0    0    1    0
 64     ORTHO P         LBS     0    0    1    0
END QUAL-PROPS
```

```
  QUAL-INPUT
    #    #     SQO   POTFW   ACQOP  SQOLIM   WSQOP  ***
   14        0.002       0   0.001   0.002     0.5
   34        0.002       0   0.001   0.002     0.5
   54        0.002       0   0.001   0.002     0.5
   64        0.002       0   0.001   0.002     0.5
  END QUAL-INPUT

  QUAL-PROPS
    #    #<--QUALID-->    QTID  QSD VPFW  QSO  VQO  ***
   14     BOD             LBS     0    0    1    0
   34     BOD             LBS     0    0    1    0
   54     BOD             LBS     0    0    1    0
   64     BOD             LBS     0    0    1    0
  END QUAL-PROPS

  QUAL-INPUT
    #    #     SQO   POTFW   ACQOP  SQOLIM   WSQOP  ***
   14          1.0      0.    0.15     2.0   0.500
   34          1.0      0.    0.15     2.0   0.500
   54          1.0      0.    0.15     2.0   0.500
   64          1.0      0.    0.15     2.0   0.500
  END QUAL-INPUT
END IMPLND

RCHRES
  ACTIVITY
*** RCHRES  Active sections
*** x -  x HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG
    1   61    1    1    0    0    0    0    1    1    1    0
  END ACTIVITY

  PRINT-INFO
*** RCHRES  Printout level flags
*** x -  x HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR
    1   61    5    5                        5    5    5         1   12
  END PRINT-INFO

  GEN-INFO
***              Name        Nexits   Unit Systems   Printer
*** RCHRES                              t-series  Engl Metr LKFG
*** x -  x                                in  out
   31     EAST UPPER REEDY CK     1          1    1   90    0    1
   41     WEST UPPER REEDY CK     1          1    1   90    0    1
   51     WHITTENHORSE CK         1          1    1   90    0    1
   61     DAVENPORT CK            1          1    1   90    0    1
    2     BAY LAKE / 7 SEAS       2          1    1   90    0    1
    3     UPPER L-405             1          1    1   90    0    0
    4     C-4                     1          1    1   90    0    0
    5     L-403 - EPCOT           1          1    1   90    0    0
    6     LOWER L-405             1          1    1   90    0    0
    7     REEDY CK AB HWY 192     1          1    1   90    0    0
    8     REEDY CK AB I-4         1          1    1   90    0    0
    9     L MABEL / SOUTH L       1          1    1   90    0    1
   10     L-105                   1          1    1   90    0    0
```

```
   11     L-103                   1         1    1   90    0    0
   12     L-107 / UPPER C-1       1         1    1   90    0    0
   13     MIDDLE C-1              1         1    1   90    0    0
   14     LOWER C-1               1         1    1   90    0    0
   15     REEDY CK AT S-40        2         1    1   90    0    0
   16     REEDY CK AT LOUGHMAN    1         1    1   90    0    0
  END GEN-INFO

  HYDR-PARM1
***         Flags for HYDR section
    RCHRES  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
    x  - x  FG FG FG FG  possible   exit *** possible   exit     possible   exit
                           *  *  *  *  * ***   *  *  *  *  *       *  *  *  *  *
    2        0  1  1  1    4  5                0
    3   14   0  1  1  1    4                   0
   15        0  1  1  1    0  4                1
   16   61   0  1  1  1    4                   0
  END HYDR-PARM1

  HYDR-PARM2
*** RCHRES    FTABNO       LEN     DELTH     STCOR        KS      DB50
*** x -  x             (miles)      (ft)      (ft)              (in)
    2              2      1.00       0.1      62.5       0.0      0.01
    3              3      5.56       0.1        .0       0.0      0.01
    4              4      2.13       0.1        .0       0.0      0.01
    5              5      3.36       0.1        .0       0.0      0.01
    6              6      2.50       0.1        .0       0.0      0.01
    7              7      2.01       0.1        .0       0.0      0.01
    8              8      2.52       0.1        .0       0.0      0.01
    9              9      2.00       0.1     88.25       0.0      0.01
   10             10      1.77       0.1        .0       0.0      0.01
   11             11      2.92       0.1        .0       0.0      0.01
   12             12      6.75       0.1        .0       0.0      0.01
   13             13      2.37       0.1        .0       0.0      0.01
   14             14      4.51       0.1        .0       0.0      0.01
   15             15      2.84       0.1        .0       0.0      0.01
   16             16       1.0       0.1     -0.73       0.0      0.01
   31             31       1.0       0.1      90.0       0.0      0.01
   41             41       1.2       0.1      90.0       0.0      0.01
   51             51      2.37       0.1     90.77       0.0      0.01
   61             61      4.64       0.1       4.0       0.0      0.01
  END HYDR-PARM2

  HYDR-INIT
***         Initial conditions for HYDR section
*** RCHRES        VOL  CAT Initial value  of COLIND     initial  value  of OUTDGT
*** x  - x      ac-ft      for each possible   exit  for each possible exit,ft3
    2        7230.0    0  4.0  5.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
    3           0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
    4           2.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
    5           0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
    6           2.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
    7           5.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
    8           2.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
    9        2700.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
```

```
   10            0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   11            0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   12            0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   13            0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   14            0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   15            0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   16            0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   31         3850.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   41         2820.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   51         2350.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   61          250.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT

  *** Section RQUAL ***

  BENTH-FLAG
    RCHRES BENF ***
    # -  #      ***
    1   61    1
  END BENTH-FLAG

  SCOUR-PARMS
    RCHRES    SCRVEL    SCRMUL ***
    # -  #                     ***
    1   61        3.        1.
  END SCOUR-PARMS

  *** Section OXRX ***

  OX-FLAGS
    RCHRES REAM ***
    # -  #      ***
    2   61    3
  END OX-FLAGS

  OX-GENPARM
    RCHRES    KBOD20     TCBOD    KODSET    SUPSAT ***
    # -  #       /hr                               ***
    2   16      0.01               0.005
   31   51      0.01               0.005
   61           0.01               0.005
  END OX-GENPARM

  ELEV
*** RCHRES       ELEV
*** x -  x       (ft)
    2   16         80
   31   41        120
   51             110
   61             100
  END ELEV
```

```
OX-BENPARM
  RCHRES     BENOD      TCBEN      EXPOD  BRBOD(1)  BRBOD(2)    EXPREL ***
  # -  #  mg/m2.hr                      mg/m2.hr  mg/m2.hr           ***
  2             40        1.1        1.2    0.0001    0.0001      2.82
  3             40        1.1        1.2    0.0001    0.0001      2.82
  4             40        1.1        1.2    0.0001    0.0001      2.82
  5             40        1.1        1.2    0.0001    0.0001      2.82
  6             40        1.1        1.2    0.0001    0.0001      2.82
  7             40        1.1        1.2    0.0001    0.0001      2.82
  8             40        1.1        1.2    0.0001    0.0001      2.82
  9             40        1.1        1.2    0.0001    0.0001      2.82
 10             40        1.1        1.2    0.0001    0.0001      2.82
 11             40        1.1        1.2    0.0001    0.0001      2.82
 12             40        1.1        1.2    0.0001    0.0001      2.82
 13             40        1.1        1.2    0.0001    0.0001      2.82
 14             40        1.1        1.2    0.0001    0.0001      2.82
 15             40        1.1        1.2    0.0001    0.0001      2.82
 16             20        1.1        1.2    0.0001    0.0001      2.82
 31             80        1.1        1.2    0.0001    0.0001      2.82
 41             80        1.1        1.2    0.0001    0.0001      2.82
 51             80        1.1        1.2    0.0001    0.0001      2.82
 61             40        1.1        1.2    0.0001    0.0001      2.82
END OX-BENPARM

OX-REAPARM
  RCHRES    TCGINV       REAK    EXPRED    EXPREV ***
  # -  #                  /hr                     ***
  2   61                 0.20      -1.1       1.1
END OX-REAPARM

OX-INIT
  RCHRES       DOX        BOD     SATDO ***
  # -  #      mg/l       mg/l      mg/l ***
  2   61         6        0.1
END OX-INIT

*** Section NUTRX ***

NUT-FLAGS
  RCHRES  TAM  NO2  PO4  AMV  DEN ADNH ADPO PHFL ***
  # -  #                                         ***
  1   61    1    0    1    1    1    0    0    2
END NUT-FLAGS

NUT-AD-FLAGS
  Atmospheric Deposition Flags ***
  RCHRES    NO3    NH3    PO4   ***
  # -  #   F  C   F  C   F  C   ***
  1   61  -1  0  -1  0   0  0
END NUT-AD-FLAGS

NUT-BENPARM
  RCHRES  BRTAM(1)  BRTAM(2)  BRPO4(1)  BRPO4(2)     ANAER  ***
  # -  #  mg/m2.hr  mg/m2.hr  mg/m2.hr  mg/m2.hr      mg/l  ***
  2   61       0.0       0.0       0.0       0.0     0.005
END NUT-BENPARM
```

```
NUT-NITDENIT
  RCHRES    KTAM20    KNO220     TCNIT    KNO320     TCDEN    DENOXT ***
  # -  #       /hr       /hr                 /hr                mg/l ***
  2          0.015     0.002      1.07     0.001      1.04         5
  3          0.015     0.002      1.07     0.001      1.04         5
  4          0.015     0.002      1.07     0.001      1.04         5
  5          0.015     0.002      1.07     0.001      1.04         5
  6          0.015     0.002      1.07     0.001      1.04         5
  7          0.015     0.002      1.07     0.001      1.04         5
  8          0.015     0.002      1.07     0.001      1.04         5
  9          0.015     0.002      1.07     0.001      1.04         5
 10          0.015     0.002      1.07     0.001      1.04         5
 11          0.015     0.002      1.07     0.001      1.04         5
 12          0.015     0.002      1.07     0.001      1.04         5
 13          0.015     0.002      1.07     0.001      1.04         5
 14          0.015     0.002      1.07     0.001      1.04         5
 15          0.015     0.002      1.07     0.001      1.04         5
 16          0.015     0.002      1.07     0.001      1.04         5
 31          0.003     0.002      1.07     0.001      1.04         5
 41          0.003     0.002      1.07     0.001      1.04         5
 51          0.003     0.002      1.07     0.001      1.04         5
 61          0.015     0.002      1.07     0.001      1.04         5
END NUT-NITDENIT

NUT-NH3VOLAT
  RCHRES    EXPNVG    EXPNVL ***
  # -  #                     ***
  2            .50    0.6667
  3            .50    0.6667
  4            .50    0.6667
  5            .50    0.6667
  6            .50    0.6667
  7            .50    0.6667
  8            .50    0.6667
  9            .50    0.6667
 10            .50    0.6667
 11            .50    0.6667
 12            .50    0.6667
 13            .50    0.6667
 14            .50    0.6667
 15            .50    0.6667
 16            .50    0.6667
 31            .50    0.6667
 41            .50    0.6667
 51            .50    0.6667
 61            .50    0.6667
END NUT-NH3VOLAT
```

```
NUT-DINIT
  RCHRES       NO3       TAM       NO2       PO4     PHVAL  ***
  # -  #      mg/l      mg/l      mg/l      mg/l ph units   ***
  2            .05      0.05        0.       .02       7.0
  3            .05      0.05        0.       .02       7.0
  4            .05      0.05        0.       .02       7.0
  5            .05      0.05        0.       .02       7.0
  6            .05      0.05        0.       .02       7.0
  7            .05      0.05        0.       .02       7.0
  8            .05      0.05        0.       .02       7.0
  9            .05      0.05        0.       .02       7.0
 10            .05      0.05        0.       .02       7.0
 11            .05      0.05        0.       .02       7.0
 12            .05      0.05        0.       .02       7.0
 13            .05      0.05        0.       .02       7.0
 14            .05      0.05        0.       .02       7.0
 15            .05      0.05        0.       .02       7.0
 16            .05      0.05        0.       .02       7.0
 31            .05      0.05        0.       .02       7.0
 41            .05      0.05        0.       .02       7.0
 51            .05      0.05        0.       .02       7.0
 61            .05      0.05        0.       .02       7.0
END NUT-DINIT

*** Section PLANK ***

PLNK-FLAGS
  RCHRES PHYF ZOOF BALF SDLT AMRF DECF NSFG ZFOO ***
  # -  #                                         ***
  1   61    1    0    0    0    1         1
END PLNK-FLAGS

PLNK-PARM1
  RCHRES    RATCLP    NONREF    LITSED     ALNPR      EXTB     MALGR ***
  # -  #                                               /ft       /hr ***
  2            0.6       0.5       0.0      0.70       1.0      0.07
  3            0.6       0.5       0.0      0.70       1.0      0.07
  4            0.6       0.5       0.0      0.70       1.0      0.07
  5            0.6       0.5       0.0      0.70       1.0      0.07
  6            0.6       0.5       0.0      0.70       1.0      0.07
  7            0.6       0.5       0.0      0.70       1.0      0.07
  8            0.6       0.5       0.0      0.70       1.0      0.07
  9            0.6       0.5       0.0      0.70       1.0      0.07
 10            0.6       0.5       0.0      0.70       1.0      0.07
 11            0.6       0.5       0.0      0.70       1.0      0.07
 12            0.6       0.5       0.0      0.70       1.0      0.07
 13            0.6       0.5       0.0      0.70       1.0      0.07
 14            0.6       0.5       0.0      0.70       1.0      0.07
 15            0.6       0.5       0.0      0.70       1.0      0.07
 16            0.6       0.5       0.0      0.70       1.0      0.07
 31            0.6       0.5       0.0      0.70       1.0      0.07
 41            0.6       0.5       0.0      0.70       1.0      0.07
 51            0.6       0.5       0.0      0.70       1.0      0.07
 61            0.6       0.5       0.0      0.70       1.0      0.07
END PLNK-PARM1
```

```
PLNK-PARM2
  RCHRES *** CMMLT      CMMN     CMMNP      CMMP    TALGRH    TALGRL    TALGRM
  # -  # ***
  2           .010     0.025     .0001      .005       95.     -20.0       86.
  3           .010     0.025     .0001      .005       95.     -20.0       86.
  4           .010     0.025     .0001      .005       95.     -20.0       86.
  5           .010     0.025     .0001      .005       95.     -20.0       86.
  6           .010     0.025     .0001      .005       95.     -20.0       86.
  7           .010     0.025     .0001      .005       95.     -20.0       86.
  8           .010     0.025     .0001      .005       95.     -20.0       86.
  9           .010     0.025     .0001      .005       95.     -20.0       86.
 10           .010     0.025     .0001      .005       95.     -20.0       86.
 11           .010     0.025     .0001      .005       95.     -20.0       86.
 12           .010     0.025     .0001      .005       95.     -20.0       86.
 13           .010     0.025     .0001      .005       95.     -20.0       86.
 14           .010     0.025     .0001      .005       95.     -20.0       86.
 15           .010     0.025     .0001      .005       95.     -20.0       86.
 16           .010     0.025     .0001      .005       95.     -20.0       86.
 31           .010     0.025     .0001      .005       95.     -20.0       86.
 41           .010     0.025     .0001      .005       95.     -20.0       86.
 51           .010     0.025     .0001      .005       95.     -20.0       86.
 61           .010     0.025     .0001      .005       95.     -20.0       86.
END PLNK-PARM2

PLNK-PARM3
  RCHRES *** ALR20      ALDH      ALDL     OXALD     NALDH     PALDH
  # -  # ***
  2          0.005      0.01     0.001      0.03      0.01     0.002
  3          0.005      0.01     0.001      0.03      0.01     0.002
  4          0.005      0.01     0.001      0.03      0.01     0.002
  5          0.005      0.01     0.001      0.03      0.01     0.002
  6          0.005      0.01     0.001      0.03      0.01     0.002
  7          0.005      0.01     0.001      0.03      0.01     0.002
  8          0.005      0.01     0.001      0.03      0.01     0.002
  9          0.005      0.01     0.001      0.03      0.01     0.002
 10          0.005      0.01     0.001      0.03      0.01     0.002
 11          0.005      0.01     0.001      0.03      0.01     0.002
 12          0.005      0.01     0.001      0.03      0.01     0.002
 13          0.005      0.01     0.001      0.03      0.01     0.002
 14          0.005      0.01     0.001      0.03      0.01     0.002
 15          0.005      0.01     0.001      0.03      0.01     0.002
 16          0.005      0.01     0.001      0.03      0.01     0.002
 31          0.005      0.01     0.001      0.03      0.01     0.002
 41          0.005      0.01     0.001      0.03      0.01     0.002
 51          0.005      0.01     0.001      0.03      0.01     0.002
 61          0.005      0.01     0.001      0.03      0.01     0.002
END PLNK-PARM3
```

```
  PHYTO-PARM
    RCHRES      SEED    MXSTAY      OREF    CLALDH    PHYSET    REFSET ***
    # -  #      mg/l      mg/l                ug/l                     ***
    2             .5        2.       20.        20       .02       .02
    3             .5        2.       20.        20       .02       .02
    4             .5        2.       20.        20       .02       .02
    5             .5        2.       20.        20       .02       .02
    6             .5        2.       20.        20       .02       .02
    7             .5        2.       20.        20       .02       .02
    8             .5        2.       20.        20       .02       .02
    9             .5        2.       20.        20       .02       .02
   10             .5        2.       20.        20       .02       .02
   11             .5        2.       20.        20       .02       .02
   12             .5        2.       20.        20       .02       .02
   13             .5        2.       20.        20       .02       .02
   14             .5        2.       20.        20       .02       .02
   15             .5        2.       20.        20       .02       .02
   16             .5        2.       20.        20       .02       .02
   31             .5        2.       20.        20       .02       .02
   41             .5        2.       20.        20       .02       .02
   51             .5        2.       20.        20       .02       .02
   61             .5        2.       20.        20       .02       .02
  END PHYTO-PARM

  PLNK-INIT
    RCHRES     PHYTO       ZOO     BENAL       ORN       ORP       ORC ***
    # -  #      mg/l     org/l     mg/m2      mg/l      mg/l      mg/l ***
    2   61       .05                           .02      0.01       0.1
  END PLNK-INIT
END RCHRES

COPY
  TIMESERIES
  Copy-opn***
*** x -  x  NPT  NMN
  101  106         7
    1    4        20
  END TIMESERIES
END COPY

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   x <Name> x tem strg<-factor->strg <Name>   x   x        <Name> x x  ***

*** Precip
*** DSN  70 = Disaggregated hourly rainfall for Conserv sites 601-604, based on
*** DSN  71 = Disaggregated hourly rainfall for L-101, based on Orlando r
*** DSN  73 = Disaggregated hourly rainfall for Conserv sites 701-901, based on
*** DSN  75 = Disaggregated hourly rainfall for L-410, modified based on 701-901

*** Segment 1
WDM1    71 PREC   0 ENGL           .45     PERLND  11  19 EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           .50     PERLND  11  19 EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .05     PERLND  11  19 EXTNL  PREC   1 1
WDM1    71 PREC   0 ENGL           .45     IMPLND  14   0 EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           .50     IMPLND  14   0 EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .05     IMPLND  14   0 EXTNL  PREC   1 1
WDM1    71 PREC   0 ENGL           .45     RCHRES   1  16 EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           .50     RCHRES   1  16 EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .05     RCHRES   1  16 EXTNL  PREC   1 1
```

```
*** Segment 3
WDM1    70 PREC   0 ENGL           .15     PERLND  31  39 EXTNL  PREC   1 1
WDM1    71 PREC   0 ENGL           .02     PERLND  31  39 EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .80     PERLND  31  39 EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           .03     PERLND  31  39 EXTNL  PREC   1 1
WDM1    70 PREC   0 ENGL           .15     IMPLND  34   0 EXTNL  PREC   1 1
WDM1    71 PREC   0 ENGL           .02     IMPLND  34   0 EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .80     IMPLND  34   0 EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           .03     IMPLND  34   0 EXTNL  PREC   1 1
WDM1    70 PREC   0 ENGL           .15     RCHRES  31  41 EXTNL  PREC   1 1
WDM1    71 PREC   0 ENGL           .02     RCHRES  31  41 EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .80     RCHRES  31  41 EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           .03     RCHRES  31  41 EXTNL  PREC   1 1

*** Segment 5
WDM1    75 PREC   0 ENGL           .80     PERLND  51  59 EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .20     PERLND  51  59 EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           .80     IMPLND  54     EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .20     IMPLND  54     EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           .80     RCHRES  51     EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .20     RCHRES  51     EXTNL  PREC   1 1

*** Segment 6
WDM1    75 PREC   0 ENGL           1.0     PERLND  61  65 EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           1.0     IMPLND  64     EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           1.0     RCHRES  61     EXTNL  PREC   1 1

*** Evap
*** DSN 80 = PET from mo. pan coefficients x pan evap at Lisbon
WDM1    80 PET      ENGL                   PERLND  11  69 EXTNL  PETINP
WDM1    80 PET      ENGL                   IMPLND  14  64 EXTNL  PETINP
WDM1    80 PET      ENGL                   RCHRES   1  61 EXTNL  POTEV

*** RIBS application - dataset in units of acre-inches
*** Divide by total area of ribs for all three lines following
WDM1    91 RIBS     ENGL      .0384615     PERLND  19     EXTNL  PREC
WDM1    91 RIBS     ENGL      .0316456     PERLND  39     EXTNL  PREC
WDM1    91 RIBS     ENGL      .0355872     PERLND  59     EXTNL  PREC

*** Well water pumped into Bay Lake and Seven Seas Lagoon
WDM     92 PUMP     ENGL                   RCHRES   2     EXTNL  IVOL

*** Grove Irrigation as PREC (sprinkler) or SURLI (drip)
WDM1    94 IRRG     ENGL                   PERLND  11     EXTNL  PREC
WDM1    94 IRRG     ENGL                   PERLND  21     EXTNL  PREC
WDM1    94 IRRG     ENGL                   PERLND  31     EXTNL  PREC
WDM1    94 IRRG     ENGL                   PERLND  51     EXTNL  PREC
WDM1    94 IRRG     ENGL                   PERLND  61     EXTNL  PREC

*** Buzzard site diversion
*** Data set units are in cubic feet per second
WDM     95 FLOW     ENGL              SAME RCHRES  15     EXTNL  OUTDGT 1
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*** Cypress Creek discharge (treated as a point)
WDM1    22 FLOW     ENGL       .082645SAME RCHRES  11     EXTNL  IVOL

***Cypress Creek water-quality (treated as point source)
***do, bod, ammon, no3, po4, orn, orp, orc
WDM    820 DO       ENGL              DIV  RCHRES  11     INFLOW OXIF   1
WDM    821 BOD      ENGL              DIV  RCHRES  11     INFLOW OXIF   2
WDM    822 NH3      ENGL              DIV  RCHRES  11     INFLOW NUIF1  2
WDM    823 NO3      ENGL              DIV  RCHRES  11     INFLOW NUIF1  1
WDM    824 PO4      ENGL              DIV  RCHRES  11     INFLOW NUIF1  4

*** Hourly air temperature at ORL MCO (degrees F)
WDM1    85 TEMP     ENGL                   PERLND  11  65 EXTNL  GATMP
WDM1    85 TEMP     ENGL                   IMPLND  14  64 EXTNL  GATMP
WDM1    85 TEMP     ENGL                   RCHRES   1  61 EXTNL  GATMP

*** Daily wind speed (mph)
WDM1    82 WIND     ENGL              SAME RCHRES   1  61 EXTNL  WIND

*** Hourly solar radiation at Daytona Beach (ly/hr)
WDM1    81 SOLR     ENGL                   RCHRES   1  61 EXTNL  SOLRAD

*** Water Temperature (degrees C)
WDM1   603 TH2O     METR                   RCHRES   2   7 HTRCH  TW
WDM1   602 TH2O     METR                   RCHRES   8     HTRCH  TW
WDM1   603 TH2O     METR                   RCHRES   9  12 HTRCH  TW
WDM1   602 TH2O     METR                   RCHRES  13     HTRCH  TW
WDM1   601 TH2O     METR                   RCHRES  14  16 HTRCH  TW
WDM1   603 TH2O     METR                   RCHRES  31  41 HTRCH  TW
WDM1   604 TH2O     METR                   RCHRES  51  61 HTRCH  TW

*** Atmospheric Deposition (lb/ac)
WDM1    86 NH4D     ENGL              DIV  PERLND  11  65 EXTNL  PQADFX 1 1
WDM1    86 NH4D     ENGL              DIV  IMPLND  14  64 EXTNL  IQADFX 1
WDM1    86 NH4D     ENGL              DIV  RCHRES   1  61 EXTNL  NUADFX 2 1
WDM1    87 NO3D     ENGL              DIV  PERLND  11  65 EXTNL  PQADFX 2 1
WDM1    87 NO3D     ENGL              DIV  IMPLND  14  64 EXTNL  IQADFX 2
WDM1    87 NO3D     ENGL              DIV  RCHRES   1  61 EXTNL  NUADFX 1 1

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Aggr Amd ***
<Name>   x        <Name> x x<-factor->strg <Name>   x <Name>qf  tem strg strg***

*** Seven Seas Lagoon/Bay Lake combined outflow (RCHRES 2)
RCHRES   2 HYDR   RO                       WDM    102 FLOW     ENGL AGGR REPL
*** Lake Mabel/South Lake Outflow (RCHRES 9)
RCHRES   9 HYDR   RO                       WDM    109 FLOW     ENGL AGGR REPL
*** Reedy Creek below S40 near Loughman
RCHRES  15 HYDR   RO                       WDM    115 FLOW     ENGL AGGR REPL
*** Upper East Reedy Creek - Lateral 405 at S-405A
RCHRES  31 HYDR   RO                       WDM    131 FLOW     ENGL AGGR REPL
*** Upper West Reedy Creek - Reedy Creek at S46 near Vineland
RCHRES  41 HYDR   RO                       WDM    141 FLOW     ENGL AGGR REPL
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*** Whittenhorse creek stage
RCHRES  51 HYDR   STAGE                    WDM    251 STAG     ENGL AGGR REPL
*** Davenport creek stage
RCHRES  61 HYDR   STAGE                    WDM    261 STAG     ENGL AGGR REPL

*** Miscellaneous temporary calibration
RCHRES   2 OXRX   SATDO                    WDM   1002 TEST     ENGL AGGR REPL
RCHRES   3 OXRX   SATDO                    WDM   1003 TEST     ENGL AGGR REPL
RCHRES   4 OXRX   SATDO                    WDM   1004 TEST     ENGL AGGR REPL
RCHRES   5 OXRX   SATDO                    WDM   1005 TEST     ENGL AGGR REPL
RCHRES   6 OXRX   SATDO                    WDM   1006 TEST     ENGL AGGR REPL
RCHRES   7 OXRX   SATDO                    WDM   1007 TEST     ENGL AGGR REPL
RCHRES   8 OXRX   SATDO                    WDM   1008 TEST     ENGL AGGR REPL
RCHRES   9 OXRX   SATDO                    WDM   1009 TEST     ENGL AGGR REPL
RCHRES  10 OXRX   SATDO                    WDM   1010 TEST     ENGL AGGR REPL
RCHRES  11 OXRX   SATDO                    WDM   1011 TEST     ENGL AGGR REPL
RCHRES  12 OXRX   SATDO                    WDM   1012 TEST     ENGL AGGR REPL
RCHRES  13 OXRX   SATDO                    WDM   1013 TEST     ENGL AGGR REPL
RCHRES  14 OXRX   SATDO                    WDM   1014 TEST     ENGL AGGR REPL
RCHRES  15 OXRX   SATDO                    WDM   1015 TEST     ENGL AGGR REPL
RCHRES  16 OXRX   SATDO                    WDM   1016 TEST     ENGL AGGR REPL
RCHRES  31 OXRX   SATDO                    WDM   1031 TEST     ENGL AGGR REPL
RCHRES  41 OXRX   SATDO                    WDM   1041 TEST     ENGL AGGR REPL
RCHRES  51 OXRX   SATDO                    WDM   1051 TEST     ENGL AGGR REPL
RCHRES  61 OXRX   SATDO                    WDM   1061 TEST     ENGL AGGR REPL

*** WQ DSNS for Loughman ***
*** REACH 16 ***
RCHRES  16 NUTRX  DNUST  1            AVER WDM1  2001 NO3X     ENGL AGGR REPL
RCHRES  16 NUTRX  DNUST  2            AVER WDM1  2002 NH3X     ENGL AGGR REPL
RCHRES  16 PLANK  PKST3  4            AVER WDM1  2003 ORGN     ENGL AGGR REPL
RCHRES  16 PLANK  PKST4  1            AVER WDM1  2004 TOTN     ENGL AGGR REPL
RCHRES  16 NUTRX  DNUST  4            AVER WDM1  2005 PO4X     ENGL AGGR REPL
RCHRES  16 PLANK  PKST3  5            AVER WDM1  2006 ORGP     ENGL AGGR REPL
RCHRES  16 PLANK  PKST4  2            AVER WDM1  2007 TOTP     ENGL AGGR REPL
RCHRES  16 PLANK  PHYCLA              AVER WDM1  2008 CHLA     ENGL AGGR REPL
RCHRES  16 PLANK  PKST3  6            AVER WDM1  2009 TOCX     ENGL AGGR REPL
RCHRES  16 OXRX   DOX                 AVER WDM1  2010 DOXX     ENGL AGGR REPL
RCHRES  16 OXRX   BOD                 AVER WDM1  2011 BODX     ENGL AGGR REPL
RCHRES  16 PLANK  TPKCF1 4            SUM  WDM1  2012 TNLD     ENGL AGGR REPL
RCHRES  16 PLANK  TPKCF1 5            SUM  WDM1  2013 TPLD     ENGL AGGR REPL
RCHRES  16 NUTRX  NUCF1  1            SUM  WDM1  2014 NO3L     ENGL AGGR REPL
RCHRES  16 NUTRX  NUCF1  2            SUM  WDM1  2225 NH3L     ENGL AGGR REPL
RCHRES  16 NUTRX  NUCF1  4            SUM  WDM1  2226 PO4L     ENGL AGGR REPL

*** WQ DSNS for Davenport Creek ***
*** REACH 61 ***
RCHRES  61 NUTRX  DNUST  1            AVER WDM1  2015 NO3X     ENGL AGGR REPL
RCHRES  61 NUTRX  DNUST  2            AVER WDM1  2016 NH3X     ENGL AGGR REPL
RCHRES  61 PLANK  PKST3  4            AVER WDM1  2017 ORGN     ENGL AGGR REPL
RCHRES  61 PLANK  PKST4  1            AVER WDM1  2018 TOTN     ENGL AGGR REPL
RCHRES  61 NUTRX  DNUST  4            AVER WDM1  2019 PO4X     ENGL AGGR REPL
RCHRES  61 PLANK  PKST3  5            AVER WDM1  2020 ORGP     ENGL AGGR REPL
RCHRES  61 PLANK  PKST4  2            AVER WDM1  2021 TOTP     ENGL AGGR REPL
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RCHRES  61 PLANK  PHYTO               AVER WDM1  2022 CHLA     ENGL AGGR REPL
RCHRES  61 PLANK  PKST3  6            AVER WDM1  2023 TOCX     ENGL AGGR REPL
RCHRES  61 OXRX   DOX                 AVER WDM1  2024 DOXX     ENGL AGGR REPL
RCHRES  61 OXRX   BOD                 AVER WDM1  2025 BODX     ENGL AGGR REPL
RCHRES  61 PLANK  TPKCF1 4            SUM  WDM1  2026 TNLD     ENGL AGGR REPL
RCHRES  61 PLANK  TPKCF1 5            SUM  WDM1  2027 TPLD     ENGL AGGR REPL
RCHRES  61 NUTRX  NUCF1  1            SUM  WDM1  2028 NO3L     ENGL AGGR REPL
RCHRES  61 NUTRX  NUCF1  2            SUM  WDM1  2227 NH3L     ENGL AGGR REPL
RCHRES  61 NUTRX  NUCF1  4            SUM  WDM1  2228 PO4L     ENGL AGGR REPL

*** WQ DSNS for Reedy Creek at S-40 ***
*** REACH 15 ***
RCHRES  15 NUTRX  DNUST  1            AVER WDM1  2029 NO3X     ENGL AGGR REPL
RCHRES  15 NUTRX  DNUST  2            AVER WDM1  2030 NH3X     ENGL AGGR REPL
RCHRES  15 PLANK  PKST3  4            AVER WDM1  2031 ORGN     ENGL AGGR REPL
RCHRES  15 PLANK  PKST4  1            AVER WDM1  2032 TOTN     ENGL AGGR REPL
RCHRES  15 NUTRX  DNUST  4            AVER WDM1  2033 PO4X     ENGL AGGR REPL
RCHRES  15 PLANK  PKST3  5            AVER WDM1  2034 ORGP     ENGL AGGR REPL
RCHRES  15 PLANK  PKST4  2            AVER WDM1  2035 TOTP     ENGL AGGR REPL
RCHRES  15 PLANK  PHYTO               AVER WDM1  2036 CHLA     ENGL AGGR REPL
RCHRES  15 PLANK  PKST3  6            AVER WDM1  2037 TOCX     ENGL AGGR REPL
RCHRES  15 OXRX   DOX                 AVER WDM1  2038 DOXX     ENGL AGGR REPL
RCHRES  15 OXRX   BOD                 AVER WDM1  2039 BODX     ENGL AGGR REPL
RCHRES  15 PLANK  TPKCF1 4            SUM  WDM1  2040 TNLD     ENGL AGGR REPL
RCHRES  15 PLANK  TPKCF1 5            SUM  WDM1  2041 TPLD     ENGL AGGR REPL
RCHRES  15 NUTRX  NUCF1  1            SUM  WDM1  2042 NO3L     ENGL AGGR REPL
RCHRES  15 NUTRX  NUCF1  2            SUM  WDM1  2229 NH3L     ENGL AGGR REPL
RCHRES  15 NUTRX  NUCF1  4            SUM  WDM1  2230 PO4L     ENGL AGGR REPL

*** WQ DSNS for Reedy Creek near Vineland ***
*** REACH 7 ***
RCHRES   7 NUTRX  DNUST  1            AVER WDM1  2043 NO3X     ENGL AGGR REPL
RCHRES   7 NUTRX  DNUST  2            AVER WDM1  2044 NH3X     ENGL AGGR REPL
RCHRES   7 PLANK  PKST3  4            AVER WDM1  2045 ORGN     ENGL AGGR REPL
RCHRES   7 PLANK  PKST4  1            AVER WDM1  2046 TOTN     ENGL AGGR REPL
RCHRES   7 NUTRX  DNUST  4            AVER WDM1  2047 PO4X     ENGL AGGR REPL
RCHRES   7 PLANK  PKST3  5            AVER WDM1  2048 ORGP     ENGL AGGR REPL
RCHRES   7 PLANK  PKST4  2            AVER WDM1  2049 TOTP     ENGL AGGR REPL
RCHRES   7 PLANK  PHYTO               AVER WDM1  2050 CHLA     ENGL AGGR REPL
RCHRES   7 PLANK  PKST3  6            AVER WDM1  2051 TOCX     ENGL AGGR REPL
RCHRES   7 OXRX   DOX                 AVER WDM1  2052 DOXX     ENGL AGGR REPL
RCHRES   7 OXRX   BOD                 AVER WDM1  2053 BODX     ENGL AGGR REPL
RCHRES   7 PLANK  TPKCF1 4            SUM  WDM1  2054 TNLD     ENGL AGGR REPL
RCHRES   7 PLANK  TPKCF1 5            SUM  WDM1  2055 TPLD     ENGL AGGR REPL
RCHRES   7 NUTRX  NUCF1  1            SUM  WDM1  2056 NO3L     ENGL AGGR REPL
RCHRES   7 NUTRX  NUCF1  2            SUM  WDM1  2231 NH3L     ENGL AGGR REPL
RCHRES   7 NUTRX  NUCF1  4            SUM  WDM1  2232 PO4L     ENGL AGGR REPL

*** WQ DSNS for Bonnet Creek near Vineland ***
*** REACH 13 ***
RCHRES  13 NUTRX  DNUST  1            AVER WDM1  2057 NO3X     ENGL AGGR REPL
RCHRES  13 NUTRX  DNUST  2            AVER WDM1  2058 NH3X     ENGL AGGR REPL
RCHRES  13 PLANK  PKST3  4            AVER WDM1  2059 ORGN     ENGL AGGR REPL
RCHRES  13 PLANK  PKST4  1            AVER WDM1  2060 TOTN     ENGL AGGR REPL
RCHRES  13 NUTRX  DNUST  4            AVER WDM1  2061 PO4X     ENGL AGGR REPL
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RCHRES  13 PLANK  PKST3  5            AVER WDM1  2062 ORGP     ENGL AGGR REPL
RCHRES  13 PLANK  PKST4  2            AVER WDM1  2063 TOTP     ENGL AGGR REPL
RCHRES  13 PLANK  PHYTO               AVER WDM1  2064 CHLA     ENGL AGGR REPL
RCHRES  13 PLANK  PKST3  6            AVER WDM1  2065 TOCX     ENGL AGGR REPL
RCHRES  13 OXRX   DOX                 AVER WDM1  2066 DOXX     ENGL AGGR REPL
RCHRES  13 OXRX   BOD                 AVER WDM1  2067 BODX     ENGL AGGR REPL
RCHRES  13 PLANK  TPKCF1 4            SUM  WDM1  2068 TNLD     ENGL AGGR REPL
RCHRES  13 PLANK  TPKCF1 5            SUM  WDM1  2069 TPLD     ENGL AGGR REPL
RCHRES  13 NUTRX  NUCF1  1            SUM  WDM1  2070 NO3L     ENGL AGGR REPL
RCHRES  13 NUTRX  NUCF1  2            SUM  WDM1  2233 NH3L     ENGL AGGR REPL
RCHRES  13 NUTRX  NUCF1  4            SUM  WDM1  2234 PO4L     ENGL AGGR REPL

*** WQ DSNS for Whittenhorse Creek ***
*** REACH 51 ***
RCHRES  51 NUTRX  DNUST  1            AVER WDM1  2071 NO3X     ENGL AGGR REPL
RCHRES  51 NUTRX  DNUST  2            AVER WDM1  2072 NH3X     ENGL AGGR REPL
RCHRES  51 PLANK  PKST3  4            AVER WDM1  2073 ORGN     ENGL AGGR REPL
RCHRES  51 PLANK  PKST4  1            AVER WDM1  2074 TOTN     ENGL AGGR REPL
RCHRES  51 NUTRX  DNUST  4            AVER WDM1  2075 PO4X     ENGL AGGR REPL
RCHRES  51 PLANK  PKST3  5            AVER WDM1  2076 ORGP     ENGL AGGR REPL
RCHRES  51 PLANK  PKST4  2            AVER WDM1  2077 TOTP     ENGL AGGR REPL
RCHRES  51 PLANK  PHYTO               AVER WDM1  2078 CHLA     ENGL AGGR REPL
RCHRES  51 PLANK  PKST3  6            AVER WDM1  2079 TOCX     ENGL AGGR REPL
RCHRES  51 OXRX   DOX                 AVER WDM1  2080 DOXX     ENGL AGGR REPL
RCHRES  51 OXRX   BOD                 AVER WDM1  2081 BODX     ENGL AGGR REPL
RCHRES  51 PLANK  TPKCF1 4            SUM  WDM1  2082 TNLD     ENGL AGGR REPL
RCHRES  51 PLANK  TPKCF1 5            SUM  WDM1  2083 TPLD     ENGL AGGR REPL
RCHRES  51 NUTRX  NUCF1  1            SUM  WDM1  2084 NO3L     ENGL AGGR REPL
RCHRES  51 NUTRX  NUCF1  2            SUM  WDM1  2235 NH3L     ENGL AGGR REPL
RCHRES  51 NUTRX  NUCF1  4            SUM  WDM1  2236 PO4L     ENGL AGGR REPL

*** WQ DSNS for Upper West Reedy Creek @ S-46 ***
*** REACH 41 ***
RCHRES  41 NUTRX  DNUST  1            AVER WDM1  2085 NO3X     ENGL AGGR REPL
RCHRES  41 NUTRX  DNUST  2            AVER WDM1  2086 NH3X     ENGL AGGR REPL
RCHRES  41 PLANK  PKST3  4            AVER WDM1  2087 ORGN     ENGL AGGR REPL
RCHRES  41 PLANK  PKST4  1            AVER WDM1  2088 TOTN     ENGL AGGR REPL
RCHRES  41 NUTRX  DNUST  4            AVER WDM1  2089 PO4X     ENGL AGGR REPL
RCHRES  41 PLANK  PKST3  5            AVER WDM1  2090 ORGP     ENGL AGGR REPL
RCHRES  41 PLANK  PKST4  2            AVER WDM1  2091 TOTP     ENGL AGGR REPL
RCHRES  41 PLANK  PHYTO               AVER WDM1  2092 CHLA     ENGL AGGR REPL
RCHRES  41 PLANK  PKST3  6            AVER WDM1  2093 TOCX     ENGL AGGR REPL
RCHRES  41 OXRX   DOX                 AVER WDM1  2094 DOXX     ENGL AGGR REPL
RCHRES  41 OXRX   BOD                 AVER WDM1  2095 BODX     ENGL AGGR REPL
RCHRES  41 PLANK  TPKCF1 4            SUM  WDM1  2096 TNLD     ENGL AGGR REPL
RCHRES  41 PLANK  TPKCF1 5            SUM  WDM1  2097 TPLD     ENGL AGGR REPL
RCHRES  41 NUTRX  NUCF1  1            SUM  WDM1  2098 NO3L     ENGL AGGR REPL
RCHRES  41 NUTRX  NUCF1  2            SUM  WDM1  2237 NH3L     ENGL AGGR REPL
RCHRES  41 NUTRX  NUCF1  4            SUM  WDM1  2238 PO4L     ENGL AGGR REPL
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*** WQ DSNS for Upper East Reedy Creek @ S-405A ***
*** REACH 31 ***
RCHRES  31 NUTRX  DNUST  1            AVER WDM1  2099 NO3X     ENGL AGGR REPL
RCHRES  31 NUTRX  DNUST  2            AVER WDM1  2100 NH3X     ENGL AGGR REPL
RCHRES  31 PLANK  PKST3  4            AVER WDM1  2101 ORGN     ENGL AGGR REPL
RCHRES  31 PLANK  PKST4  1            AVER WDM1  2102 TOTN     ENGL AGGR REPL
RCHRES  31 NUTRX  DNUST  4            AVER WDM1  2103 PO4X     ENGL AGGR REPL
RCHRES  31 PLANK  PKST3  5            AVER WDM1  2104 ORGP     ENGL AGGR REPL
RCHRES  31 PLANK  PKST4  2            AVER WDM1  2105 TOTP     ENGL AGGR REPL
RCHRES  31 PLANK  PHYTO               AVER WDM1  2106 CHLA     ENGL AGGR REPL
RCHRES  31 PLANK  PKST3  6            AVER WDM1  2107 TOCX     ENGL AGGR REPL
RCHRES  31 OXRX   DOX                 AVER WDM1  2108 DOXX     ENGL AGGR REPL
RCHRES  31 OXRX   BOD                 AVER WDM1  2109 BODX     ENGL AGGR REPL
RCHRES  31 PLANK  TPKCF1 4            SUM  WDM1  2110 TNLD     ENGL AGGR REPL
RCHRES  31 PLANK  TPKCF1 5            SUM  WDM1  2111 TPLD     ENGL AGGR REPL
RCHRES  31 NUTRX  NUCF1  1            SUM  WDM1  2112 NO3L     ENGL AGGR REPL
RCHRES  31 NUTRX  NUCF1  2            SUM  WDM1  2239 NH3L     ENGL AGGR REPL
RCHRES  31 NUTRX  NUCF1  4            SUM  WDM1  2240 PO4L     ENGL AGGR REPL

*** WQ DSNS for Lateral 405 at S-405 ***
*** REACH 3 ***
RCHRES   3 NUTRX  DNUST  1            AVER WDM1  2113 NO3X     ENGL AGGR REPL
RCHRES   3 NUTRX  DNUST  2            AVER WDM1  2114 NH3X     ENGL AGGR REPL
RCHRES   3 PLANK  PKST3  4            AVER WDM1  2115 ORGN     ENGL AGGR REPL
RCHRES   3 PLANK  PKST4  1            AVER WDM1  2116 TOTN     ENGL AGGR REPL
RCHRES   3 NUTRX  DNUST  4            AVER WDM1  2117 PO4X     ENGL AGGR REPL
RCHRES   3 PLANK  PKST3  5            AVER WDM1  2118 ORGP     ENGL AGGR REPL
RCHRES   3 PLANK  PKST4  2            AVER WDM1  2119 TOTP     ENGL AGGR REPL
RCHRES   3 PLANK  PHYTO               AVER WDM1  2120 CHLA     ENGL AGGR REPL
RCHRES   3 PLANK  PKST3  6            AVER WDM1  2121 TOCX     ENGL AGGR REPL
RCHRES   3 OXRX   DOX                 AVER WDM1  2122 DOXX     ENGL AGGR REPL
RCHRES   3 OXRX   BOD                 AVER WDM1  2123 BODX     ENGL AGGR REPL
RCHRES   3 PLANK  TPKCF1 4            SUM  WDM1  2124 TNLD     ENGL AGGR REPL
RCHRES   3 PLANK  TPKCF1 5            SUM  WDM1  2125 TPLD     ENGL AGGR REPL
RCHRES   3 NUTRX  NUCF1  1            SUM  WDM1  2126 NO3L     ENGL AGGR REPL
RCHRES   3 NUTRX  NUCF1  2            SUM  WDM1  2241 NH3L     ENGL AGGR REPL
RCHRES   3 NUTRX  NUCF1  4            SUM  WDM1  2242 PO4L     ENGL AGGR REPL

*** WQ DSNS for Reedy Creek at I-4 ***
*** REACH 8 ***
RCHRES   8 NUTRX  DNUST  1            AVER WDM1  2127 NO3X     ENGL AGGR REPL
RCHRES   8 NUTRX  DNUST  2            AVER WDM1  2128 NH3X     ENGL AGGR REPL
RCHRES   8 PLANK  PKST3  4            AVER WDM1  2129 ORGN     ENGL AGGR REPL
RCHRES   8 PLANK  PKST4  1            AVER WDM1  2130 TOTN     ENGL AGGR REPL
RCHRES   8 NUTRX  DNUST  4            AVER WDM1  2131 PO4X     ENGL AGGR REPL
RCHRES   8 PLANK  PKST3  5            AVER WDM1  2132 ORGP     ENGL AGGR REPL
RCHRES   8 PLANK  PKST4  2            AVER WDM1  2133 TOTP     ENGL AGGR REPL
RCHRES   8 PLANK  PHYTO               AVER WDM1  2134 CHLA     ENGL AGGR REPL
RCHRES   8 PLANK  PKST3  6            AVER WDM1  2135 TOCX     ENGL AGGR REPL
RCHRES   8 OXRX   DOX                 AVER WDM1  2136 DOXX     ENGL AGGR REPL
RCHRES   8 OXRX   BOD                 AVER WDM1  2137 BODX     ENGL AGGR REPL
RCHRES   8 PLANK  TPKCF1 4            SUM  WDM1  2138 TNLD     ENGL AGGR REPL
RCHRES   8 PLANK  TPKCF1 5            SUM  WDM1  2139 TPLD     ENGL AGGR REPL
RCHRES   8 NUTRX  NUCF1  1            SUM  WDM1  2140 NO3L     ENGL AGGR REPL
RCHRES   8 NUTRX  NUCF1  2            SUM  WDM1  2243 NH3L     ENGL AGGR REPL
RCHRES   8 NUTRX  NUCF1  4            SUM  WDM1  2244 PO4L     ENGL AGGR REPL
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*** WQ DSNS for Bay Lake/Seven Seas ***
*** REACH 2 ***
RCHRES   2 NUTRX  DNUST  1            AVER WDM1  2141 NO3X     ENGL AGGR REPL
RCHRES   2 NUTRX  DNUST  2            AVER WDM1  2142 NH3X     ENGL AGGR REPL
RCHRES   2 PLANK  PKST3  4            AVER WDM1  2143 ORGN     ENGL AGGR REPL
RCHRES   2 PLANK  PKST4  1            AVER WDM1  2144 TOTN     ENGL AGGR REPL
RCHRES   2 NUTRX  DNUST  4            AVER WDM1  2145 PO4X     ENGL AGGR REPL
RCHRES   2 PLANK  PKST3  5            AVER WDM1  2146 ORGP     ENGL AGGR REPL
RCHRES   2 PLANK  PKST4  2            AVER WDM1  2147 TOTP     ENGL AGGR REPL
RCHRES   2 PLANK  PHYTO               AVER WDM1  2148 CHLA     ENGL AGGR REPL
RCHRES   2 PLANK  PKST3  6            AVER WDM1  2149 TOCX     ENGL AGGR REPL
RCHRES   2 OXRX   DOX                 AVER WDM1  2150 DOXX     ENGL AGGR REPL
RCHRES   2 OXRX   BOD                 AVER WDM1  2151 BODX     ENGL AGGR REPL
RCHRES   2 PLANK  TPKCF1 4            SUM  WDM1  2152 TNLD     ENGL AGGR REPL
RCHRES   2 PLANK  TPKCF1 5            SUM  WDM1  2153 TPLD     ENGL AGGR REPL
RCHRES   2 NUTRX  NUCF1  1            SUM  WDM1  2154 NO3L     ENGL AGGR REPL
RCHRES   2 NUTRX  NUCF1  2            SUM  WDM1  2245 NH3L     ENGL AGGR REPL
RCHRES   2 NUTRX  NUCF1  4            SUM  WDM1  2246 PO4L     ENGL AGGR REPL

*** WQ DSNS for Lake Mabel/South Lake
*** REACH 9 ***
RCHRES   9 NUTRX  DNUST  1            AVER WDM1  2155 NO3X     ENGL AGGR REPL
RCHRES   9 NUTRX  DNUST  2            AVER WDM1  2156 NH3X     ENGL AGGR REPL
RCHRES   9 PLANK  PKST3  4            AVER WDM1  2157 ORGN     ENGL AGGR REPL
RCHRES   9 PLANK  PKST4  1            AVER WDM1  2158 TOTN     ENGL AGGR REPL
RCHRES   9 NUTRX  DNUST  4            AVER WDM1  2159 PO4X     ENGL AGGR REPL
RCHRES   9 PLANK  PKST3  5            AVER WDM1  2160 ORGP     ENGL AGGR REPL
RCHRES   9 PLANK  PKST4  2            AVER WDM1  2161 TOTP     ENGL AGGR REPL
RCHRES   9 PLANK  PHYTO               AVER WDM1  2162 CHLA     ENGL AGGR REPL
RCHRES   9 PLANK  PKST3  6            AVER WDM1  2163 TOCX     ENGL AGGR REPL
RCHRES   9 OXRX   DOX                 AVER WDM1  2164 DOXX     ENGL AGGR REPL
RCHRES   9 OXRX   BOD                 AVER WDM1  2165 BODX     ENGL AGGR REPL
RCHRES   9 PLANK  TPKCF1 4            SUM  WDM1  2166 TNLD     ENGL AGGR REPL
RCHRES   9 PLANK  TPKCF1 5            SUM  WDM1  2167 TPLD     ENGL AGGR REPL
RCHRES   9 NUTRX  NUCF1  1            SUM  WDM1  2168 NO3L     ENGL AGGR REPL
RCHRES   9 NUTRX  NUCF1  2            SUM  WDM1  2247 NH3L     ENGL AGGR REPL
RCHRES   9 NUTRX  NUCF1  4            SUM  WDM1  2248 PO4L     ENGL AGGR REPL

*** WQ DSNS for Lower L-405 ***
*** REACH 6 ***
RCHRES   6 NUTRX  DNUST  1            AVER WDM1  2169 NO3X     ENGL AGGR REPL
RCHRES   6 NUTRX  DNUST  2            AVER WDM1  2170 NH3X     ENGL AGGR REPL
RCHRES   6 PLANK  PKST3  4            AVER WDM1  2171 ORGN     ENGL AGGR REPL
RCHRES   6 PLANK  PKST4  1            AVER WDM1  2172 TOTN     ENGL AGGR REPL
RCHRES   6 NUTRX  DNUST  4            AVER WDM1  2173 PO4X     ENGL AGGR REPL
RCHRES   6 PLANK  PKST3  5            AVER WDM1  2174 ORGP     ENGL AGGR REPL
RCHRES   6 PLANK  PKST4  2            AVER WDM1  2175 TOTP     ENGL AGGR REPL
RCHRES   6 PLANK  PHYTO               AVER WDM1  2176 CHLA     ENGL AGGR REPL
RCHRES   6 PLANK  PKST3  6            AVER WDM1  2177 TOCX     ENGL AGGR REPL
RCHRES   6 OXRX   DOX                 AVER WDM1  2178 DOXX     ENGL AGGR REPL
RCHRES   6 OXRX   BOD                 AVER WDM1  2179 BODX     ENGL AGGR REPL
RCHRES   6 PLANK  TPKCF1 4            SUM  WDM1  2180 TNLD     ENGL AGGR REPL
RCHRES   6 PLANK  TPKCF1 5            SUM  WDM1  2181 TPLD     ENGL AGGR REPL
RCHRES   6 NUTRX  NUCF1  1            SUM  WDM1  2182 NO3L     ENGL AGGR REPL
RCHRES   6 NUTRX  NUCF1  2            SUM  WDM1  2249 NH3L     ENGL AGGR REPL
RCHRES   6 NUTRX  NUCF1  4            SUM  WDM1  2250 PO4L     ENGL AGGR REPL
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*** WQ DSNS for L-103, Buena Vista ***
*** REACH 11 ***
RCHRES  11 NUTRX  DNUST  1            AVER WDM1  2183 NO3X     ENGL AGGR REPL
RCHRES  11 NUTRX  DNUST  2            AVER WDM1  2184 NH3X     ENGL AGGR REPL
RCHRES  11 PLANK  PKST3  4            AVER WDM1  2185 ORGN     ENGL AGGR REPL
RCHRES  11 PLANK  PKST4  1            AVER WDM1  2186 TOTN     ENGL AGGR REPL
RCHRES  11 NUTRX  DNUST  4            AVER WDM1  2187 PO4X     ENGL AGGR REPL
RCHRES  11 PLANK  PKST3  5            AVER WDM1  2188 ORGP     ENGL AGGR REPL
RCHRES  11 PLANK  PKST4  2            AVER WDM1  2189 TOTP     ENGL AGGR REPL
RCHRES  11 PLANK  PHYTO               AVER WDM1  2190 CHLA     ENGL AGGR REPL
RCHRES  11 PLANK  PKST3  6            AVER WDM1  2191 TOCX     ENGL AGGR REPL
RCHRES  11 OXRX   DOX                 AVER WDM1  2192 DOXX     ENGL AGGR REPL
RCHRES  11 OXRX   BOD                 AVER WDM1  2193 BODX     ENGL AGGR REPL
RCHRES  11 PLANK  TPKCF1 4            SUM  WDM1  2194 TNLD     ENGL AGGR REPL
RCHRES  11 PLANK  TPKCF1 5            SUM  WDM1  2195 TPLD     ENGL AGGR REPL
RCHRES  11 NUTRX  NUCF1  1            SUM  WDM1  2196 NO3L     ENGL AGGR REPL
RCHRES  11 NUTRX  NUCF1  2            SUM  WDM1  2251 NH3L     ENGL AGGR REPL
RCHRES  11 NUTRX  NUCF1  4            SUM  WDM1  2252 PO4L     ENGL AGGR REPL

*** WQ DSNS for L-105 ***
*** REACH 10 ***
RCHRES  10 NUTRX  DNUST  1            AVER WDM1  2197 NO3X     ENGL AGGR REPL
RCHRES  10 NUTRX  DNUST  2            AVER WDM1  2198 NH3X     ENGL AGGR REPL
RCHRES  10 PLANK  PKST3  4            AVER WDM1  2199 ORGN     ENGL AGGR REPL
RCHRES  10 PLANK  PKST4  1            AVER WDM1  2200 TOTN     ENGL AGGR REPL
RCHRES  10 NUTRX  DNUST  4            AVER WDM1  2201 PO4X     ENGL AGGR REPL
RCHRES  10 PLANK  PKST3  5            AVER WDM1  2202 ORGP     ENGL AGGR REPL
RCHRES  10 PLANK  PKST4  2            AVER WDM1  2203 TOTP     ENGL AGGR REPL
RCHRES  10 PLANK  PHYTO               AVER WDM1  2204 CHLA     ENGL AGGR REPL
RCHRES  10 PLANK  PKST3  6            AVER WDM1  2205 TOCX     ENGL AGGR REPL
RCHRES  10 OXRX   DOX                 AVER WDM1  2206 DOXX     ENGL AGGR REPL
RCHRES  10 OXRX   BOD                 AVER WDM1  2207 BODX     ENGL AGGR REPL
RCHRES  10 PLANK  TPKCF1 4            SUM  WDM1  2208 TNLD     ENGL AGGR REPL
RCHRES  10 PLANK  TPKCF1 5            SUM  WDM1  2209 TPLD     ENGL AGGR REPL
RCHRES  10 NUTRX  NUCF1  1            SUM  WDM1  2210 NO3L     ENGL AGGR REPL
RCHRES  10 NUTRX  NUCF1  2            SUM  WDM1  2253 NH3L     ENGL AGGR REPL
RCHRES  10 NUTRX  NUCF1  4            SUM  WDM1  2254 PO4L     ENGL AGGR REPL

*** WQ DSNS for L-403 - EPCOT ***
*** REACH 5 ***
RCHRES   5 NUTRX  DNUST  1            AVER WDM1  2211 NO3X     ENGL AGGR REPL
RCHRES   5 NUTRX  DNUST  2            AVER WDM1  2212 NH3X     ENGL AGGR REPL
RCHRES   5 PLANK  PKST3  4            AVER WDM1  2213 ORGN     ENGL AGGR REPL
RCHRES   5 PLANK  PKST4  1            AVER WDM1  2214 TOTN     ENGL AGGR REPL
RCHRES   5 NUTRX  DNUST  4            AVER WDM1  2215 PO4X     ENGL AGGR REPL
RCHRES   5 PLANK  PKST3  5            AVER WDM1  2216 ORGP     ENGL AGGR REPL
RCHRES   5 PLANK  PKST4  2            AVER WDM1  2217 TOTP     ENGL AGGR REPL
RCHRES   5 PLANK  PHYTO               AVER WDM1  2218 CHLA     ENGL AGGR REPL
RCHRES   5 PLANK  PKST3  6            AVER WDM1  2219 TOCX     ENGL AGGR REPL
RCHRES   5 OXRX   DOX                 AVER WDM1  2220 DOXX     ENGL AGGR REPL
RCHRES   5 OXRX   BOD                 AVER WDM1  2221 BODX     ENGL AGGR REPL
RCHRES   5 PLANK  TPKCF1 4            SUM  WDM1  2222 TNLD     ENGL AGGR REPL
RCHRES   5 PLANK  TPKCF1 5            SUM  WDM1  2223 TPLD     ENGL AGGR REPL
RCHRES   5 NUTRX  NUCF1  1            SUM  WDM1  2224 NO3L     ENGL AGGR REPL
RCHRES   5 NUTRX  NUCF1  2            SUM  WDM1  2255 NH3L     ENGL AGGR REPL
RCHRES   5 NUTRX  NUCF1  4            SUM  WDM1  2256 PO4L     ENGL AGGR REPL
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*** WQ DSNS for C-4 ***
*** REACH 4 ***
RCHRES   4 NUTRX  DNUST  1            AVER WDM1  2257 NO3X      ENGL AGGR REPL
RCHRES   4 NUTRX  DNUST  2            AVER WDM1  2258 NH3X      ENGL AGGR REPL
RCHRES   4 PLANK  PKST3  4            AVER WDM1  2259 ORGN      ENGL AGGR REPL
RCHRES   4 PLANK  PKST4  1            AVER WDM1  2260 TOTN      ENGL AGGR REPL
RCHRES   4 NUTRX  DNUST  4            AVER WDM1  2261 PO4X      ENGL AGGR REPL
RCHRES   4 PLANK  PKST3  5            AVER WDM1  2262 ORGP      ENGL AGGR REPL
RCHRES   4 PLANK  PKST4  2            AVER WDM1  2263 TOTP      ENGL AGGR REPL
RCHRES   4 PLANK  PHYTO               AVER WDM1  2264 CHLA      ENGL AGGR REPL
RCHRES   4 PLANK  PKST3  6            AVER WDM1  2265 TOCX      ENGL AGGR REPL
RCHRES   4 OXRX   DOX                 AVER WDM1  2266 DOXX      ENGL AGGR REPL
RCHRES   4 OXRX   BOD                 AVER WDM1  2267 BODX      ENGL AGGR REPL
RCHRES   4 PLANK  TPKCF1 4            SUM  WDM1  2268 TNLD      ENGL AGGR REPL
RCHRES   4 PLANK  TPKCF1 5            SUM  WDM1  2269 TPLD      ENGL AGGR REPL
RCHRES   4 NUTRX  NUCF1  1            SUM  WDM1  2270 NO3L      ENGL AGGR REPL
RCHRES   4 NUTRX  NUCF1  2            SUM  WDM1  2271 NH3L      ENGL AGGR REPL
RCHRES   4 NUTRX  NUCF1  4            SUM  WDM1  2272 PO4L      ENGL AGGR REPL

*** WQ DSNS for L-107/UPPER C-1 ***
*** REACH 12 ***
RCHRES  12 NUTRX  DNUST  1            AVER WDM1  2273 NO3X      ENGL AGGR REPL
RCHRES  12 NUTRX  DNUST  2            AVER WDM1  2274 NH3X      ENGL AGGR REPL
RCHRES  12 PLANK  PKST3  4            AVER WDM1  2275 ORGN      ENGL AGGR REPL
RCHRES  12 PLANK  PKST4  1            AVER WDM1  2276 TOTN      ENGL AGGR REPL
RCHRES  12 NUTRX  DNUST  4            AVER WDM1  2277 PO4X      ENGL AGGR REPL
RCHRES  12 PLANK  PKST3  5            AVER WDM1  2278 ORGP      ENGL AGGR REPL
RCHRES  12 PLANK  PKST4  2            AVER WDM1  2279 TOTP      ENGL AGGR REPL
RCHRES  12 PLANK  PHYTO               AVER WDM1  2280 CHLA      ENGL AGGR REPL
RCHRES  12 PLANK  PKST3  6            AVER WDM1  2281 TOCX      ENGL AGGR REPL
RCHRES  12 OXRX   DOX                 AVER WDM1  2282 DOXX      ENGL AGGR REPL
RCHRES  12 OXRX   BOD                 AVER WDM1  2283 BODX      ENGL AGGR REPL
RCHRES  12 PLANK  TPKCF1 4            SUM  WDM1  2284 TNLD      ENGL AGGR REPL
RCHRES  12 PLANK  TPKCF1 5            SUM  WDM1  2285 TPLD      ENGL AGGR REPL
RCHRES  12 NUTRX  NUCF1  1            SUM  WDM1  2286 NO3L      ENGL AGGR REPL
RCHRES  12 NUTRX  NUCF1  2            SUM  WDM1  2287 NH3L      ENGL AGGR REPL
RCHRES  12 NUTRX  NUCF1  4            SUM  WDM1  2288 PO4L      ENGL AGGR REPL

*** WQ DSNS for LOWER C-1 ***
*** REACH 14 ***
RCHRES  14 NUTRX  DNUST  1            AVER WDM1  2289 NO3X      ENGL AGGR REPL
RCHRES  14 NUTRX  DNUST  2            AVER WDM1  2290 NH3X      ENGL AGGR REPL
RCHRES  14 PLANK  PKST3  4            AVER WDM1  2291 ORGN      ENGL AGGR REPL
RCHRES  14 PLANK  PKST4  1            AVER WDM1  2292 TOTN      ENGL AGGR REPL
RCHRES  14 NUTRX  DNUST  4            AVER WDM1  2293 PO4X      ENGL AGGR REPL
RCHRES  14 PLANK  PKST3  5            AVER WDM1  2294 ORGP      ENGL AGGR REPL
RCHRES  14 PLANK  PKST4  2            AVER WDM1  2295 TOTP      ENGL AGGR REPL
RCHRES  14 PLANK  PHYTO               AVER WDM1  2296 CHLA      ENGL AGGR REPL
RCHRES  14 PLANK  PKST3  6            AVER WDM1  2297 TOCX      ENGL AGGR REPL
RCHRES  14 OXRX   DOX                 AVER WDM1  2298 DOXX      ENGL AGGR REPL
RCHRES  14 OXRX   BOD                 AVER WDM1  2299 BODX      ENGL AGGR REPL
RCHRES  14 PLANK  TPKCF1 4            SUM  WDM1  2300 TNLD      ENGL AGGR REPL
RCHRES  14 PLANK  TPKCF1 5            SUM  WDM1  2301 TPLD      ENGL AGGR REPL
RCHRES  14 NUTRX  NUCF1  1            SUM  WDM1  2302 NO3L      ENGL AGGR REPL
RCHRES  14 NUTRX  NUCF1  2            SUM  WDM1  2303 NH3L      ENGL AGGR REPL
RCHRES  14 NUTRX  NUCF1  4            SUM  WDM1  2304 PO4L      ENGL AGGR REPL
```

```
*** WHITTENHORSE CREEK
*** All acreage of segment 5 in Whittenhorse basin, i.e. area rch 51
RCHRES  51 HYDR   RO              1.0     WDM    411 FLOW     ENGL AGGR REPL
RCHRES  51 ROFLOW ROVOL      .00163049     WDM    418 SIMQ     ENGL AGGR REPL
COPY   102 OUTPUT MEAN   1   0.0001359     WDM    412 SURO     ENGL AGGR REPL
COPY   102 OUTPUT MEAN   2   0.0001359     WDM    413 IFWO     ENGL AGGR REPL
COPY   102 OUTPUT MEAN   3   0.0001359     WDM    414 AGWO     ENGL AGGR REPL
COPY   102 OUTPUT MEAN   4   0.0001359     WDM    419 PETX     ENGL AGGR REPL
COPY   102 OUTPUT MEAN   5   0.0001359     WDM    415 SAET     ENGL AGGR REPL
COPY   102 OUTPUT MEAN   6   0.0001359     WDM    416 UZSX     ENGL AGGR REPL
COPY   102 OUTPUT MEAN   7   0.0001359     WDM    417 LZSX     ENGL AGGR REPL

*** DAVENPORT CREEK
*** All acreage of segment 6 in Davenport basin, i.e. area rch 61
RCHRES  61 HYDR   RO              1.0     WDM    421 FLOW     ENGL AGGR REPL
RCHRES  61 ROFLOW ROVOL      .00116923     WDM    428 SIMQ     ENGL AGGR REPL
COPY   103 OUTPUT MEAN   1   0.0000974     WDM    422 SURO     ENGL AGGR REPL
COPY   103 OUTPUT MEAN   2   0.0000974     WDM    423 IFWO     ENGL AGGR REPL
COPY   103 OUTPUT MEAN   3   0.0000974     WDM    424 AGWO     ENGL AGGR REPL
COPY   103 OUTPUT MEAN   4   0.0000974     WDM    429 PETX     ENGL AGGR REPL
COPY   103 OUTPUT MEAN   5   0.0000974     WDM    425 SAET     ENGL AGGR REPL
COPY   103 OUTPUT MEAN   6   0.0000974     WDM    426 UZSX     ENGL AGGR REPL
COPY   103 OUTPUT MEAN   7   0.0000974     WDM    427 LZSX     ENGL AGGR REPL

*** REEDY CREEK @ HWY 192
*** Sum of areas rch 1, 2 (except half direct lake contrib area), rch 3-7
*** All segment 3
*** All Whittenhorse
RCHRES   7 HYDR   RO              1.0     WDM    431 FLOW     ENGL AGGR REPL
RCHRES   7 ROFLOW ROVOL      2.7686E-4     WDM    438 SIMQ     ENGL AGGR REPL
COPY   104 OUTPUT MEAN   1   2.3223E-5     WDM    432 SURO     ENGL AGGR REPL
COPY   104 OUTPUT MEAN   2   2.3223E-5     WDM    433 IFWO     ENGL AGGR REPL
COPY   104 OUTPUT MEAN   3   2.3223E-5     WDM    434 AGWO     ENGL AGGR REPL
COPY   104 OUTPUT MEAN   4   2.3223E-5     WDM    439 PETX     ENGL AGGR REPL
COPY   104 OUTPUT MEAN   5   2.3223E-5     WDM    435 SAET     ENGL AGGR REPL
COPY   104 OUTPUT MEAN   6   2.3223E-5     WDM    436 UZSX     ENGL AGGR REPL
COPY   104 OUTPUT MEAN   7   2.3223E-5     WDM    437 LZSX     ENGL AGGR REPL

*** BONNETT CREEK
*** Sum of areas rch 2 (except half direct lake contrib area), rch 9-13
*** All segment 2
RCHRES  13 HYDR   RO              1.0     WDM    441 FLOW     ENGL AGGR REPL
RCHRES  13 ROFLOW ROVOL      1.3820E-3     WDM    448 SIMQ     ENGL AGGR REPL
COPY   105 OUTPUT MEAN   1   1.1517E-4     WDM    442 SURO     ENGL AGGR REPL
COPY   105 OUTPUT MEAN   2   1.1517E-4     WDM    443 IFWO     ENGL AGGR REPL
COPY   105 OUTPUT MEAN   3   1.1517E-4     WDM    444 AGWO     ENGL AGGR REPL
COPY   105 OUTPUT MEAN   4   1.1517E-4     WDM    449 PETX     ENGL AGGR REPL
COPY   105 OUTPUT MEAN   5   1.1517E-4     WDM    445 SAET     ENGL AGGR REPL
COPY   105 OUTPUT MEAN   6   1.1517E-4     WDM    446 UZSX     ENGL AGGR REPL
COPY   105 OUTPUT MEAN   7   1.1517E-4     WDM    447 LZSX     ENGL AGGR REPL
```

```
*** REEDY CREEK @ LOUGHMAN
*** All segments 1-6
RCHRES  16 HYDR   RO              1.0     WDM    451 FLOW      ENGL AGGR REPL
RCHRES  16 ROFLOW ROVOL      1.5678E-4    WDM    458 SIMQ      ENGL AGGR REPL
COPY   106 OUTPUT MEAN   1   1.3065E-5    WDM    452 SURO      ENGL AGGR REPL
COPY   106 OUTPUT MEAN   2   1.3065E-5    WDM    453 IFWO      ENGL AGGR REPL
COPY   106 OUTPUT MEAN   3   1.3065E-5    WDM    454 AGWO      ENGL AGGR REPL
COPY   106 OUTPUT MEAN   4   1.3065E-5    WDM    459 PETX      ENGL AGGR REPL
COPY   106 OUTPUT MEAN   5   1.3065E-5    WDM    455 SAET      ENGL AGGR REPL
COPY   106 OUTPUT MEAN   6   1.3065E-5    WDM    456 UZSX      ENGL AGGR REPL
COPY   106 OUTPUT MEAN   7   1.3065E-5    WDM    457 LZSX      ENGL AGGR REPL

END EXT TARGETS

SCHEMATIC
<-Volume->                  <--Area-->     <-Volume->  <ML#> ***
<Name>   x                  <-factor->     <Name>   x        ***
*** Internal Basin
PERLND  11       ***             0.0     RCHRES   2      1
PERLND  12                      26.0     RCHRES   2      1
PERLND  13       ***             0.0     RCHRES   2      1
PERLND  14                       5.7     RCHRES   2      1
PERLND  15                       2.5     RCHRES   2      1
IMPLND  14                      12.5     RCHRES   2      2

PERLND  11                       3.7     RCHRES   3      1
PERLND  12                     679.6     RCHRES   3      1
PERLND  13                      84.9     RCHRES   3      1
PERLND  14                     596.0     RCHRES   3      1
PERLND  15                     936.6     RCHRES   3      1
IMPLND  14                     519.8     RCHRES   3      2

PERLND  11                     325.6     RCHRES   4      1
PERLND  12                      84.7     RCHRES   4      1
PERLND  13                     141.7     RCHRES   4      1
PERLND  14                     269.4     RCHRES   4      1
PERLND  16                     963.8     RCHRES   4      1
PERLND  19                      26.0     RCHRES   4      1
IMPLND  14                      76.8     RCHRES   4      2

PERLND  11       ***             0.0     RCHRES   5      1
PERLND  12                      47.6     RCHRES   5      1
PERLND  13                      74.1     RCHRES   5      1
PERLND  14                     177.4     RCHRES   5      1
PERLND  15                     236.0     RCHRES   5      1
IMPLND  14                     268.2     RCHRES   5      2

PERLND  11                     655.8     RCHRES   6      1
PERLND  12                     555.1     RCHRES   6      1
PERLND  13                    1501.6     RCHRES   6      1
PERLND  14                    1023.6     RCHRES   6      1
PERLND  16                    3735.1     RCHRES   6      1
IMPLND  14                     638.7     RCHRES   6      2
```

```
PERLND  11        ***              0.0     RCHRES   7      1
PERLND  12                       592.4     RCHRES   7      1
PERLND  13                       610.0     RCHRES   7      1
PERLND  14                        61.3     RCHRES   7      1
PERLND  15                      1822.9     RCHRES   7      1
IMPLND  14                        30.0     RCHRES   7      2

PERLND  11                       794.9     RCHRES   8      1
PERLND  12                       320.4     RCHRES   8      1
PERLND  13                       532.6     RCHRES   8      1
PERLND  14                        70.1     RCHRES   8      1
PERLND  18                      1697.9     RCHRES   8      1
IMPLND  14                        47.0     RCHRES   8      2

PERLND  11                       138.2     RCHRES   9      1
PERLND  12                        22.4     RCHRES   9      1
PERLND  13                       163.5     RCHRES   9      1
PERLND  14                       213.8     RCHRES   9      1
PERLND  15                       465.0     RCHRES   9      1
IMPLND  14                        61.8     RCHRES   9      2

PERLND  11        ***              0.0     RCHRES  10      1
PERLND  12                        16.5     RCHRES  10      1
PERLND  13                       116.1     RCHRES  10      1
PERLND  14                       243.5     RCHRES  10      1
PERLND  15                       424.8     RCHRES  10      1
IMPLND  14                        60.9     RCHRES  10      2

PERLND  11        ***              0.0     RCHRES  11      1
PERLND  12                       312.3     RCHRES  11      1
PERLND  13                        41.0     RCHRES  11      1
PERLND  14                       217.7     RCHRES  11      1
PERLND  15                       791.7     RCHRES  11      1
IMPLND  14                       773.5     RCHRES  11      2

PERLND  11                        70.3     RCHRES  12      1
PERLND  12                       390.3     RCHRES  12      1
PERLND  13                        92.5     RCHRES  12      1
PERLND  14                       141.8     RCHRES  12      1
PERLND  15                      1301.0     RCHRES  12      1
IMPLND  14                        52.2     RCHRES  12      2

PERLND  11        ***              0.0     RCHRES  13      1
PERLND  12                       282.7     RCHRES  13      1
PERLND  13                       950.5     RCHRES  13      1
PERLND  14                        84.8     RCHRES  13      1
PERLND  15                       874.0     RCHRES  13      1
IMPLND  14                       357.0     RCHRES  13      2

PERLND  11        ***              0.0     RCHRES  14      1
PERLND  12                       555.4     RCHRES  14      1
PERLND  13                      1228.0     RCHRES  14      1
PERLND  14                       119.4     RCHRES  14      1
PERLND  17                      2552.2     RCHRES  14      1
IMPLND  14                       101.7     RCHRES  14      2
```

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PERLND  11                      1320.7     RCHRES  15      1
PERLND  12                       120.3     RCHRES  15      1
PERLND  13                      1308.4     RCHRES  15      1
PERLND  14                        79.0     RCHRES  15      1
PERLND  18                      2966.1     RCHRES  15      1
IMPLND  14                        23.6     RCHRES  15      2

PERLND  11        ***              0.0     RCHRES  16      1
PERLND  12                       111.3     RCHRES  16      1
PERLND  13                       530.0     RCHRES  16      1
PERLND  14                        47.6     RCHRES  16      1
PERLND  18                      1133.6     RCHRES  16      1
IMPLND  14                        19.8     RCHRES  16      2

*** East Upper Reedy
PERLND  31                      2161.1     RCHRES  31      1
PERLND  32                       169.6     RCHRES  31      1
PERLND  33                      2306.1     RCHRES  31      1
PERLND  34                        64.4     RCHRES  31      1
PERLND  35                      2684.5     RCHRES  31      1
IMPLND  34                        30.3     RCHRES  31      2

*** West Upper Reedy
PERLND  31                      4002.0     RCHRES  41      1
PERLND  32                       215.9     RCHRES  41      1
PERLND  33                      3694.5     RCHRES  41      1
PERLND  34                       137.5     RCHRES  41      1
PERLND  35                      2240.7     RCHRES  41      1
PERLND  39                        31.6     RCHRES  41      1
IMPLND  34                        53.2     RCHRES  41      2

*** Whittenhorse
PERLND  51                      2118.5     RCHRES  51      1
PERLND  52                       184.2     RCHRES  51      1
PERLND  53                      1481.6     RCHRES  51      1
PERLND  54                       100.9     RCHRES  51      1
PERLND  55                      3400.0     RCHRES  51      1
PERLND  59                        28.1     RCHRES  51      1
IMPLND  54                        46.6     RCHRES  51      2

*** Davenport
PERLND  61                      4854.3     RCHRES  61      1
PERLND  62                       304.6     RCHRES  61      1
PERLND  63                      1704.5     RCHRES  61      1
PERLND  64                       385.4     RCHRES  61      1
PERLND  65                      2854.3     RCHRES  61      1
IMPLND  64                       160.1     RCHRES  61      2

*** Reach Connections
RCHRES  31                                 RCHRES   3      3
RCHRES  41                                 RCHRES   4      3
RCHRES  51                                 RCHRES   4      3
RCHRES   2                                 RCHRES   3      4
RCHRES   2                                 RCHRES  10      5
```

```
RCHRES   3                                RCHRES   6       3
RCHRES   4                                RCHRES   6       3
RCHRES   5                                RCHRES   6       3
RCHRES   6                                RCHRES   7       3
RCHRES   7                                RCHRES   8       3
RCHRES   8                                RCHRES  15       3
RCHRES   9                                RCHRES  12       3
RCHRES  10                                RCHRES  12       3
RCHRES  11                                RCHRES  13       3
RCHRES  12                                RCHRES  13       3
RCHRES  13                                RCHRES  14       3
RCHRES  14                                RCHRES  15       3
RCHRES  61                                RCHRES  15       3
RCHRES  15                                RCHRES  16       5

*** HSPEXP Datasets

*** Whittenhorse 02266200
*** All acreage of Segment 5
PERLND  51                      2118.5     COPY   102      90
PERLND  52                       184.2     COPY   102      90
PERLND  53                      1481.6     COPY   102      90
PERLND  54                       100.9     COPY   102      90
PERLND  55                      3400.0     COPY   102      90
PERLND  59                        28.1     COPY   102      90
IMPLND  54                        46.6     COPY   102      91

*** Davenport 02266480
*** All acreage of Segment 6
PERLND  61                      4854.3     COPY   103      90
PERLND  62                       304.6     COPY   103      90
PERLND  63                      1704.5     COPY   103      90
PERLND  64                       385.4     COPY   103      90
PERLND  65                      2854.3     COPY   103      90
IMPLND  64                       160.1     COPY   103      91

*** Reedy @ Hwy 192 02266300
*** sum areas rch 1, 2 (except half direct lake contrib area), 3-7
PERLND  11                       985.1     COPY   104      90
PERLND  12                      1972.3     COPY   104      90
PERLND  13                      2412.3     COPY   104      90
PERLND  14                      2130.5     COPY   104      90
PERLND  15                       937.8     COPY   104      90
PERLND  16                       965.0     COPY   104      90
PERLND  19                        26.0     COPY   104      90
IMPLND  14                      1539.8     COPY   104      91

*** all Segment 3
PERLND  31                      6163.1     COPY   104      90
PERLND  32                       385.5     COPY   104      90
PERLND  33                      6000.6     COPY   104      90
PERLND  34                       201.9     COPY   104      90
PERLND  35                      4925.3     COPY   104      90
PERLND  39                        31.6     COPY   104      90
IMPLND  34                        83.5     COPY   104      91
```

```
*** all Whittenhorse
PERLND  51                      2118.5     COPY   104     90
PERLND  52                       184.2     COPY   104     90
PERLND  53                      1481.6     COPY   104     90
PERLND  54                       100.9     COPY   104     90
PERLND  55                      3400.0     COPY   104     90
PERLND  59                        28.1     COPY   104     90
IMPLND  54                        46.6     COPY   104     91

*** Bonnett 02264100
*** sum areas rch 2 (half lake contrib area only), 9-13
PERLND  11                       208.5     COPY   105     90
PERLND  12                      1037.2     COPY   105     90
PERLND  13                      1363.6     COPY   105     90
PERLND  14                       904.4     COPY   105     90
PERLND  15                      3857.9     COPY   105     90
IMPLND  14                      1311.6     COPY   105     91

*** Reedy @ Loughman 02266500
*** all segment 1
PERLND  11                      3309.3     COPY   106     90
PERLND  12                      4116.9     COPY   106     90
PERLND  13                      7374.8     COPY   106     90
PERLND  14                      3350.9     COPY   106     90
PERLND  15                      6854.6     COPY   106     90
PERLND  16                      4698.9     COPY   106     90
PERLND  17                      2552.2     COPY   106     90
PERLND  18                      5797.5     COPY   106     90
PERLND  19                        26.0     COPY   106     90
IMPLND  14                      3043.6     COPY   106     91

*** all segment 3
PERLND  31                      6163.1     COPY   106     90
PERLND  32                       385.5     COPY   106     90
PERLND  33                      6000.6     COPY   106     90
PERLND  34                       201.9     COPY   106     90
PERLND  35                      4925.3     COPY   106     90
PERLND  39                        31.6     COPY   106     90
IMPLND  34                        83.5     COPY   106     91

*** all segment 5
PERLND  51                      2118.5     COPY   106     90
PERLND  52                       184.2     COPY   106     90
PERLND  53                      1481.6     COPY   106     90
PERLND  54                       100.9     COPY   106     90
PERLND  55                      3400.0     COPY   106     90
PERLND  59                        28.1     COPY   106     90
IMPLND  54                        46.6     COPY   106     91

*** All Segment 6
PERLND  61                      4854.3     COPY   106     90
PERLND  62                       304.6     COPY   106     90
PERLND  63                      1704.5     COPY   106     90
PERLND  64                       385.4     COPY   106     90
PERLND  65                      2854.3     COPY   106     90
IMPLND  64                       160.1     COPY   106     91
```

```
*** Total loadings report
*** all segment 1
PERLND  11                      3309.3     REPORT   1      8              1
PERLND  12                      4116.9     REPORT   1      8              2
PERLND  13                      7374.8     REPORT   1      8              3
PERLND  14                      3350.9     REPORT   1      8              4
PERLND  15                      6854.6     REPORT   1      8              5
PERLND  16                      4698.9     REPORT   1      8              5
PERLND  17                      2552.2     REPORT   1      8              5
PERLND  18                      5797.5     REPORT   1      8              5
PERLND  19                        26.0     REPORT   1      8              6
IMPLND  14                      3043.6     REPORT   1      9              7

*** all segment 3
PERLND  31                      6163.1     REPORT   3      8              1
PERLND  32                       385.5     REPORT   3      8              2
PERLND  33                      6000.6     REPORT   3      8              3
PERLND  34                       201.9     REPORT   3      8              4
PERLND  35                      4925.3     REPORT   3      8              5
PERLND  39                        31.6     REPORT   3      8              6
IMPLND  34                        83.5     REPORT   3      9              7

*** all segment 5
PERLND  51                      2118.5     REPORT   5      8              1
PERLND  52                       184.2     REPORT   5      8              2
PERLND  53                      1481.6     REPORT   5      8              3
PERLND  54                       100.9     REPORT   5      8              4
PERLND  55                      3400.0     REPORT   5      8              5
PERLND  59                        28.1     REPORT   5      8              6
IMPLND  54                        46.6     REPORT   5      9              7

*** all segment 6
PERLND  61                      4854.3     REPORT   6      8              1
PERLND  62                       304.6     REPORT   6      8              2
PERLND  63                      1704.5     REPORT   6      8              3
PERLND  64                       385.4     REPORT   6      8              4
PERLND  65                      2854.3     REPORT   6      8              5
IMPLND  64                       160.1     REPORT   6      9              7


*** Per acre loadings report ***
*** all segment 1
PERLND  11                                 REPORT  11      8              1
PERLND  12                                 REPORT  11      8              2
PERLND  13                                 REPORT  11      8              3
PERLND  14                                 REPORT  11      8              4
PERLND  15                       .3444     REPORT  11      8              5
PERLND  16                       .2361     REPORT  11      8              5
PERLND  17                       .1282     REPORT  11      8              5
PERLND  18                       .2913     REPORT  11      8              5
PERLND  19                                 REPORT  11      8              6
IMPLND  14                                 REPORT  11      9              7
```

```
*** all segment 3
PERLND  31                                 REPORT  13      8              1
PERLND  32                                 REPORT  13      8              2
PERLND  33                                 REPORT  13      8              3
PERLND  34                                 REPORT  13      8              4
PERLND  35                                 REPORT  13      8              5
PERLND  39                                 REPORT  13      8              6
IMPLND  34                                 REPORT  13      9              7

*** all segment 5
PERLND  51                                 REPORT  15      8              1
PERLND  52                                 REPORT  15      8              2
PERLND  53                                 REPORT  15      8              3
PERLND  54                                 REPORT  15      8              4
PERLND  55                                 REPORT  15      8              5
PERLND  59                                 REPORT  15      8              6
IMPLND  54                                 REPORT  15      9              7

*** all segment 6
PERLND  61                                 REPORT  16      8              1
PERLND  62                                 REPORT  16      8              2
PERLND  63                                 REPORT  16      8              3
PERLND  64                                 REPORT  16      8              4
PERLND  65                                 REPORT  16      8              5
IMPLND  64                                 REPORT  16      9              7


*** Percent loads report
*** all segment 1
PERLND  11                      3309.3     REPORT  21      8              1
PERLND  12                      4116.9     REPORT  21      8              2
PERLND  13                      7374.8     REPORT  21      8              3
PERLND  14                      3350.9     REPORT  21      8              4
PERLND  15                      6854.6     REPORT  21      8              5
PERLND  16                      4698.9     REPORT  21      8              5
PERLND  17                      2552.2     REPORT  21      8              5
PERLND  18                      5797.5     REPORT  21      8              5
PERLND  19                        26.0     REPORT  21      8              6
IMPLND  14                      3043.6     REPORT  21      9              7

*** all segment 3
PERLND  31                      6163.1     REPORT  23      8              1
PERLND  32                       385.5     REPORT  23      8              2
PERLND  33                      6000.6     REPORT  23      8              3
PERLND  34                       201.9     REPORT  23      8              4
PERLND  35                      4925.3     REPORT  23      8              5
PERLND  39                        31.6     REPORT  23      8              6
IMPLND  34                        83.5     REPORT  23      9              7

*** all segment 5
PERLND  51                      2118.5     REPORT  25      8              1
PERLND  52                       184.2     REPORT  25      8              2
PERLND  53                      1481.6     REPORT  25      8              3
PERLND  54                       100.9     REPORT  25      8              4
PERLND  55                      3400.0     REPORT  25      8              5
PERLND  59                        28.1     REPORT  25      8              6
IMPLND  54                        46.6     REPORT  25      9              7
```

```
*** all segment 6
PERLND  61                      4854.3     REPORT  26      8              1
PERLND  62                       304.6     REPORT  26      8              2
PERLND  63                      1704.5     REPORT  26      8              3
PERLND  64                       385.4     REPORT  26      8              4
PERLND  65                      2854.3     REPORT  26      8              5
IMPLND  64                       160.1     REPORT  26      9              7

RCHRES  31                                 REPORT 100     10              1
RCHRES  41                                 REPORT 100     10              2
RCHRES  51                                 REPORT 100     10              3
RCHRES  61                                 REPORT 100     10              4
RCHRES   2                                 REPORT 100     10              5
RCHRES   3                                 REPORT 100     10              6
RCHRES   4                                 REPORT 100     10              7
RCHRES   5                                 REPORT 100     10              8
RCHRES   6                                 REPORT 100     10              9
RCHRES   7                                 REPORT 100     10             10
RCHRES   8                                 REPORT 100     10             11
RCHRES   9                                 REPORT 100     10             12
RCHRES  10                                 REPORT 100     10             13
RCHRES  11                                 REPORT 100     10             14
RCHRES  12                                 REPORT 100     10             15
RCHRES  13                                 REPORT 100     10             16
RCHRES  14                                 REPORT 100     10             17
RCHRES  15                                 REPORT 100     10             18
RCHRES  16                                 REPORT 100     10             19

END SCHEMATIC

MASS-LINK
  MASS-LINK       10
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
RCHRES     OXRX   OXIF   1                 REPORT         INPUT  TIMSER 1
RCHRES     OXRX   OXCF3  1                 REPORT         INPUT  TIMSER 2
RCHRES     OXRX   OXCF3  2                 REPORT         INPUT  TIMSER 3
RCHRES     OXRX   OXCF3  3                 REPORT         INPUT  TIMSER 4
RCHRES     OXRX   OXCF3  4                 REPORT         INPUT  TIMSER 5
RCHRES     OXRX   OXCF3  5                 REPORT         INPUT  TIMSER 6
RCHRES     OXRX   OXIF   2                 REPORT         INPUT  TIMSER 7
RCHRES     OXRX   OXCF4  1                 REPORT         INPUT  TIMSER 8
RCHRES     OXRX   OXCF4  2                 REPORT         INPUT  TIMSER 9
RCHRES     OXRX   OXCF4  3                 REPORT         INPUT  TIMSER10
RCHRES     OXRX   OXCF4  4                 REPORT         INPUT  TIMSER11
RCHRES     OXRX   OXCF4  5                 REPORT         INPUT  TIMSER12
RCHRES     NUTRX  NUIF1  2                 REPORT         INPUT  TIMSER13
RCHRES     NUTRX  NUCF5  1                 REPORT         INPUT  TIMSER14
RCHRES     NUTRX  NUCF5  2                 REPORT         INPUT  TIMSER15
RCHRES     NUTRX  NUCF5  3                 REPORT         INPUT  TIMSER16
RCHRES     NUTRX  NUCF5  4                 REPORT         INPUT  TIMSER17
RCHRES     NUTRX  NUCF5  5                 REPORT         INPUT  TIMSER18
RCHRES     NUTRX  NUIF1  1                 REPORT         INPUT  TIMSER19
RCHRES     NUTRX  NUCF4  1                 REPORT         INPUT  TIMSER20
```

```
RCHRES     NUTRX  NUCF4  2                 REPORT         INPUT  TIMSER21
RCHRES     NUTRX  NUCF4  3                 REPORT         INPUT  TIMSER22
RCHRES     NUTRX  NUCF4  4                 REPORT         INPUT  TIMSER23
RCHRES     NUTRX  NUIF1  4                 REPORT         INPUT  TIMSER24
RCHRES     NUTRX  NUCF7  1                 REPORT         INPUT  TIMSER25
RCHRES     NUTRX  NUCF7  2                 REPORT         INPUT  TIMSER26
RCHRES     NUTRX  NUCF7  3                 REPORT         INPUT  TIMSER27
RCHRES     PLANK  PKIF   1                 REPORT         INPUT  TIMSER28
RCHRES     PLANK  PKCF5  1                 REPORT         INPUT  TIMSER29
RCHRES     PLANK  PKCF5  3                 REPORT         INPUT  TIMSER30
RCHRES     PLANK  PKCF5  4                 REPORT         INPUT  TIMSER31
RCHRES     PLANK  PKIF   3                 REPORT         INPUT  TIMSER32
RCHRES     PLANK  PKCF8  1                 REPORT         INPUT  TIMSER33
RCHRES     PLANK  PKCF8  2                 REPORT         INPUT  TIMSER34
RCHRES     PLANK  PKIF   4                 REPORT         INPUT  TIMSER35
RCHRES     PLANK  PKCF9  1                 REPORT         INPUT  TIMSER36
RCHRES     PLANK  PKCF9  2                 REPORT         INPUT  TIMSER37
RCHRES     PLANK  PKIF   5                 REPORT         INPUT  TIMSER38
RCHRES     PLANK  PKCF10 1                 REPORT         INPUT  TIMSER39
RCHRES     PLANK  PKCF10 2                 REPORT         INPUT  TIMSER40
  END MASS-LINK   10
  MASS-LINK        9
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
IMPLND     IQUAL  SOQUAL 1                 REPORT         INPUT  TIMSER 1
IMPLND     IQUAL  SOQUAL 2                 REPORT         INPUT  TIMSER 2
IMPLND     IQUAL  SOQUAL 4   0.0480        REPORT         INPUT  TIMSER 3
IMPLND     IQUAL  SOQUAL 1                 REPORT         INPUT  TIMSER 4
IMPLND     IQUAL  SOQUAL 2                 REPORT         INPUT  TIMSER 4
IMPLND     IQUAL  SOQUAL 4   0.0480        REPORT         INPUT  TIMSER 4
IMPLND     IQUAL  SOQUAL 3                 REPORT         INPUT  TIMSER 5
IMPLND     IQUAL  SOQUAL 4   0.0023        REPORT         INPUT  TIMSER 6
IMPLND     IQUAL  SOQUAL 3                 REPORT         INPUT  TIMSER 7
IMPLND     IQUAL  SOQUAL 4   0.0023        REPORT         INPUT  TIMSER 7
IMPLND     IQUAL  SOQUAL 4   0.400         REPORT         INPUT  TIMSER 8
IMPLND     IQUAL  SOQUAL 4   0.301         REPORT         INPUT  TIMSER 9
  END MASS-LINK    9
  MASS-LINK        8
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
PERLND     PQUAL  POQUAL 1                 REPORT         INPUT  TIMSER 1
PERLND     PQUAL  POQUAL 2                 REPORT         INPUT  TIMSER 2
PERLND     PQUAL  POQUAL 4   0.0480        REPORT         INPUT  TIMSER 3
PERLND     PQUAL  POQUAL 1                 REPORT         INPUT  TIMSER 4
PERLND     PQUAL  POQUAL 2                 REPORT         INPUT  TIMSER 4
PERLND     PQUAL  POQUAL 4   0.0480        REPORT         INPUT  TIMSER 4
PERLND     PQUAL  POQUAL 3                 REPORT         INPUT  TIMSER 5
PERLND     PQUAL  POQUAL 4   0.0023        REPORT         INPUT  TIMSER 6
PERLND     PQUAL  POQUAL 3                 REPORT         INPUT  TIMSER 7
PERLND     PQUAL  POQUAL 4   0.0023        REPORT         INPUT  TIMSER 7
PERLND     PQUAL  POQUAL 4   0.400         REPORT         INPUT  TIMSER 8
PERLND     PQUAL  POQUAL 4   0.301         REPORT         INPUT  TIMSER 9
  END MASS-LINK    8
```

```
  MASS-LINK        1
<-Volume-> <-Grp> <-Member-><--Mult--> Tran<-Target vols> <-Grp> <-Member->***
<Name>***         <Name> x x<-factor-> strg<Name>                <Name> x x
PERLND     PWATER PERO       0.0833333     RCHRES         INFLOW IVOL
PERLND     PWTGAS PODOXM                   RCHRES         INFLOW OXIF   1
PERLND     PQUAL  POQUAL 1                 RCHRES         INFLOW NUIF1  2
PERLND     PQUAL  POQUAL 2                 RCHRES         INFLOW NUIF1  1
PERLND     PQUAL  POQUAL 3                 RCHRES         INFLOW NUIF1  4
PERLND     PQUAL  POQUAL 4   0.40          RCHRES         INFLOW OXIF   2
PERLND     PQUAL  POQUAL 4   0.048         RCHRES         INFLOW PKIF   3
PERLND     PQUAL  POQUAL 4   0.0023        RCHRES         INFLOW PKIF   4
PERLND     PQUAL  POQUAL 4   0.301         RCHRES         INFLOW PKIF   5
  END MASS-LINK    1

  MASS-LINK        2
<-Volume-> <-Grp> <-Member-><--Mult--> Tran<-Target vols> <-Grp> <-Member->***
<Name>***         <Name> x x<-factor-> strg<Name>                <Name> x x
IMPLND     IWATER SURO       0.0833333     RCHRES         INFLOW IVOL
IMPLND     IWTGAS SODOXM                   RCHRES         INFLOW OXIF   1
IMPLND     IQUAL  SOQUAL 1                 RCHRES         INFLOW NUIF1  2
IMPLND     IQUAL  SOQUAL 2                 RCHRES         INFLOW NUIF1  1
IMPLND     IQUAL  SOQUAL 3                 RCHRES         INFLOW NUIF1  4
IMPLND     IQUAL  SOQUAL 4   0.40          RCHRES         INFLOW OXIF   2
IMPLND     IQUAL  SOQUAL 4   0.048         RCHRES         INFLOW PKIF   3
IMPLND     IQUAL  SOQUAL 4   0.0023        RCHRES         INFLOW PKIF   4
IMPLND     IQUAL  SOQUAL 4   0.301         RCHRES         INFLOW PKIF   5
  END MASS-LINK    2

  MASS-LINK        3
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
RCHRES     ROFLOW                          RCHRES         INFLOW
  END MASS-LINK    3

  MASS-LINK        4
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
RCHRES     OFLOW         1                 RCHRES         INFLOW
  END MASS-LINK    4

  MASS-LINK        5
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
RCHRES     OFLOW         2                 RCHRES         INFLOW
  END MASS-LINK    5

  MASS-LINK        6
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
RCHRES     OFLOW         3                 RCHRES         INFLOW
  END MASS-LINK    6

  MASS-LINK        7
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
RCHRES     OFLOW         4                 RCHRES         INFLOW
  END MASS-LINK    7
```

```
  MASS-LINK       90
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
PERLND     PWATER SURO                     COPY           INPUT  MEAN   1
PERLND     PWATER IFWO                     COPY           INPUT  MEAN   2
PERLND     PWATER AGWO                     COPY           INPUT  MEAN   3
PERLND     PWATER PET                      COPY           INPUT  MEAN   4
PERLND     PWATER TAET                     COPY           INPUT  MEAN   5
PERLND     PWATER UZS                      COPY           INPUT  MEAN   6
PERLND     PWATER LZS                      COPY           INPUT  MEAN   7
  END MASS-LINK   90

  MASS-LINK       91
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
IMPLND     IWATER SURO                     COPY           INPUT  MEAN   1
IMPLND     IWATER PET                      COPY           INPUT  MEAN   4
IMPLND     IWATER IMPEV                    COPY           INPUT  MEAN   5
  END MASS-LINK   91
END MASS-LINK

FTABLES
  FTABLE      2
   14    5
     DEPTH      AREA    VOLUME    DISCH1    DISCH2 ***
      (FT)   (ACRES)   (AC-FT)     (CFS)     (CFS) ***
       0.0       0.0       0.0         0         0
       1.0       2.1       0.7         0         0
       6.0       8.2      29.9         0         0
      10.0      36.9     123.3         0         0
      14.0     124.6     408.1         0         0
      18.0     332.5    1054.3         0         0
      22.0     411.2    2424.5         0         0
      26.0     466.4    4185.8         0         0
      30.0     524.2    6178.6         0         0
      31.0     527.1    6702.8         0         0
      32.0     569.8    7229.9         0         0
      33.0     583.5    7745.6     52.00    208.01
      34.0     596.5    8266.5    104.52    418.08
      35.0     611.5    8788.3    157.14    628.55
  END FTABLE  2

  FTABLE      3
   15    4
     DEPTH      AREA    VOLUME     DISCH ***
      (FT)   (ACRES)   (AC-FT)     (CFS) ***
      0.00       0.0       0.0       0.0
      0.74      25.1      17.1      13.6
      1.48      29.0      37.0      44.7
      2.21      32.9      59.9      91.3
      2.95      36.8      85.6     153.6
      3.69      40.7     114.2     231.9
      4.43      44.6     145.6     327.0
      5.90      52.4     217.2     570.9
```

```
    7.38      60.2     300.2     892.0
    8.85      68.0     394.8     1297.
   11.80     635.5    1432.5     3104.
   14.75    1203.1    4144.4     7550.
   17.70    1770.6    8530.5    16025.
   20.65    2338.1   14590.8    29680.
   23.60    2905.6   22325.3    49543.
END FTABLE  3

FTABLE      4
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    1.00       2.3       1.9       0.2
    2.00       3.2       4.6       0.9
    3.00       4.1       8.2       1.9
    4.00       4.9      12.7       3.5
    5.00       5.8      18.1       5.6
    6.00       6.7      24.4       8.3
    8.00       8.5      39.5      15.9
   10.00      10.2      58.2      26.6
   12.00      12.0      80.4      40.9
   16.00     306.5     717.4     123.2
   20.00     601.0    2532.4     367.5
   24.00     895.5    5525.4     863.3
   28.00    1190.0    9696.5     1685.
   32.00    1484.5   15045.6     2898.
END FTABLE  4

FTABLE      5
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    1.33      14.3      17.6     128.9
    2.67      16.7      38.3     423.1
    4.00      19.0      62.1     863.4
    5.33      21.4      89.0     1451.
    6.67      23.7     119.1     2190.
    8.00      26.0     152.2     3090.
   10.67      30.7     227.9     5399.
   13.33      35.4     316.1     8445.
   16.00      40.1     416.8    12294.
   21.33     660.3    2284.6    26168.
   26.67    1280.6    7460.3    50366.
   32.00    1900.8   15944.0    89001.
   37.33    2521.0   27735.5   145505.
   42.67    3141.3   42835.0   222956.
END FTABLE  5
```

```
FTABLE      6
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    0.57      11.5       6.2       5.9
    1.13      12.7      13.0      19.1
    1.70      13.9      20.5      38.4
    2.27      15.1      28.7      63.4
    2.83      16.2      37.6      94.3
    3.40      17.4      47.1     131.0
    4.53      19.8      68.2     222.4
    5.67      22.2      92.0     339.0
    6.80      24.5     118.5     482.3
    9.07     220.8     396.5     997.8
   11.33     417.0    1119.4     1973.
   13.60     613.3    2287.1     3616.
   15.87     809.5    3899.7     6102.
   18.13    1005.8    5957.0     9584.
END FTABLE  6

FTABLE      7
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    0.38     269.6      98.3      56.7
    0.77     296.0     206.7     184.0
    1.15     322.3     325.2     369.9
    1.53     348.7     453.8     611.7
    1.92     375.0     592.6     909.0
    2.30     401.4     741.4     1262.
    3.07     454.1    1069.3     2140.
    3.83     506.8    1437.7     3258.
    4.60     559.5    1846.4     4629.
    6.13     666.1    2786.1     8807.
    7.67     772.7    3889.2    14237.
    9.20     879.3    5155.6    20997.
   10.73     985.8    6585.5    29160.
   12.27    1092.4    8178.9    38800.
END FTABLE  7

FTABLE      8
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    0.54      87.7      42.1      14.4
    1.08     107.6      95.0      48.7
    1.63     127.5     158.7     102.4
    2.17     147.4     233.1     176.5
    2.71     167.3     318.4     272.6
    3.25     187.2     414.4     392.5
    4.33     227.1     638.8     710.0
    5.42     266.9     906.4     1142.
```

```
    6.50     306.7    1217.1     1701.
    8.67     495.7    2086.4     3614.
   10.83     684.7    3365.2     6436.
   13.00     873.8    5053.6    10376.
   15.17    1062.8    7151.5    15616.
   17.33    1251.8    9658.9    22317.
END FTABLE  8

FTABLE      9
 10    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
       0         0         0         0
    0.01   406.641         0         0
       1   421.107   445.873         0
       2   435.720   896.251         0
       3   450.332  1346.628         0
       4   464.945  1797.005         0
       5   479.557  2247.382         0
       6   494.170  2697.760         0
       7   508.783  3148.137     227.1
       8   523.395  3598.514     454.1
END FTABLE  9

FTABLE     10
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    1.71       2.9       3.5       8.1
    3.42       4.4       9.8      32.4
    5.13       6.0      18.7      77.7
    6.83       7.6      30.3     148.3
    8.54       9.2      44.6     248.7
   10.25      10.7      61.6     382.6
   13.67      13.9     103.6     765.8
   17.08      17.0     156.4     1326.
   20.50      20.2     219.9     2089.
   27.33     439.0    1788.9     6256.
   34.17     857.9    6220.1    17971.
   41.00    1276.8   13513.7    41312.
   47.83    1695.7   23669.6    79656.
   54.67    2114.5   36687.8   136014.
END FTABLE 10

FTABLE     11
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    1.00       4.4       3.6       7.8
    2.00       6.0       8.8      28.0
    3.00       7.6      15.6      61.6
    4.00       9.2      24.0     110.6
    5.00      10.8      34.0     177.0
```

```
     6.00      12.4      45.6     262.6
     8.00      15.6      73.5     498.6
    10.00      18.7     107.8     832.1
    12.00      21.9     148.5     1276.
    16.00     425.9    1044.0     3792.
    20.00     829.8    3555.3    11204.
    24.00    1233.8    7682.5    26215.
    28.00    1637.7   13425.4    51062.
    32.00    2041.7   20784.1    87738.
  END FTABLE 11

  FTABLE     12
   15    4
    DEPTH      AREA    VOLUME     DISCH ***
     (FT)   (ACRES)   (AC-FT)     (CFS) ***
     0.00       0.0       0.0       0.0
     1.27      14.6      14.7      16.8
     2.54      20.6      37.2      62.0
     3.81      26.7      67.2     139.9
     5.08      32.7     104.9     256.1
     6.35      38.7     150.3     415.9
     7.63      44.8     203.4     624.3
    10.17      56.8     332.5     1206.
    12.71      68.9     492.2     2039.
    15.25      80.9     682.5     3155.
    20.33    1269.2    4114.1    10265.
    25.42    2457.5   13586.3    32999.
    30.50    3645.9   29099.1    80174.
    35.58    4834.2   50652.5   159080.
    40.67    6022.5   78246.5   276217.
  END FTABLE 12

  FTABLE     13
   15    4
    DEPTH      AREA    VOLUME     DISCH ***
     (FT)   (ACRES)   (AC-FT)     (CFS) ***
     0.00       0.0       0.0       0.0
     1.35      13.8      17.3      50.0
     2.70      15.8      37.3     163.9
     4.05      17.9      60.0     333.2
     5.40      19.9      85.5     557.7
     6.75      21.9     113.7     838.8
     8.10      23.9     144.6     1179.
    10.80      28.0     214.7     2045.
    13.50      32.0     295.7     3179.
    16.20      36.1     387.7     4603.
    21.60     479.3    1779.2    10436.
    27.00     922.5    5564.1    23326.
    32.40    1365.7   11742.4    46807.
    37.80    1809.0   20314.2    83810.
    43.20    2252.2   31279.3   136949.
  END FTABLE 13
```

```
FTABLE     14
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    1.32      28.0      34.8      76.0
    2.64      31.5      74.1     247.0
    3.96      34.9     117.9     498.1
    5.28      38.3     166.2     827.0
    6.60      41.7     219.1     1234.
    7.92      45.2     276.5     1721.
   10.57      52.0     404.9     2947.
   13.21      58.9     551.4     4527.
   15.85      65.7     716.0     6486.
   21.13     891.3    3244.2    14395.
   26.42    1716.9   10134.2    31869.
   31.70    2542.5   21386.0    63733.
   36.98    3368.0   36999.5   113983.
   42.27    4193.6   56974.8   186187.
END FTABLE 14

FTABLE     15
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    0.88     229.4     176.5     107.8
    1.76     286.8     403.4     368.7
    2.64     344.1     680.7     780.9
    3.52     401.5    1008.5     1357.
    4.40     458.8    1386.6     2110.
    5.28     516.2    1815.2     3057.
    7.03     630.9    2823.7     5585.
    8.79     745.6    4033.9     9054.
   10.55     860.3    5445.7    13572.
   14.07    1206.1    9079.1    28863.
   17.58    1551.8   13928.4    50439.
   21.10    1897.6   19993.6    79279.
   24.62    2243.3   27274.7   116247.
   28.13    2589.1   35771.7   162147.
END FTABLE 15

FTABLE     16
 16    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00      0.00       0.0       0.0
    0.01      1.49       0.1       0.0
    0.23      1.72       0.2      0.14
    0.73      2.34      0.82      0.41
    1.23      3.18      2.34      1.11
    1.73      4.33      4.63      3.05
    2.23      5.89      7.69      8.34
    2.73      8.01      11.5      22.8
    3.23      10.9      16.1      62.4
```

```
    3.73      14.8      21.5     170.6
    4.23      20.1      27.7     466.6
    4.73      27.4      34.6     1276.
    5.23      37.2      42.3     3491.
    5.73      50.6      50.7     9550.
    6.23      68.9      60.0    26121.
    6.73      93.7      70.0    71450.
END FTABLE 16

FTABLE     31
 10    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    0.01     600.0       3.0       0.0
    1.00     612.4     603.2       0.0
    2.00     625.1    1221.9       0.0
    3.00     637.9    1853.5       0.0
    4.00     650.9    2497.8       0.0
    5.00     663.9    3155.2       0.0
    6.00     677.1    3825.7       0.0
    7.00     690.4    4509.5     446.6
    8.00     703.9    5206.7     901.9
END FTABLE 31

FTABLE     41
 10    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    0.01     435.8       2.2       0.0
    1.00     446.4     438.8       0.0
    2.00     457.2     890.6       0.0
    3.00     468.2    1353.3       0.0
    4.00     479.2    1827.0       0.0
    5.00     490.5    2311.9       0.0
    6.00     501.8    2808.0       0.0
    7.00     513.3    3315.6     331.5
    8.00     524.9    3834.7     670.5
END FTABLE 41

FTABLE     51
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
     0.0    820.00      0.00       0.0
     0.5    830.00    412.50       0.0
     1.0    840.00    830.00       0.0
     1.5    850.00   1252.50       0.0
     2.0    860.00   1680.00       0.0
     2.5    870.14   2112.54       0.1
     3.0    880.28   2550.14       4.0
     3.5    890.42   2992.82      17.0
     4.0    900.57   3440.56      60.0
     4.5    910.60   3893.36     280.0
```

```
       5.0    920.60   4351.16    1000.0
       5.5    930.60   4813.96    4500.0
       6.0    940.60   5281.76   17000.0
       6.5    950.60   5754.56   75000.0
       7.0    960.60   6232.36  250000.0
  END FTABLE 51

  FTABLE     61
   22    4
     DEPTH      AREA    VOLUME     DISCH ***
      (FT)   (ACRES)   (AC-FT)     (CFS) ***
       0.0      61.6       0.0       0.0
       0.2    104.67     16.63      1.00
       0.4    146.76     41.77      1.80
       1.0    272.92    167.68      6.90
       1.5    377.94    330.39      13.0
       2.0    482.87    545.60      21.0
       2.5    587.74    813.25      37.0
       3.0    692.54   1133.32      53.0
       3.5    797.29   1505.78      79.0
       4.0    902.00   1930.60     140.0
       4.5   1006.66   2407.76     220.0
       5.0   1111.19   2937.23     350.0
       5.5   1283.64   3535.94     725.0
       6.0   1456.06   4220.86    1100.0
       6.5   1628.46   4992.00    2000.0
       7.0   1800.83   5849.32    2600.0
       7.5   1973.18   6792.82    4800.0
       8.0   2145.52   7822.50    7000.0
       8.5   2317.83   8938.33   13000.0
       9.0   2490.13  10140.32   19000.0
       9.5   2662.41  11428.46   29500.0
      10.0   2834.68  12802.73   40000.0
  END FTABLE 61
END FTABLES

END RUN
```

Appendix E

APPENDIX E

User control input file for simulating future land use with the Hydrological Simulation Program-Fortran

```
-------------------- FLUSE08.uci--------------------***
RUN

GLOBAL
 Reedy Creek, Orange and Osceola Counties, Florida
  START       1990  1  1  0  0  END    1995 12 31 24  0
  RUN INTERP OUTPUT LEVEL    4    1
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<type>  <fun>***<------------fname--------------------------------------------->
MESSU      25   FLUSE08.ech
WDM        27   reedy.wdm
           90   FLUSE08.out
           91   FLUSE08.totrept1.out
           93   FLUSE08.totrept3.out
           95   FLUSE08.totrept5.out
           96   FLUSE08.totrept6.out
           81   FLUSE08.acrrept1.out
           83   FLUSE08.acrrept3.out
           85   FLUSE08.acrrept5.out
           86   FLUSE08.acrrept6.out
           71   FLUSE08.pctrept1.out
           73   FLUSE08.pctrept3.out
           75   FLUSE08.pctrept5.out
           76   FLUSE08.pctrept6.out
           51   FLUSE08.rchflux.out
END FILES

OPN SEQUENCE
    INGRP              INDELT  1: 0
      PERLND      31
      PERLND      32
      PERLND      33
      PERLND      34
      PERLND      39
      PERLND      35
      IMPLND      34
      RCHRES      31
      RCHRES      41

      PERLND      51
      PERLND      52
      PERLND      53
      PERLND      54
      PERLND      55
      PERLND      59
      IMPLND      54
      RCHRES      51
      COPY       102
```

```
      PERLND      61
      PERLND      62
      PERLND      63
      PERLND      64
      PERLND      65
      IMPLND      64
      RCHRES      61
      COPY       103

      PERLND      11
      PERLND      12
      PERLND      13
      PERLND      14
      PERLND      15
      PERLND      16
      PERLND      17
      PERLND      18
      PERLND      19
      IMPLND      14
      RCHRES       2
      RCHRES       3
      RCHRES       4
      RCHRES       5
      RCHRES       6
      RCHRES       7
      RCHRES       8
      RCHRES       9
      RCHRES      10
      RCHRES      11
      RCHRES      12
      RCHRES      13
      RCHRES      14
      RCHRES      15
      RCHRES      16
      REPORT       1
      REPORT       3
      REPORT       5
      REPORT       6
      REPORT      11
      REPORT      13
      REPORT      15
      REPORT      16
      REPORT      21
      REPORT      23
      REPORT      25
      REPORT      26
      REPORT     100
      COPY       104
      COPY       105
      COPY       106
      COPY         1
      COPY         2
      COPY         3
      COPY         4
END OPN SEQUENCE
```

```
REPORT
  REPORT-FLAGS
  Rept-opn***
*** x -  x REPT NCON NSRC FORM CWID PWID PLIN PCOD  PYR
    1        91    9    7    2   12 1000 1000    5   12
    3        93    9    7    2   12 1000 1000    5   12
    5        95    9    7    2   12 1000 1000    5   12
    6        96    9    7    2   12 1000 1000    5   12
   11        81    9    7    1   12 1000 1000    5   12
   13        83    9    7    1   12 1000 1000    5   12
   15        85    9    7    1   12 1000 1000    5   12
   16        86    9    7    1   12 1000 1000    5   12
   21        71    9    7    2   12 1000 1000    5   12
   23        73    9    7    2   12 1000 1000    5   12
   25        75    9    7    2   12 1000 1000    5   12
   26        76    9    7    2   12 1000 1000    5   12
  100        51   40   19    1   12 1000 1000    5   12
  END REPORT-FLAGS
  REPORT-TITLE
  Rept-opn***
*** x -  x<--------------------------title--------------------------->
    1     Land Surface total-loads
    3     Land Surface total-loads
    5     Land Surface total-loads
    6     Land Surface total-loads
   11     Land Surface total-loads
   13     Land Surface total-loads
   15     Land Surface total-loads
   16     Land Surface total-loads
   21     Land Surface total-loads
   23     Land Surface total-loads
   25     Land Surface total-loads
   26     Land Surface total-loads
  100     Instream Process Fluxes
  END REPORT-TITLE
  REPORT-SRC
  Rept-opn***
*** x -  x<---source-name---->
    1     Agric
    1     Forest
    1     Range
    1     Urban P
    1     Wetland
    1     RIBs
    1     Impervious
    3     Agric
    3     Forest
    3     Range
    3     Urban P
    3     Wetland
    3     RIBs
    3     Impervious
    5     Agric
    5     Forest
    5     Range
```

```
   5     Urban P
   5     Wetland
   5     RIBs
   5     Impervious
   6     Agric
   6     Forest
   6     Range
   6     Urban P
   6     Wetland
   6     RIBs
   6     Impervious
  11     Agric
  11     Forest
  11     Range
  11     Urban P
  11     Wetland
  11     RIBs
  11     Impervious
  13     Agric
  13     Forest
  13     Range
  13     Urban P
  13     Wetland
  13     RIBs
  13     Impervious
  15     Agric
  15     Forest
  15     Range
  15     Urban P
  15     Wetland
  15     RIBs
  15     Impervious
  16     Agric
  16     Forest
  16     Range
  16     Urban P
  16     Wetland
  16     RIBs
  16     Impervious
  21     Agric
  21     Forest
  21     Range
  21     Urban P
  21     Wetland
  21     RIBs
  21     Impervious
  23     Agric
  23     Forest
  23     Range
  23     Urban P
  23     Wetland
  23     RIBs
  23     Impervious
  25     Agric
  25     Forest
```

```
    25     Range
    25     Urban P
    25     Wetland
    25     RIBs
    25     Impervious
    26     Agric
    26     Forest
    26     Range
    26     Urban P
    26     Wetland
    26     RIBs
    26     Impervious
   100     Rch 31
   100     Rch 41
   100     Rch 51
   100     Rch 61
   100     Rch  2
   100     Rch  3
   100     Rch  4
   100     Rch  5
   100     Rch  6
   100     Rch  7
   100     Rch  8
   100     Rch  9
   100     Rch 10
   100     Rch 11
   100     Rch 12
   100     Rch 13
   100     Rch 14
   100     Rch 15
   100     Rch 16
  END REPORT-SRC
  REPORT-CON
  Rept-opn***
*** x -  x<-----con-name-----> TRAN SIGD DECP
    1     NH3                  SUM     5    3
    1     NO3                  SUM     5    3
    1     Organic N            SUM     5    3
    1     Total N              SUM     5    3
    1     PO4                  SUM     5    3
    1     Organic P            SUM     5    3
    1     Total P              SUM     5    3
    1     BOD                  SUM     5    3
    1     TOC                  SUM     5    3
    3     NH3                  SUM     5    3
    3     NO3                  SUM     5    3
    3     Organic N            SUM     5    3
    3     Total N              SUM     5    3
    3     PO4                  SUM     5    3
    3     Organic P            SUM     5    3
    3     Total P              SUM     5    3
    3     BOD                  SUM     5    3
    3     TOC                  SUM     5    3
    5     NH3                  SUM     5    3
    5     NO3                  SUM     5    3
```

```
 5     Organic N            SUM     5    3
 5     Total N              SUM     5    3
 5     PO4                  SUM     5    3
 5     Organic P            SUM     5    3
 5     Total P              SUM     5    3
 5     BOD                  SUM     5    3
 5     TOC                  SUM     5    3
 6     NH3                  SUM     5    3
 6     NO3                  SUM     5    3
 6     Organic N            SUM     5    3
 6     Total N              SUM     5    3
 6     PO4                  SUM     5    3
 6     Organic P            SUM     5    3
 6     Total P              SUM     5    3
 6     BOD                  SUM     5    3
 6     TOC                  SUM     5    3
11     NH3                  SUM     5    3
11     NO3                  SUM     5    3
11     Organic N            SUM     5    3
11     Total N              SUM     5    3
11     PO4                  SUM     5    3
11     Organic P            SUM     5    3
11     Total P              SUM     5    3
11     BOD                  SUM     5    3
11     TOC                  SUM     5    3
13     NH3                  SUM     5    3
13     NO3                  SUM     5    3
13     Organic N            SUM     5    3
13     Total N              SUM     5    3
13     PO4                  SUM     5    3
13     Organic P            SUM     5    3
13     Total P              SUM     5    3
13     BOD                  SUM     5    3
13     TOC                  SUM     5    3
15     NH3                  SUM     5    3
15     NO3                  SUM     5    3
15     Organic N            SUM     5    3
15     Total N              SUM     5    3
15     PO4                  SUM     5    3
15     Organic P            SUM     5    3
15     Total P              SUM     5    3
15     BOD                  SUM     5    3
15     TOC                  SUM     5    3
16     NH3                  SUM     5    3
16     NO3                  SUM     5    3
16     Organic N            SUM     5    3
16     Total N              SUM     5    3
16     PO4                  SUM     5    3
16     Organic P            SUM     5    3
16     Total P              SUM     5    3
16     BOD                  SUM     5    3
16     TOC                  SUM     5    3
21     NH3                  SUM     5    3
21     NO3                  SUM     5    3
21     Organic N            SUM     5    3
```

```
 21     Total N             SUM     5    3
 21     PO4                 SUM     5    3
 21     Organic P           SUM     5    3
 21     Total P             SUM     5    3
 21     BOD                 SUM     5    3
 21     TOC                 SUM     5    3
 23     NH3                 SUM     5    3
 23     NO3                 SUM     5    3
 23     Organic N           SUM     5    3
 23     Total N             SUM     5    3
 23     PO4                 SUM     5    3
 23     Organic P           SUM     5    3
 23     Total P             SUM     5    3
 23     BOD                 SUM     5    3
 23     TOC                 SUM     5    3
 25     NH3                 SUM     5    3
 25     NO3                 SUM     5    3
 25     Organic N           SUM     5    3
 25     Total N             SUM     5    3
 25     PO4                 SUM     5    3
 25     Organic P           SUM     5    3
 25     Total P             SUM     5    3
 25     BOD                 SUM     5    3
 25     TOC                 SUM     5    3
 26     NH3                 SUM     5    3
 26     NO3                 SUM     5    3
 26     Organic N           SUM     5    3
 26     Total N             SUM     5    3
 26     PO4                 SUM     5    3
 26     Organic P           SUM     5    3
 26     Total P             SUM     5    3
 26     BOD                 SUM     5    3
 26     TOC                 SUM     5    3
100     DO-Inflow           SUM     4    2
100     DO-Reaeration       SUM     4    2
100     DO-BOD Decay        SUM     4    2
100     DO-Benthal demand   SUM     4    2
100     DO-Nitrification    SUM     4    2
100     DO-Phyto. growth    SUM     4    2
100     BOD-Inflow          SUM     4    2
100     BOD-Decay           SUM     4    2
100     BOD-Benthal release SUM     4    2
100     BOD-Sink            SUM     4    2
100     BOD-Denitrification SUM     4    2
100     BOD-Phyto. death    SUM     4    2
100     NH3-Inflow          SUM     4    2
100     NH3-Nitrification   SUM     4    2
100     NH3-Volatilization  SUM     4    2
100     NH3-Benthal release SUM     4    2
100     NH3-BOD Decay       SUM     4    2
100     NH3-Phyto. growth   SUM     4    2
100     NO3-Inflow          SUM     4    2
100     NO3-Nitrification   SUM     4    2
100     NO3-Denitrification SUM     4    2
100     NO3-BOD Decay       SUM     4    2
```

```
  100     NO3-Phyto. growth    SUM     4    2
  100     PO4-Inflow           SUM     4    2
  100     PO4-Benthal release  SUM     4    2
  100     PO4-BOD Decay        SUM     4    2
  100     PO4-Phyto. growth    SUM     4    2
  100     PHY-Inflow           SUM     4    2
  100     PHY-Sink             SUM     4    2
  100     PHY-Death            SUM     4    2
  100     PHY-Growth           SUM     4    2
  100     ORN-Inflow           SUM     4    2
  100     ORN-Sink             SUM     4    2
  100     ORN-Phyto. death     SUM     4    2
  100     ORP-Inflow           SUM     4    2
  100     ORP-Sink             SUM     4    2
  100     ORP-Phyto. death     SUM     4    2
  100     ORC-Inflow           SUM     4    2
  100     ORC-Sink             SUM     4    2
  100     ORC-Phyto. death     SUM     4    2
  END REPORT-CON

  REPORT-SUMM
  Rept-opn***
*** x -  x<--src-sum-header--> STRN <--tim-sum-header--> TTRN STTR
    1           Total Load     SUM  Average              AVER    1
    3           Total Load     SUM  Average              AVER    1
    5           Total Load     SUM  Average              AVER    1
    6           Total Load     SUM  Average              AVER    1
   11        Per acre Load     SUM  Average              AVER    1
   13        Per acre Load     SUM  Average              AVER    1
   15        Per acre Load     SUM  Average              AVER    1
   16        Per acre Load     SUM  Average              AVER    1
   21         Percent Load     PCT  Average              AVER    1
   23         Percent Load     PCT  Average              AVER    1
   25         Percent Load     PCT  Average              AVER    1
   26         Percent Load     PCT  Average              AVER    1
  100                          SUM  Average              AVER    1
  END REPORT-SUMM
END REPORT

PERLND

  ACTIVITY
    <PLS >              Active Sections                              ***
    x -   x ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   11   65    1         1         1    1    1
  END ACTIVITY

  PRINT-INFO
     <PLS> ********************* Print-flags ************************* PIVL  PYR
    x -   x ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC *********
   11   65    5         5         5    5    5                                 12
  END PRINT-INFO
```

```
  GEN-INFO
    <PLS >      Name                  Unit-systems   Printer***
    x -  x                                t-series Engl Metr***
                                           in  out          ***
   11     AGRICULTURE- CENTRAL              1    1   90
   12     FOREST- CENTRAL                   1    1   90
   13     RANGELAND                         1    1   90
   14     URBAN                             1    1   90
   15     WETLAND                           1    1   90
   16     WETLAND-AQ Q RCH 4,6              1    1   90
   17     WETLAND-AQ Q RCH 14               1    1   90
   18     WETLAND-AQ Q 8,15,16              1    1   90
   19     RIBS                              1    1   90
   31     AGRICULTURE- UPPER RC             1    1   90
   32     FOREST                            1    1   90
   33     RANGELAND                         1    1   90
   34     URBAN                             1    1   90
   35     WETLAND                           1    1   90
   39     RIBS                              1    1   90
   51     AGRICULTURE- WHIT                 1    1   90
   52     FOREST                            1    1   90
   53     RANGELAND                         1    1   90
   54     URBAN                             1    1   90
   55     WETLAND                           1    1   90
   59     RIBS                              1    1   90
   61     AGRICULTURE- DAV                  1    1   90
   62     FOREST                            1    1   90
   63     RANGELAND                         1    1   90
   64     URBAN                             1    1   90
   65     WETLAND                           1    1   90
  END GEN-INFO

  PWAT-PARM1
*** <PLS >                   Flags
*** x -  x CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE IFFC  HWT
   11         0    1    1    0    0    0    0    0    1    0    0
   12         0    1    1    0    0    0    0    0    1    0    0
   13         0    1    1    0    0    0    0    0    1    0    0
   14         0    1    1    0    0    0    0    0    1    0    0
   15         0    1    1    0    0    0    0    0    1    0    0
   16         0    1    1    0    0    0    0    0    1    0    0
   17         0    1    1    0    0    0    0    0    1    0    0
   18         0    1    1    0    0    0    0    0    1    0    0
   19         0    1    1    0    0    0    0    0    0    0    0
   31         0    1    1    0    0    0    0    0    1    0    0
   32         0    1    1    0    0    0    0    0    1    0    0
   33         0    1    1    0    0    0    0    0    1    0    0
   34         0    1    1    0    0    0    0    0    1    0    0
   35         0    1    1    0    0    0    0    0    1    0    0
   39         0    1    1    0    0    0    0    0    0    0    0
   51         0    1    1    0    0    0    0    0    1    0    0
   52         0    1    1    0    0    0    0    0    1    0    0
   53         0    1    1    0    0    0    0    0    1    0    0
   54         0    1    1    0    0    0    0    0    1    0    0
   55         0    1    1    0    0    0    0    0    1    0    0
```

```
   59         0    1    1    0    0    0    0    0    0    0    0
   61         0    1    1    0    0    0    0    0    1    0    0
   62         0    1    1    0    0    0    0    0    1    0    0
   63         0    1    1    0    0    0    0    0    1    0    0
   64         0    1    1    0    0    0    0    0    1    0    0
   65         0    1    1    0    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
***  <PLS>    FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
***  x - x                (in)   (in/hr)      (ft)   (ft/ft)    (1/in)   (1/day)
   11           0.0     2.000     0.100    1252.9     0.008     0.000     0.970
   12           0.0     2.000     0.250     855.2     0.005     0.000     0.970
   13           0.0     2.000     0.250    1182.0     0.011     0.000     0.970
   14           0.0     2.000     0.070    1144.8     0.007     0.000     0.970
   15           0.0     1.500     0.250     943.8     0.004     0.000     0.970
   16           0.0     1.500     0.250     943.8     0.004     0.000     0.970
   17           0.0     1.500     0.250     943.8     0.004     0.000     0.970
   18           0.0     1.500     0.250     943.8     0.004     0.000     0.970
   19           0.0     2.000     0.250     100.0     0.001     0.000     0.970
   31           0.0     2.000     0.200     795.3     0.014     0.000     0.970
   32           0.0     2.000     0.250    1372.0     0.028     0.000     0.970
   33           0.0     2.000     0.250    1147.1     0.020     0.000     0.970
   34           0.0     2.000     0.070    1223.6     0.016     0.000     0.970
   35           0.0     1.500     0.250     690.7     0.004     0.000     0.970
   39           0.0     2.000     0.250     100.0     0.001     0.000     0.970
   51           0.0     2.000     0.200     481.9     0.013     0.000     0.970
   52           0.0     2.000     0.250     433.0     0.026     0.000     0.970
   53           0.0     2.000     0.250    1937.8     0.028     0.000     0.970
   54           0.0     2.000     0.070    1311.2     0.031     0.000     0.970
   55           0.0     1.500     0.250     510.7     0.004     0.000     0.970
   59           0.0     2.000     0.250     100.0     0.001     0.000     0.970
   61           0.0     2.000     0.100     792.0     0.016     0.000     0.970
   62           0.0     2.000     0.250     318.6     0.016     0.000     0.970
   63           0.0     2.000     0.250     847.8     0.015     0.000     0.970
   64           0.0     2.000     0.070     642.1     0.010     0.000     0.970
   65           0.0     1.500     0.250     662.2     0.005     0.000     0.970
  END PWAT-PARM2

  PWAT-PARM3
***  <PLS>    PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
***  x - x   (deg F)   (deg F)
   11          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   12          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   13          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   14          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   15          40.0      35.0       2.0       2.0     0.400     0.000     0.100
   16          40.0      35.0       2.0       2.0     0.400     0.000     0.100
   17          40.0      35.0       2.0       2.0     0.400     0.000     0.100
   18          40.0      35.0       2.0       2.0     0.400     0.000     0.100
   19          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   31          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   32          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   33          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   34          40.0      35.0       2.0       2.0     0.500     0.000     0.000
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   35          40.0      35.0       2.0       2.0     0.400     0.000     0.100
   39          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   51          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   52          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   53          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   54          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   55          40.0      35.0       2.0       2.0     0.400     0.000     0.100
   59          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   61          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   62          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   63          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   64          40.0      35.0       2.0       2.0     0.500     0.000     0.000
   65          40.0      35.0       2.0       2.0     0.400     0.000     0.100
  END PWAT-PARM3

  PWAT-PARM4
*** <PLS >     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP
*** x -  x      (in)      (in)                       (1/day)
   11          0.080     0.200      0.20     0.500     0.800     0.600
   12          0.100     0.560      0.35     0.600     0.800     0.600
   13          0.050     0.320      0.15     0.500     0.800     0.600
   14          0.050     0.320      0.10     0.500     0.800     0.600
   15          0.200     0.350      0.35     0.700     0.800     0.600
   16          0.200     0.350      0.35     0.700     0.800     0.600
   17          0.200     0.350      0.35     0.700     0.800     0.600
   18          0.200     0.350      0.35     0.700     0.800     0.600
   19          0.000     0.700      0.10     0.600     0.800     0.500
   31          0.080     0.200      0.20     1.000     0.900     0.600
   32          0.100     0.560      0.35     1.000     0.900     0.600
   33          0.050     0.320      0.15     1.000     0.900     0.600
   34          0.050     0.320      0.10     1.000     0.900     0.600
   35          0.200     0.350      0.35     1.000     0.900     0.600
   39          0.000     0.700      0.10     1.000     0.900     0.500
   51          0.080     0.200      0.20     1.000     0.900     0.600
   52          0.100     0.560      0.35     1.000     0.900     0.600
   53          0.050     0.320      0.15     1.000     0.900     0.600
   54          0.050     0.320      0.10     1.000     0.900     0.600
   55          0.200     0.350      0.35     1.000     0.900     0.600
   59          0.000     0.700      0.10     1.000     0.900     0.500
   61          0.080     0.200      0.20     0.500     0.800     0.600
   62          0.100     0.560      0.35     0.600     0.800     0.600
   63          0.050     0.320      0.15     0.500     0.800     0.600
   64          0.050     0.320      0.10     0.500     0.800     0.600
   65          0.200     0.350      0.35     0.700     0.800     0.600
  END PWAT-PARM4

  MON-LZETPARM
*** <PLS >  Lower zone evapotransp parameter at start of each month
   11        .1   .2   .8   .8   .8   .8   .8   .8   .8   .8   .6   .1
   12        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   13        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   14        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   15        .5   .6   .8   .8   .8   .8   .8   .8   .8   .8   .6   .5
   16        .5   .6   .8   .8   .8   .8   .8   .8   .8   .8   .6   .5
   17        .5   .6   .8   .8   .8   .8   .8   .8   .8   .8   .6   .5
   18        .5   .6   .8   .8   .8   .8   .8   .8   .8   .8   .6   .5
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   31        .1   .2   .8   .8   .8   .8   .8   .8   .8   .8   .6   .1
   32        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   33        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   34        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   35        .5   .6   .8   .8   .8   .8   .8   .8   .8   .8   .6   .5
   51        .1   .2   .8   .8   .8   .8   .8   .8   .8   .8   .6   .1
   52        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   53        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   54        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   55        .5   .6   .8   .8   .8   .8   .8   .8   .8   .8   .6   .5
   61        .1   .2   .8   .8   .8   .8   .8   .8   .8   .8   .6   .1
   62        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   63        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   64        .2   .3   .8   .8   .8   .8   .8   .8   .8   .8   .6   .2
   65        .5   .6   .8   .8   .8   .8   .8   .8   .8   .8   .6   .5
  END MON-LZETPARM

  PWAT-STATE1
***  <PLS>  PWATER state variables (in)
***  x - x      CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   11            0.0       0.0     0.408     0.001      3.21     0.712       0.0
   12            0.0       0.0     0.778     0.001      3.09     0.704       0.0
   13            0.0       0.0     0.407     0.001      2.95     0.734       0.0
   14            0.0       0.0     0.405     0.001      2.74      0.49       0.0
   15            0.0       0.0     0.582     0.001      2.35     0.749       0.0
   16            0.0       0.0     0.582     0.001      2.35     0.749       0.0
   17            0.0       0.0     0.582     0.001      2.35     0.749       0.0
   18            0.0       0.0     0.582     0.001      2.35     0.749       0.0
   19            0.0       0.0     0.703     0.001       2.6     0.974       0.0
   31            0.0       0.0     0.401     0.001      3.38     0.818       0.0
   32            0.0       0.0     0.886     0.001      3.28     0.683       0.0
   33            0.0       0.0     0.407     0.001         3     0.715       0.0
   34            0.0       0.0     0.514     0.001      2.84     0.455       0.0
   35            0.0       0.0     0.661     0.001      2.55     0.721       0.0
   39            0.0       0.0     0.724     0.001      2.68     1.013       0.0
   51            0.0       0.0      0.04     0.001      1.70      0.18       0.0
   52            0.0       0.0      0.03     0.001      0.40      0.09       0.0
   53            0.0       0.0      0.01     0.001      0.33      0.09       0.0
   54            0.0       0.0      0.01     0.001      0.37      0.07       0.0
   55            0.0       0.0      0.02     0.001      0.32      0.02       0.0
   59            0.0       0.0      0.02     0.001      0.81      0.17       0.0
   61            0.0       0.0     0.407     0.001      3.20     0.707       0.0
   62            0.0       0.0     0.858     0.001      3.19     0.785       0.0
   63            0.0       0.0     0.442     0.001      3.03     0.825       0.0
   64            0.0       0.0     0.502     0.001      2.75     0.489       0.0
   65            0.0       0.0     0.618     0.001      2.45     0.861       0.0
  END PWAT-STATE1
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  PSTEMP-PARM1
*** <PLS >  Flags for section PSTEMP
*** x -  x SLTV ULTV LGTV TSOP
   11         1    1    1    1
   12         1    1    1    1
   13         1    1    1    1
   14         1    1    1    1
   15         1    1    1    1
   16         1    1    1    1
   17         1    1    1    1
   18         1    1    1    1
   19         1    1    1    1
   31         1    1    1    1
   32         1    1    1    1
   33         1    1    1    1
   34         1    1    1    1
   35         1    1    1    1
   39         1    1    1    1
   51         1    1    1    1
   52         1    1    1    1
   53         1    1    1    1
   54         1    1    1    1
   55         1    1    1    1
   59         1    1    1    1
   61         1    1    1    1
   62         1    1    1    1
   63         1    1    1    1
   64         1    1    1    1
   65         1    1    1    1
  END PSTEMP-PARM1

  PSTEMP-PARM2
*** <PLS >      ASLT      BSLT     ULTP1     ULTP2     LGTP1     LGTP2
*** x -  x   (deg F)   (degF/F             (degF/F             (deg F)
   11           32.0      1.00      32.0       1.0      60.8
   12           32.0      1.00      32.0       1.0      60.8
   13           32.0      1.00      32.0       1.0      60.8
   14           32.0      1.00      32.0       1.0      60.8
   15           32.0      1.00      32.0       1.0      60.8
   16           32.0      1.00      32.0       1.0      60.8
   17           32.0      1.00      32.0       1.0      60.8
   18           32.0      1.00      32.0       1.0      60.8
   19           32.0      1.00      32.0       1.0      60.8
   31           32.0      1.00      32.0       1.0      60.8
   32           32.0      1.00      32.0       1.0      60.8
   33           32.0      1.00      32.0       1.0      60.8
   34           32.0      1.00      32.0       1.0      60.8
   35           32.0      1.00      32.0       1.0      60.8
   39           32.0      1.00      32.0       1.0      60.8
   51           32.0      1.00      32.0       1.0      60.8
   52           32.0      1.00      32.0       1.0      60.8
   53           32.0      1.00      32.0       1.0      60.8
   54           32.0      1.00      32.0       1.0      60.8
   55           32.0      1.00      32.0       1.0      60.8
   59           32.0      1.00      32.0       1.0      60.8
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   61           32.0      1.00      32.0       1.0      60.8
   62           32.0      1.00      32.0       1.0      60.8
   63           32.0      1.00      32.0       1.0      60.8
   64           32.0      1.00      32.0       1.0      60.8
   65           32.0      1.00      32.0       1.0      60.8
  END PSTEMP-PARM2

  MON-ASLT
*** <PLS >  Value of ASLT at start of each month (deg F)
*** x -  x  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC
   11      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0
   12      33.0 33.0 35.0 41.0 52.0 54.0 55.0 55.0 53.0 47.0 40.0 35.0
   13      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0
   14      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   15      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   16      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   17      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   18      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   19      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0

   31      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0
   32      33.0 33.0 35.0 41.0 52.0 54.0 55.0 55.0 53.0 47.0 40.0 35.0
   33      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0
   34      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   35      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   39      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0

   51      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0
   52      33.0 33.0 35.0 41.0 52.0 54.0 55.0 55.0 53.0 47.0 40.0 35.0
   53      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0
   54      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   55      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   59      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0

   61      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0
   62      33.0 33.0 35.0 41.0 52.0 54.0 55.0 55.0 53.0 47.0 40.0 35.0
   63      29.0 29.0 30.0 34.0 54.0 60.0 60.0 60.0 58.0 40.0 35.0 30.0
   64      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
   65      30.0 30.0 32.0 38.0 52.0 57.0 58.0 57.0 55.0 42.0 36.0 32.0
  END MON-ASLT

  MON-BSLT
*** <PLS >  Value of BSLT at start of each month (deg F/F)
*** x -  x  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC
   11       .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60
   12       0.4  .40  .42  .50  .55  .60  .60  .60  .60  .55  .45  .42
   13       .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60
   14       0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   15       0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   16       0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   17       0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   18       0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   19       .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60
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   31       .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60
   32       0.4  .40  .42  .50  .55  .60  .60  .60  .60  .55  .45  .42
   33       .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60
   34       0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   35       0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   39       .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60

   51       .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60
   52       0.4  .40  .42  .50  .55  .60  .60  .60  .60  .55  .45  .42
   53       .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60
   54       0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   55       0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   59       .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60

   61       .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60
   62       0.4  .40  .42  .50  .55  .60  .60  .60  .60  .55  .45  .42
   63       .55  .55  .65  .70  .80  .80  .80  .75  .70  .65  .60  .60
   64       0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
   65       0.5  .50  .55  .65  .75  .75  .75  .75  .70  .65  .60  .55
  END MON-BSLT

  MON-ULTP1
*** <PLS >  Value of ULTP1 at start of each month in deg F (TSOPFG=1)
*** x -  x  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC
   11      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0
   12      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   13      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0
   14      35.0 35.0 36.0 39.0 43.0 48.0 50.0 50.0 50.0 44.0 38.0 36.0
   15      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   16      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   17      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   18      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   19      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0

   31      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0
   32      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   33      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0
   34      35.0 35.0 36.0 39.0 43.0 48.0 50.0 50.0 50.0 44.0 38.0 36.0
   35      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   39      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0

   51      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0
   52      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   53      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0
   54      35.0 35.0 36.0 39.0 43.0 48.0 50.0 50.0 50.0 44.0 38.0 36.0
   55      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   59      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0

   61      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0
   62      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
   63      34.0 34.0 35.0 37.0 42.0 52.0 54.0 54.0 52.0 43.0 37.0 35.0
   64      35.0 35.0 36.0 39.0 43.0 48.0 50.0 50.0 50.0 44.0 38.0 36.0
   65      36.0 36.0 37.0 40.0 45.0 48.0 48.0 48.0 48.0 45.0 40.0 38.0
  END MON-ULTP1
```

```
  MON-ULTP2
*** <PLS >  Value of ULTP2 at start of each month in Deg F/F (TSOPFG=1)
*** x -  x  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC
   11       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35
   12       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   13       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35
   14       .25  .25  0.3  .40  0.5  .60  .65  .65  .65  .55  .45  .30
   15       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   16       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   17       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   18       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   19       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35

   31       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35
   32       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   33       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35
   34       .25  .25  0.3  .40  0.5  .60  .65  .65  .65  .55  .45  .30
   35       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   39       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35

   51       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35
   52       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   53       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35
   54       .25  .25  0.3  .40  0.5  .60  .65  .65  .65  .55  .45  .30
   55       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   59       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35

   61       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35
   62       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
   63       0.3  0.3  .35  .45  .55  .65  0.7  0.7  0.7  .65  .55  .35
   64       .25  .25  0.3  .40  0.5  .60  .65  .65  .65  .55  .45  .30
   65       .22  .22  .25  .40  0.5  .55  .55  .55  .55  .50  .45  .25
  END MON-ULTP2

  MON-LGTP1
*** <PLS >  Value of LGTP1 at start of each month in Deg F (TSOPFG=1)
*** x -  x  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC

   11      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
   12      38.0 38.0 38.0 43.0 50.0 55.0 61.0 63.0 62.0 60.0 50.0 40.0
   13      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
   14      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
   15      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
   16      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
   17      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
   18      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
   19      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0

   31      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
   32      38.0 38.0 38.0 43.0 50.0 55.0 61.0 63.0 62.0 60.0 50.0 40.0
   33      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
   34      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
   35      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
   39      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
```

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  51      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
  52      38.0 38.0 38.0 43.0 50.0 55.0 61.0 63.0 62.0 60.0 50.0 40.0
  53      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
  54      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
  55      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
  59      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0

  61      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
  62      38.0 38.0 38.0 43.0 50.0 55.0 61.0 63.0 62.0 60.0 50.0 40.0
  63      35.0 35.0 35.0 40.0 52.0 58.0 67.0 69.0 68.0 62.0 42.0 35.0
  64      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
  65      38.0 38.0 38.0 42.0 50.0 62.0 66.0 67.0 65.0 55.0 45.0 40.0
 END MON-LGTP1

 PSTEMP-TEMPS
<PLS> Initial Conditions for Section PSTEMP ***
   #    #     AIRTC     SLTMP     ULTMP     LGTMP  ***
   1   65      56.0      56.0      56.0      68.0
 END PSTEMP-TEMPS

 PWT-PARM1
<PLS> Flags for Section PWTGAS ***
   #    #  IDV  ICV  GDV  GCV  ***
  11         1    0    1    0
  12         1    0    1    0
  13         1    0    1    0
  14         1    0    1    0
  15         1    0    1    0
  16         1    0    1    0
  17         1    0    1    0
  18         1    0    1    0
  19         1    0    1    0
  31         1    0    1    0
  32         1    0    1    0
  33         1    0    1    0
  34         1    0    1    0
  35         1    0    1    0
  39         1    0    1    0
  51         1    0    1    0
  52         1    0    1    0
  53         1    0    1    0
  54         1    0    1    0
  55         1    0    1    0
  59         1    0    1    0
  61         1    0    1    0
  62         1    0    1    0
  63         1    0    1    0
  64         1    0    1    0
  65         1    0    1    0
 END PWT-PARM1
```

```
PWT-PARM2
  #    #      ELEV     IDOXP     ICO2P     ADOXP     ACO2P  ***
 11          80.00         6      0.00         4      0.00
 12          80.00         6      0.00         4      0.00
 13          80.00         6      0.00         4      0.00
 14          80.00         6      0.00         4      0.00
 15          80.00         6      0.00         4      0.00
 16          80.00         6      0.00         4      0.00
 17          80.00         6      0.00         4      0.00
 18          80.00         6      0.00         4      0.00
 19          80.00         6      0.00         4      0.00
 31         120.00         6      0.00         4      0.00
 32         120.00         6      0.00         4      0.00
 33         120.00         6      0.00         4      0.00
 34         120.00         6      0.00         4      0.00
 35         120.00         6      0.00         4      0.00
 39         120.00         6      0.00         4      0.00
 51         110.00         6      0.00         4      0.00
 52         110.00         6      0.00         4      0.00
 53         110.00         6      0.00         4      0.00
 54         110.00         6      0.00         4      0.00
 55         110.00         6      0.00         4      0.00
 59         110.00         6      0.00         4      0.00
 61         100.00         6      0.00         4      0.00
 62         100.00         6      0.00         4      0.00
 63         100.00         6      0.00         4      0.00
 64         100.00         6      0.00         4      0.00
 65         100.00         6      0.00         4      0.00
END PWT-PARM2

MON-IFWDOX
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11   65  8.0  8.0  7.5  7.0  6.5  6.0  6.0  6.0  6.5  7.0  7.5  8.0
END MON-IFWDOX

MON-GRNDDOX
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11   65  6.0  6.0  5.5  5.0  4.0  4.0  4.0  4.0  4.5  5.0  5.5  6.0
END MON-GRNDDOX

PWT-GASES
  #    #     SODOX     SOCO2     IODOX     IOCO2     AODOX     AOCO2  ***
  1   65      10.0       0.0       8.0       0.0       6.0       0.0
END PWT-GASES

NQUALS
*** NQAL - NH3, NO2+NO3, ORTHO P, AND BOD ***
  #    # NQAL  ***
  1   65    4
END NQUALS
```

```
PQL-AD-FLAGS
           Atmospheric Deposition Flags ***
  <PLS >  QUAL1  QUAL2  QUAL3  QUAL4  ***
  # -  #   F  C   F  C   F  C   F  C  ***
 11       -1  0  -1  0   0  0   0  0
 12       -1  0  -1  0   0  0   0  0
 13       -1  0  -1  0   0  0   0  0
 14       -1  0  -1  0   0  0   0  0
 15       -1  0  -1  0   0  0   0  0
 16       -1  0  -1  0   0  0   0  0
 17       -1  0  -1  0   0  0   0  0
 18       -1  0  -1  0   0  0   0  0
 19       -1  0  -1  0   0  0   0  0
 31       -1  0  -1  0   0  0   0  0
 32       -1  0  -1  0   0  0   0  0
 33       -1  0  -1  0   0  0   0  0
 34       -1  0  -1  0   0  0   0  0
 35       -1  0  -1  0   0  0   0  0
 39       -1  0  -1  0   0  0   0  0
 51       -1  0  -1  0   0  0   0  0
 52       -1  0  -1  0   0  0   0  0
 53       -1  0  -1  0   0  0   0  0
 54       -1  0  -1  0   0  0   0  0
 55       -1  0  -1  0   0  0   0  0
 59       -1  0  -1  0   0  0   0  0
 61       -1  0  -1  0   0  0   0  0
 62       -1  0  -1  0   0  0   0  0
 63       -1  0  -1  0   0  0   0  0
 64       -1  0  -1  0   0  0   0  0
 65       -1  0  -1  0   0  0   0  0
END PQL-AD-FLAGS

QUAL-PROPS
  #    #<--QUALID-->    QTID  QSD VPFW VPFS  QSO  VQO QIFW VIQC QAGW VAQC  ***
 11     NH3             LBS     0    0    0    1    1    1    3    1    3
 12     NH3             LBS     0    0    0    1    1    1    3    1    3
 13     NH3             LBS     0    0    0    1    1    1    3    1    3
 14     NH3             LBS     0    0    0    1    1    1    3    1    3
 15     NH3             LBS     0    0    0    1    1    1    3    1    3
 16     NH3             LBS     0    0    0    1    1    1    3    1    3
 17     NH3             LBS     0    0    0    1    1    1    3    1    3
 18     NH3             LBS     0    0    0    1    1    1    3    1    3
 19     NH3             LBS     0    0    0    1    1    1    3    1    3
 31     NH3             LBS     0    0    0    1    1    1    3    1    3
 32     NH3             LBS     0    0    0    1    1    1    3    1    3
 33     NH3             LBS     0    0    0    1    1    1    3    1    3
 34     NH3             LBS     0    0    0    1    1    1    3    1    3
 35     NH3             LBS     0    0    0    1    1    1    3    1    3
 39     NH3             LBS     0    0    0    1    1    1    3    1    3
 51     NH3             LBS     0    0    0    1    1    1    3    1    3
 52     NH3             LBS     0    0    0    1    1    1    3    1    3
 53     NH3             LBS     0    0    0    1    1    1    3    1    3
 54     NH3             LBS     0    0    0    1    1    1    3    1    3
 55     NH3             LBS     0    0    0    1    1    1    3    1    3
 59     NH3             LBS     0    0    0    1    1    1    3    1    3
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  61      NH3             LBS      0     0     0     1     1     1     3     1     3
  62      NH3             LBS      0     0     0     1     1     1     3     1     3
  63      NH3             LBS      0     0     0     1     1     1     3     1     3
  64      NH3             LBS      0     0     0     1     1     1     3     1     3
  65      NH3             LBS      0     0     0     1     1     1     3     1     3
 END QUAL-PROPS

 QUAL-INPUT
   #    #     SQO   POTFW   POTFS   ACQOP  SQOLIM   WSQOP    IOQC    AOQC   ***
  11         .004                          .012     0.5
  12         .002                          .004     0.5
  13         .004                          .012     0.5
  14         .004                          .012     0.5
  15         .002                          .004     0.5
  16         .002                          .004     0.5
  17         .002                          .004     0.5
  18         .002                          .004     0.5
  19         .004                          .012     0.5

  31         .004                          .012     0.5
  32         .002                          .004     0.5
  33         .004                          .012     0.5
  34         .004                          .012     0.5
  35         .002                          .004     0.5
  39         .004                          .012     0.5

  51         .004                          .012     0.5
  52         .002                          .004     0.5
  53         .004                          .012     0.5
  54         .004                          .012     0.5
  55         .002                          .004     0.5
  59         .004                          .012     0.5

  61         .004                          .012     0.5
  62         .002                          .004     0.5
  63         .004                          .012     0.5
  64         .004                          .012     0.5
  65         .002                          .004     0.5
 END QUAL-INPUT

 MON-ACCUM
          ACCUMULATION RATE OF NH4 (lb NH4-N/AC.DAY)            ***
   #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC   ***
  11      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
  12      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
  13      .006 .006 .006 .006 .006 .006 .006 .006 .006 .006 .006 .006
  14      .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
  15   18 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
  19      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002

  31      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
  32      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
  33      .006 .006 .006 .006 .006 .006 .006 .006 .006 .006 .006 .006
  34      .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
  35      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
  39      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
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 51       .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
 52       .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 53       .006 .006 .006 .006 .006 .006 .006 .006 .006 .006 .006 .006
 54       .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 55       .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 59       .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002

 61       .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
 62       .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 63       .006 .006 .006 .006 .006 .006 .006 .006 .006 .006 .006 .006
 64       .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 65       .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
END MON-ACCUM

MON-SQOLIM
          STORAGE LIMIT OF NH4 (lb NH4-N/AC)                       ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11       .040 .040 .040 .040 .040 .040 .040 .040 .040 .040 .040 .040
 12       .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 13       .024 .024 .024 .024 .024 .024 .024 .024 .024 .024 .024 .024
 14       .032 .032 .032 .032 .032 .032 .032 .032 .032 .032 .032 .032
 15   18 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 19       .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012

 31       .040 .040 .040 .040 .040 .040 .040 .040 .040 .040 .040 .040
 32       .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 33       .024 .024 .024 .024 .024 .024 .024 .024 .024 .024 .024 .024
 34       .032 .032 .032 .032 .032 .032 .032 .032 .032 .032 .032 .032
 35       .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 39       .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012

 51       .040 .040 .040 .040 .040 .040 .040 .040 .040 .040 .040 .040
 52       .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 53       .024 .024 .024 .024 .024 .024 .024 .024 .024 .024 .024 .024
 54       .032 .032 .032 .032 .032 .032 .032 .032 .032 .032 .032 .032
 55       .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 59       .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012

 61       .040 .040 .040 .040 .040 .040 .040 .040 .040 .040 .040 .040
 62       .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
 63       .024 .024 .024 .024 .024 .024 .024 .024 .024 .024 .024 .024
 64       .032 .032 .032 .032 .032 .032 .032 .032 .032 .032 .032 .032
 65       .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008 .008
END MON-SQOLIM
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  MON-IFLW-CONC
            Interflow Concentration of NH4-N (mg/l)                     ***
    #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC   ***
   11      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   12      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
   13      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   14      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   15   18 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030
   19      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100

   31      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   32      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
   33      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   34      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   35      .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030
   39      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100

   51      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   52      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
   53      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   54      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   55      .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030
   59      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100

   61      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   62      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
   63      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   64      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   65      .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030
  END MON-IFLW-CONC

  MON-GRND-CONC
            Active Groundwater Concentration of NH4-N (mg/l)            ***
    #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC   ***
   11      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   12      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
   13      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   14      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   15   18 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030
   19      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100

   31      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   32      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
   33      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   34      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   35      .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030
   39      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100

   51      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   52      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
   53      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   54      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
   55      .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030
   59      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
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 61      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 62      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
 63      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 64      .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100 .100
 65      .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030 .030
END MON-GRND-CONC

QUAL-PROPS
  #    #<--QUALID-->    QTID  QSD VPFW VPFS  QSO  VQO QIFW VIQC QAGW VAQC  ***
 11     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 12     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 13     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 14     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 15     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 16     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 17     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 18     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 19     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 31     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 32     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 33     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 34     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 35     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 39     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 51     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 52     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 53     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 54     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 55     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 59     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 61     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 62     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 63     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 64     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
 65     NO2 NO3         LBS     0    0    0    1    1    1    3    1    3
END QUAL-PROPS

QUAL-INPUT
  #    #     SQO   POTFW   POTFS   ACQOP  SQOLIM   WSQOP    IOQC    AOQC   ***
 11         .040                            .120      .5
 12         .005                            .010      .5
 13         .040                            .120      .5
 14         .040                            .120      .5
 15   18    .005                            .010      .5
 19         .040                            .120      .5

 31         .040                            .120      .5
 32         .005                            .010      .5
 33         .040                            .120      .5
 34         .040                            .120      .5
 35         .005                            .010      .5
 39         .040                            .120      .5
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  51         .040                             .480      .5
  52         .005                             .100      .5
  53         .040                             .480      .5
  54         .040                             .480      .5
  55         .005                             .100      .5
  59         .040                             .480      .5

  61         .040                             .480      .5
  62         .005                             .100      .5
  63         .040                             .480      .5
  64         .040                             .480      .5
  65         .005                             .100      .5
END QUAL-INPUT

MON-ACCUM
         ACCUMULATION RATE   NO2 NO3 (lb NO3-N/AC.DAY)              ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
  11       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
  12     0.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.005
  13      0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
  14      0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03
  15   180.0020.0020.0020.0020.0020.0020.0020.0020.0020.0020.0020.002
  19      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

  31       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
  32     0.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.005
  33      0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
  34      0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03
  35     0.0020.0020.0020.0020.0020.0020.0020.0020.0020.0020.0020.002
  39      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

  51       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
  52     0.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.005
  53      0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
  54      0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03
  55     0.0020.0020.0020.0020.0020.0020.0020.0020.0020.0020.0020.002
  59      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

  61       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
  62     0.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.005
  63      0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
  64      0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.03
  65     0.0020.0020.0020.0020.0020.0020.0020.0020.0020.0020.0020.002
END MON-ACCUM

MON-SQOLIM
         STORAGE LIMIT OF    NO2 NO3 (lb NO3-N/AC)                  ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
  11      0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20
  12      .010 .010 .010 .010 .010 .010 .010 .010 .010 .010 .010 .010
  13      0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
  14      0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
  15   18 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
  19      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020
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 31      0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20
 32      .010 .010 .010 .010 .010 .010 .010 .010 .010 .010 .010 .010
 33      0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 34      0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
 35      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 39      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020

 51      0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20
 52      .010 .010 .010 .010 .010 .010 .010 .010 .010 .010 .010 .010
 53      0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 54      0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
 55      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 59      .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020 .020

 61      0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20
 62      .010 .010 .010 .010 .010 .010 .010 .010 .010 .010 .010 .010
 63      0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 64      0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
 65      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
END MON-SQOLIM

MON-IFLW-CONC
          Interflow Concentration of NO3-N (mg/l)                     ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11       0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
 12      0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 13      0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 14      0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 15   18 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.02
 19         5    5    5    5    5    5    5    5    5    5    5    5

 31       0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
 32      0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 33      0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 34      0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 35      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 39         5    5    5    5    5    5    5    5    5    5    5    5

 51       0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
 52      0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 53      0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 54      0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 55      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 59         5    5    5    5    5    5    5    5    5    5    5    5

 61       0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
 62      0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 63      0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 64      0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 65      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
END MON-IFLW-CONC
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MON-GRND-CONC
          Active Groundwater Concentration of NO3-N (mg/l)            ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11       0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
 12      0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 13      0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 14      0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 15      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 16      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 17      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 18      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 19         5    5    5    5    5    5    5    5    5    5    5    5

 31       0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
 32      0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 33      0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 34      0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 35      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 39         5    5    5    5    5    5    5    5    5    5    5    5

 51       0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
 52      0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 53      0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 54      0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 55      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 59         5    5    5    5    5    5    5    5    5    5    5    5

 61       0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
 62      0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05
 63      0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 64      0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15 0.15
 65      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
END MON-GRND-CONC

QUAL-PROPS
  #    #<--QUALID-->    QTID  QSD VPFW VPFS  QSO  VQO QIFW VIQC QAGW VAQC   ***
 11     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 12     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 13     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 14     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 15     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 16     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 17     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 18     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 19     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 31     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 32     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 33     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 34     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 35     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 39     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
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 51     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 52     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 53     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 54     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 55     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 59     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 61     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 62     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 63     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 64     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
 65     ORTHO P         LBS     0    0    0    1    1    1    3    1    3
END QUAL-PROPS

QUAL-INPUT
  #    #     SQO   POTFW   POTFS   ACQOP  SQOLIM   WSQOP    IOQC    AOQC   ***
 11         .004                            .012      .5
 12         .002                            .004      .5
 13         .004                            .012      .5
 14         .004                            .012      .5
 15   18    .002                            .004      .5
 19         .004                            .012      .5

 31         .004                            .012      .5
 32         .002                            .004      .5
 33         .004                            .012      .5
 34         .004                            .012      .5
 35         .002                            .004      .5
 39         .004                            .012      .5

 51         .004                            .012      .5
 52         .002                            .004      .5
 53         .004                            .012      .5
 54         .004                            .012      .5
 55         .002                            .004      .5
 59         .004                            .012      .5

 61         .004                            .012      .5
 62         .002                            .004      .5
 63         .004                            .012      .5
 64         .004                            .012      .5
 65         .002                            .004      .5
END QUAL-INPUT

MON-ACCUM
          ACCUMULATION RATE OF PO4 (lb PO4-P/AC.DAY)            ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 12      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 13      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 14      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 15   18 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 19      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
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 31      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 32      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 33      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 34      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 35      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 39      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004

 51      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 52      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 53      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 54      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 55      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 59      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004

 61      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 62      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
 63      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 64      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 65      .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002 .002
END MON-ACCUM

MON-SQOLIM
          STORAGE LIMIT OF PO4 (lb PO4-P/AC)                       ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 12      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 13      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 14      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 15   18 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 19      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012

 31      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 32      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 33      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 34      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 35      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 39      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012

 51      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 52      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 53      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 54      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 55      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 59      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012

 61      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 62      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
 63      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 64      .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012 .012
 65      .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004 .004
END MON-SQOLIM
```

```
MON-IFLW-CONC
          Interflow Concentration of PO4-P (mg/l)                     ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
 12     0.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.025
 13       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
 14      0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16
 15   18 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 19      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

 31      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
 32     0.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.025
 33       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
 34      0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16
 35      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 39      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

 51      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
 52     0.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.025
 53       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
 54      0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16
 55      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 59      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

 61      0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
 62     0.0120.0120.0120.0120.0120.0120.0120.0120.0120.0120.0120.012
 63     0.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.005
 64      0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08
 65     0.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.005
END MON-IFLW-CONC

MON-GRND-CONC
          Active Groundwater Concentration of PO4-P (mg/l)            ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
 12     0.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.025
 13       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
 14      0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16
 15   18 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 19      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

 31      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
 32     0.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.025
 33       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
 34      0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16
 35      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 39      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01

 51      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
 52     0.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.0250.025
 53       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
 54      0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16
 55      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
 59      0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
```

```
 61      0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
 62     0.0120.0120.0120.0120.0120.0120.0120.0120.0120.0120.0120.012
 63     0.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.005
 64      0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08
 65     0.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.0050.005
END MON-GRND-CONC

QUAL-PROPS
  #    #<--QUALID-->    QTID  QSD VPFW VPFS  QSO  VQO QIFW VIQC QAGW VAQC  ***
 11     BOD             LBS     0    0    0    1    1    1    3    1    3
 12     BOD             LBS     0    0    0    1    1    1    3    1    3
 13     BOD             LBS     0    0    0    1    1    1    3    1    3
 14     BOD             LBS     0    0    0    1    1    1    3    1    3
 15     BOD             LBS     0    0    0    1    1    1    3    1    3
 16     BOD             LBS     0    0    0    1    1    1    3    1    3
 17     BOD             LBS     0    0    0    1    1    1    3    1    3
 18     BOD             LBS     0    0    0    1    1    1    3    1    3
 19     BOD             LBS     0    0    0    1    1    1    3    1    3
 31     BOD             LBS     0    0    0    1    1    1    3    1    3
 32     BOD             LBS     0    0    0    1    1    1    3    1    3
 33     BOD             LBS     0    0    0    1    1    1    3    1    3
 34     BOD             LBS     0    0    0    1    1    1    3    1    3
 35     BOD             LBS     0    0    0    1    1    1    3    1    3
 39     BOD             LBS     0    0    0    1    1    1    3    1    3
 51     BOD             LBS     0    0    0    1    1    1    3    1    3
 52     BOD             LBS     0    0    0    1    1    1    3    1    3
 53     BOD             LBS     0    0    0    1    1    1    3    1    3
 54     BOD             LBS     0    0    0    1    1    1    3    1    3
 55     BOD             LBS     0    0    0    1    1    1    3    1    3
 59     BOD             LBS     0    0    0    1    1    1    3    1    3
 61     BOD             LBS     0    0    0    1    1    1    3    1    3
 62     BOD             LBS     0    0    0    1    1    1    3    1    3
 63     BOD             LBS     0    0    0    1    1    1    3    1    3
 64     BOD             LBS     0    0    0    1    1    1    3    1    3
 65     BOD             LBS     0    0    0    1    1    1    3    1    3
END QUAL-PROPS

QUAL-INPUT
  #    #     SQO   POTFW   POTFS   ACQOP  SQOLIM   WSQOP    IOQC    AOQC   ***
 11          .35                             5.0      .5
 12          .15                             .75      .5
 13          .35                             5.0      .5
 14          .60                             6.0      .5
 15   18     .15                             1.5      .5
 19          .35                             5.0      .5

 31          .35                             5.0      .5
 32          .15                             .75      .5
 33          .35                             5.0      .5
 34          .60                             6.0      .5
 35          .15                             1.5      .5
 39          .35                             5.0      .5
```

```
 51          .35                                   5.0       .5
 52          .15                                   .75       .5
 53          .35                                   5.0       .5
 54          .60                                   6.0       .5
 55          .15                                   1.5       .5
 59          .35                                   5.0       .5

 61          .35                                   5.0       .5
 62          .15                                   .75       .5
 63          .35                                   5.0       .5
 64          .60                                   6.0       .5
 65          .15                                   1.5       .5
END QUAL-INPUT

MON-ACCUM
       ACCUMULATION RATE FOR BOD/Organics (lb /AC.DAY)  ***
 #     #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11        0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5
 12        0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2
 13       0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35
 14       0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30
 15    18 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 19        0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5

 31        0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5
 32        0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2
 33       0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35
 34       0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30
 35       0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 39        0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5

 51        0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5
 52        0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2
 53       0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35
 54       0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30
 55       0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
 59        0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5

 61        0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5  0.5
 62        0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2  0.2
 63       0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35 0.35
 64       0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30
 65       0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10
END MON-ACCUM

MON-SQOLIM
       STORAGE RATE FOR BOD/Organics (lb /AC)    ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11        1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
 12        .45  .45  .45  .45  .45  .45  .45  .45  .45  .45  .45  .45
 13        0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7
 14        0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6
 15    18  .20  .20  .20  .20  .20  .20  .20  .20  .20  .20  .20  .20
 19        1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
```

```
 31       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
 32       .45  .45  .45  .45  .45  .45  .45  .45  .45  .45  .45  .45
 33       0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7
 34       0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6
 35       .20  .20  .20  .20  .20  .20  .20  .20  .20  .20  .20  .20
 39       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0

 51       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
 52       .45  .45  .45  .45  .45  .45  .45  .45  .45  .45  .45  .45
 53       0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7
 54       0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6
 55       .20  .20  .20  .20  .20  .20  .20  .20  .20  .20  .20  .20
 59       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0

 61       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
 62       .45  .45  .45  .45  .45  .45  .45  .45  .45  .45  .45  .45
 63       0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7
 64       0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6  0.6
 65       .20  .20  .20  .20  .20  .20  .20  .20  .20  .20  .20  .20
END MON-SQOLIM

MON-IFLW-CONC
          Interflow Concentration of BOD/Organics (mg/l)   ***
  #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
 11       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 12       2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0
 13       3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0
 14       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 15   18  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
 19       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0

 31       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 32       2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0
 33       3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0
 34       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 35       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
 39       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0

 51       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 52       2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0
 53       3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0
 54       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 55       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
 59       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0

 61       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 62       2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0
 63       3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0
 64       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 65       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
END MON-IFLW-CONC
```

```
  MON-GRND-CONC
         Active Groundwater Concentration of BOD/Organics (mg/l)  ***
    #    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   11       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
   12       2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0
   13       3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0
   14       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
   15   18  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
   19       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0

   31       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
   32       2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0
   33       3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0
   34       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
   35       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
   39       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0

   51       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
   52       2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0
   53       3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0
   54       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
   55       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
   59       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0

   61       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
   62       2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0  2.0
   63       3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0  3.0
   64       5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
   65       1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
  END MON-GRND-CONC
END PERLND

IMPLND
  ACTIVITY
    #    # ATMP SNOW IWAT  SLD  IWG IQAL  ***
   14   64    1    0    1    0    1    1
  END ACTIVITY

  PRINT-INFO
    #    # ATMP SNOW IWAT  SLD  IWG IQAL PIVL  PYR  ***
   14   64    5    0    5    0    5    5    1   12
  END PRINT-INFO

  GEN-INFO
*** <ILS >      Name            Unit-systems   Printer
*** <ILS >                          t-series Engl Metr
*** x -  x                           in  out
   14      URBAN                      1    1   90    0
   34      URBAN                      1    1   90    0
   54      URBAN                      1    1   90    0
   64      URBAN                      1    1   90    0
  END GEN-INFO
```

```
  IWAT-PARM1
*** <ILS >        Flags
*** x -  x CSNO RTOP  VRS  VNN RTLI
   14         0    1    0    0    0
   34         0    1    0    0    0
   54         0    1    0    0    0
   64         0    1    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
*** <ILS >      LSUR     SLSUR      NSUR     RETSC
*** x -  x      (ft)                          (ft)
   14          200.0   0.01015     0.015      0.05
   34          200.0   0.01015     0.015      0.05
   54          200.0   0.01015     0.015      0.05
   64          200.0   0.01015     0.015      0.05
  END IWAT-PARM2

  IWAT-PARM3
*** <ILS >    PETMAX    PETMIN
*** x -  x   (deg F)   (deg F)
   14   64      40.0      35.0
  END IWAT-PARM3

  IWAT-STATE1
*** <ILS >  IWATER state variables (inches)
*** x -  x      RETS      SURS
   14   64       0.0       0.0
  END IWAT-STATE1

  IWT-PARM1
    #    # WTFV CSNO  ***
   14   64    1    0
  END IWT-PARM1

  IWT-PARM2
    #    #      ELEV      AWTF      BWTF  ***
   14          80.00      34.0       0.3
   34         120.00      34.0       0.3
   54         110.00      34.0       0.3
   64         100.00      34.0       0.3
  END IWT-PARM2

  MON-AWTF
*** <ILS >  Values of AWTF at start of each month (oF)
*** x -  x  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC
   14   64 29.0 29.0 30.0 34.0 40.0 50.0 50.0 50.0 45.0 40.0 35.0 30.0
  END MON-AWTF

  MON-BWTF
*** <ILS >  Values of BWTF at start of each month (F/F)
*** x -  x  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC
   14   64  .55  .55  .60  .60  .65  .65  .65  .65  .60  .55  .55  .55
  END MON-BWTF
```

```
NQUALS
  #    # NQAL  ***
 14   64    4
END NQUALS

IQL-AD-FLAGS
           Atmospheric Deposition Flags ***
  <ILS >  QUAL1  QUAL2  QUAL3  QUAL4  ***
  # -  #   F  C   F  C   F  C   F  C  ***
 14       -1  0  -1  0   0  0   0  0
 34       -1  0  -1  0   0  0   0  0
 54       -1  0  -1  0   0  0   0  0
 64       -1  0  -1  0   0  0   0  0
END IQL-AD-FLAGS

QUAL-PROPS
  #    #<--QUALID-->    QTID  QSD VPFW  QSO  VQO  ***
 14     NH3             LBS     0    0    1    0
 34     NH3             LBS     0    0    1    0
 54     NH3             LBS     0    0    1    0
 64     NH3             LBS     0    0    1    0
END QUAL-PROPS

QUAL-INPUT
  #    #     SQO   POTFW   ACQOP  SQOLIM   WSQOP  ***
 14        0.001       0   0.004   0.005     0.5
 34        0.001       0   0.004   0.005     0.5
 54        0.001       0   0.004   0.005     0.5
 64        0.001       0   0.004   0.005     0.5
END QUAL-INPUT

QUAL-PROPS
  #    #<--QUALID-->    QTID  QSD VPFW  QSO  VQO  ***
 14     NO2 NO3         LBS     0    0    1    0
 34     NO2 NO3         LBS     0    0    1    0
 54     NO2 NO3         LBS     0    0    1    0
 64     NO2 NO3         LBS     0    0    1    0
END QUAL-PROPS

QUAL-INPUT
  #    #     SQO   POTFW   ACQOP  SQOLIM   WSQOP  ***
 14        0.007       0   0.006   0.009     0.5
 34        0.007       0   0.006   0.009     0.5
 54        0.007       0   0.006   0.009     0.5
 64        0.007       0   0.006   0.009     0.5
END QUAL-INPUT

QUAL-PROPS
  #    #<--QUALID-->    QTID  QSD VPFW  QSO  VQO  ***
 14     ORTHO P         LBS     0    0    1    0
 34     ORTHO P         LBS     0    0    1    0
 54     ORTHO P         LBS     0    0    1    0
 64     ORTHO P         LBS     0    0    1    0
END QUAL-PROPS
```

```
  QUAL-INPUT
    #    #     SQO   POTFW   ACQOP  SQOLIM   WSQOP  ***
   14        0.002       0   0.001   0.002     0.5
   34        0.002       0   0.001   0.002     0.5
   54        0.002       0   0.001   0.002     0.5
   64        0.002       0   0.001   0.002     0.5
  END QUAL-INPUT

  QUAL-PROPS
    #    #<--QUALID-->    QTID  QSD VPFW  QSO  VQO  ***
   14     BOD             LBS      0    0    1    0
   34     BOD             LBS      0    0    1    0
   54     BOD             LBS      0    0    1    0
   64     BOD             LBS      0    0    1    0
  END QUAL-PROPS

  QUAL-INPUT
    #    #     SQO   POTFW   ACQOP  SQOLIM   WSQOP  ***
   14          1.0      0.    0.15     2.0   0.500
   34          1.0      0.    0.15     2.0   0.500
   54          1.0      0.    0.15     2.0   0.500
   64          1.0      0.    0.15     2.0   0.500
  END QUAL-INPUT
END IMPLND

RCHRES
  ACTIVITY
*** RCHRES  Active sections
*** x -  x HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG
    1   61    1    1    0    0    0    0    1    1    1    0
  END ACTIVITY

  PRINT-INFO
*** RCHRES  Printout level flags
*** x -  x HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR
    1   61    5    5                        5    5    5         1   12
  END PRINT-INFO

  GEN-INFO
***              Name        Nexits   Unit Systems   Printer
*** RCHRES                               t-series  Engl Metr LKFG
*** x -  x                                 in  out
   31     EAST UPPER REEDY CK     1         1    1   90    0    1
   41     WEST UPPER REEDY CK     1         1    1   90    0    1
   51     WHITTENHORSE CK         1         1    1   90    0    1
   61     DAVENPORT CK            1         1    1   90    0    1
    2     BAY LAKE / 7 SEAS       2         1    1   90    0    1
    3     UPPER L-405             1         1    1   90    0    0
    4     C-4                     1         1    1   90    0    0
    5     L-403 - EPCOT           1         1    1   90    0    0
    6     LOWER L-405             1         1    1   90    0    0
    7     REEDY CK AB HWY 192     1         1    1   90    0    0
    8     REEDY CK AB I-4         1         1    1   90    0    0
    9     L MABEL / SOUTH L       1         1    1   90    0    1
   10     L-105                   1         1    1   90    0    0
```

```
   11     L-103                   1         1    1   90     0    0
   12     L-107 / UPPER C-1       1         1    1   90     0    0
   13     MIDDLE C-1              1         1    1   90     0    0
   14     LOWER C-1               1         1    1   90     0    0
   15     REEDY CK AT S-40        2         1    1   90     0    0
   16     REEDY CK AT LOUGHMAN    1         1    1   90     0    0
  END GEN-INFO

  HYDR-PARM1
***         Flags for HYDR section
    RCHRES  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
    x  - x  FG FG FG FG  possible   exit *** possible   exit     possible   exit
                           *  *  *  *  * ***   *  *  *  *  *       *  *  *  *  *
    2        0  1  1  1    4  5                0
    3   14   0  1  1  1    4                   0
   15        0  1  1  1    0  4                1
   16   61   0  1  1  1    4                   0
  END HYDR-PARM1

  HYDR-PARM2
*** RCHRES    FTABNO        LEN     DELTH      STCOR         KS      DB50
*** x -  x             (miles)      (ft)       (ft)              (in)
    2              2      1.00       0.1       62.5        0.0      0.01
    3              3      5.56       0.1         .0        0.0      0.01
    4              4      2.13       0.1         .0        0.0      0.01
    5              5      3.36       0.1         .0        0.0      0.01
    6              6      2.50       0.1         .0        0.0      0.01
    7              7      2.01       0.1         .0        0.0      0.01
    8              8      2.52       0.1         .0        0.0      0.01
    9              9      2.00       0.1      88.25        0.0      0.01
   10             10      1.77       0.1         .0        0.0      0.01
   11             11      2.92       0.1         .0        0.0      0.01
   12             12      6.75       0.1         .0        0.0      0.01
   13             13      2.37       0.1         .0        0.0      0.01
   14             14      4.51       0.1         .0        0.0      0.01
   15             15      2.84       0.1         .0        0.0      0.01
   16             16       1.0       0.1      -0.73        0.0      0.01
   31             31       1.0       0.1       90.0        0.0      0.01
   41             41       1.2       0.1       90.0        0.0      0.01
   51             51      2.37       0.1      90.77        0.0      0.01
   61             61      4.64       0.1        4.0        0.0      0.01
  END HYDR-PARM2

  HYDR-INIT
***         Initial conditions for HYDR section
*** RCHRES       VOL  CAT Initial value  of COLIND     initial  value  of OUTDGT
*** x  - x     ac-ft      for each possible   exit  for each possible exit,ft3
    2         7230.0    0  4.0  5.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
    3            0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
    4            2.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
    5            0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
    6            2.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
    7            5.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
    8            2.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
    9         2700.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
```

```
   10            0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   11            0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   12            0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   13            0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   14            0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   15            0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   16            0.1    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   31         3850.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   41         2820.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   51         2350.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
   61          250.0    0  4.0  4.0  4.0  4.0  4.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT

  *** Section RQUAL ***

  BENTH-FLAG
    RCHRES BENF ***
    # -  #      ***
    1   61    1
  END BENTH-FLAG

  SCOUR-PARMS
    RCHRES    SCRVEL    SCRMUL ***
    # -  #                     ***
    1   61        3.        1.
  END SCOUR-PARMS

  *** Section OXRX ***

  OX-FLAGS
    RCHRES REAM ***
    # -  #      ***
    2   61    3
  END OX-FLAGS

  OX-GENPARM
    RCHRES    KBOD20     TCBOD    KODSET    SUPSAT ***
    # -  #       /hr                               ***
    2   16      0.01              0.005
   31   51      0.01              0.005
   61           0.01              0.005
  END OX-GENPARM

  ELEV
*** RCHRES      ELEV
*** x -  x      (ft)
    2   16        80
   31   41       120
   51            110
   61            100
  END ELEV
```

```
OX-BENPARM
  RCHRES     BENOD     TCBEN     EXPOD  BRBOD(1)  BRBOD(2)    EXPREL ***
  # -  #  mg/m2.hr                      mg/m2.hr  mg/m2.hr           ***
  2             40       1.1       1.2    0.0001    0.0001      2.82
  3             40       1.1       1.2    0.0001    0.0001      2.82
  4             40       1.1       1.2    0.0001    0.0001      2.82
  5             40       1.1       1.2    0.0001    0.0001      2.82
  6             40       1.1       1.2    0.0001    0.0001      2.82
  7             40       1.1       1.2    0.0001    0.0001      2.82
  8             40       1.1       1.2    0.0001    0.0001      2.82
  9             40       1.1       1.2    0.0001    0.0001      2.82
 10             40       1.1       1.2    0.0001    0.0001      2.82
 11             40       1.1       1.2    0.0001    0.0001      2.82
 12             40       1.1       1.2    0.0001    0.0001      2.82
 13             40       1.1       1.2    0.0001    0.0001      2.82
 14             40       1.1       1.2    0.0001    0.0001      2.82
 15             40       1.1       1.2    0.0001    0.0001      2.82
 16             20       1.1       1.2    0.0001    0.0001      2.82
 31             80       1.1       1.2    0.0001    0.0001      2.82
 41             80       1.1       1.2    0.0001    0.0001      2.82
 51             80       1.1       1.2    0.0001    0.0001      2.82
 61             40       1.1       1.2    0.0001    0.0001      2.82
END OX-BENPARM

OX-REAPARM
  RCHRES    TCGINV      REAK    EXPRED    EXPREV ***
  # -  #                 /hr                     ***
  2   61                0.20      -1.1       1.1
END OX-REAPARM

OX-INIT
  RCHRES       DOX       BOD     SATDO ***
  # -  #      mg/l      mg/l      mg/l ***
  2   61         6       0.1
END OX-INIT

*** Section NUTRX ***

NUT-FLAGS
  RCHRES  TAM  NO2  PO4  AMV  DEN ADNH ADPO PHFL ***
  # -  #                                         ***
  1   61    1    0    1    1    1    0    0    2
END NUT-FLAGS

NUT-AD-FLAGS
  Atmospheric Deposition Flags ***
  RCHRES    NO3    NH3    PO4  ***
  # -  #   F  C   F  C   F  C  ***
  1   61  -1  0  -1  0   0  0
END NUT-AD-FLAGS

NUT-BENPARM
  RCHRES  BRTAM(1)  BRTAM(2)  BRPO4(1)  BRPO4(2)     ANAER  ***
  # -  #  mg/m2.hr  mg/m2.hr  mg/m2.hr  mg/m2.hr      mg/l  ***
  2   61       0.0       0.0       0.0       0.0     0.005
END NUT-BENPARM
```

```
NUT-NITDENIT
  RCHRES    KTAM20    KNO220     TCNIT    KNO320     TCDEN    DENOXT ***
  # -  #       /hr       /hr                 /hr                mg/l ***
  2          0.015     0.002      1.07     0.001      1.04         5
  3          0.015     0.002      1.07     0.001      1.04         5
  4          0.015     0.002      1.07     0.001      1.04         5
  5          0.015     0.002      1.07     0.001      1.04         5
  6          0.015     0.002      1.07     0.001      1.04         5
  7          0.015     0.002      1.07     0.001      1.04         5
  8          0.015     0.002      1.07     0.001      1.04         5
  9          0.015     0.002      1.07     0.001      1.04         5
 10          0.015     0.002      1.07     0.001      1.04         5
 11          0.015     0.002      1.07     0.001      1.04         5
 12          0.015     0.002      1.07     0.001      1.04         5
 13          0.015     0.002      1.07     0.001      1.04         5
 14          0.015     0.002      1.07     0.001      1.04         5
 15          0.015     0.002      1.07     0.001      1.04         5
 16          0.015     0.002      1.07     0.001      1.04         5
 31          0.003     0.002      1.07     0.001      1.04         5
 41          0.003     0.002      1.07     0.001      1.04         5
 51          0.003     0.002      1.07     0.001      1.04         5
 61          0.015     0.002      1.07     0.001      1.04         5
END NUT-NITDENIT

NUT-NH3VOLAT
  RCHRES    EXPNVG    EXPNVL ***
  # -  #                     ***
  2            .50    0.6667
  3            .50    0.6667
  4            .50    0.6667
  5            .50    0.6667
  6            .50    0.6667
  7            .50    0.6667
  8            .50    0.6667
  9            .50    0.6667
 10            .50    0.6667
 11            .50    0.6667
 12            .50    0.6667
 13            .50    0.6667
 14            .50    0.6667
 15            .50    0.6667
 16            .50    0.6667
 31            .50    0.6667
 41            .50    0.6667
 51            .50    0.6667
 61            .50    0.6667
END NUT-NH3VOLAT
```

```
NUT-DINIT
  RCHRES        NO3        TAM        NO2        PO4      PHVAL  ***
  # -  #      mg/l      mg/l      mg/l      mg/l ph units   ***
  2            .05      0.05        0.       .02       7.0
  3            .05      0.05        0.       .02       7.0
  4            .05      0.05        0.       .02       7.0
  5            .05      0.05        0.       .02       7.0
  6            .05      0.05        0.       .02       7.0
  7            .05      0.05        0.       .02       7.0
  8            .05      0.05        0.       .02       7.0
  9            .05      0.05        0.       .02       7.0
 10            .05      0.05        0.       .02       7.0
 11            .05      0.05        0.       .02       7.0
 12            .05      0.05        0.       .02       7.0
 13            .05      0.05        0.       .02       7.0
 14            .05      0.05        0.       .02       7.0
 15            .05      0.05        0.       .02       7.0
 16            .05      0.05        0.       .02       7.0
 31            .05      0.05        0.       .02       7.0
 41            .05      0.05        0.       .02       7.0
 51            .05      0.05        0.       .02       7.0
 61            .05      0.05        0.       .02       7.0
END NUT-DINIT

*** Section PLANK ***

PLNK-FLAGS
  RCHRES PHYF ZOOF BALF SDLT AMRF DECF NSFG ZFOO ***
  # -  #                                         ***
  1   61    1    0    0    0    1         1
END PLNK-FLAGS

PLNK-PARM1
  RCHRES    RATCLP    NONREF    LITSED     ALNPR      EXTB     MALGR ***
  # -  #                                               /ft       /hr ***
  2            0.6       0.5       0.0      0.70       1.0      0.07
  3            0.6       0.5       0.0      0.70       1.0      0.07
  4            0.6       0.5       0.0      0.70       1.0      0.07
  5            0.6       0.5       0.0      0.70       1.0      0.07
  6            0.6       0.5       0.0      0.70       1.0      0.07
  7            0.6       0.5       0.0      0.70       1.0      0.07
  8            0.6       0.5       0.0      0.70       1.0      0.07
  9            0.6       0.5       0.0      0.70       1.0      0.07
 10            0.6       0.5       0.0      0.70       1.0      0.07
 11            0.6       0.5       0.0      0.70       1.0      0.07
 12            0.6       0.5       0.0      0.70       1.0      0.07
 13            0.6       0.5       0.0      0.70       1.0      0.07
 14            0.6       0.5       0.0      0.70       1.0      0.07
 15            0.6       0.5       0.0      0.70       1.0      0.07
 16            0.6       0.5       0.0      0.70       1.0      0.07
 31            0.6       0.5       0.0      0.70       1.0      0.07
 41            0.6       0.5       0.0      0.70       1.0      0.07
 51            0.6       0.5       0.0      0.70       1.0      0.07
 61            0.6       0.5       0.0      0.70       1.0      0.07
END PLNK-PARM1
```

```
PLNK-PARM2
  RCHRES *** CMMLT      CMMN     CMMNP      CMMP    TALGRH    TALGRL    TALGRM
  # -  # ***
  2           .010     0.025     .0001      .005       95.     -20.0       86.
  3           .010     0.025     .0001      .005       95.     -20.0       86.
  4           .010     0.025     .0001      .005       95.     -20.0       86.
  5           .010     0.025     .0001      .005       95.     -20.0       86.
  6           .010     0.025     .0001      .005       95.     -20.0       86.
  7           .010     0.025     .0001      .005       95.     -20.0       86.
  8           .010     0.025     .0001      .005       95.     -20.0       86.
  9           .010     0.025     .0001      .005       95.     -20.0       86.
 10           .010     0.025     .0001      .005       95.     -20.0       86.
 11           .010     0.025     .0001      .005       95.     -20.0       86.
 12           .010     0.025     .0001      .005       95.     -20.0       86.
 13           .010     0.025     .0001      .005       95.     -20.0       86.
 14           .010     0.025     .0001      .005       95.     -20.0       86.
 15           .010     0.025     .0001      .005       95.     -20.0       86.
 16           .010     0.025     .0001      .005       95.     -20.0       86.
 31           .010     0.025     .0001      .005       95.     -20.0       86.
 41           .010     0.025     .0001      .005       95.     -20.0       86.
 51           .010     0.025     .0001      .005       95.     -20.0       86.
 61           .010     0.025     .0001      .005       95.     -20.0       86.
END PLNK-PARM2

PLNK-PARM3
  RCHRES *** ALR20      ALDH      ALDL     OXALD     NALDH     PALDH
  # -  # ***
  2          0.005      0.01     0.001      0.03      0.01     0.002
  3          0.005      0.01     0.001      0.03      0.01     0.002
  4          0.005      0.01     0.001      0.03      0.01     0.002
  5          0.005      0.01     0.001      0.03      0.01     0.002
  6          0.005      0.01     0.001      0.03      0.01     0.002
  7          0.005      0.01     0.001      0.03      0.01     0.002
  8          0.005      0.01     0.001      0.03      0.01     0.002
  9          0.005      0.01     0.001      0.03      0.01     0.002
 10          0.005      0.01     0.001      0.03      0.01     0.002
 11          0.005      0.01     0.001      0.03      0.01     0.002
 12          0.005      0.01     0.001      0.03      0.01     0.002
 13          0.005      0.01     0.001      0.03      0.01     0.002
 14          0.005      0.01     0.001      0.03      0.01     0.002
 15          0.005      0.01     0.001      0.03      0.01     0.002
 16          0.005      0.01     0.001      0.03      0.01     0.002
 31          0.005      0.01     0.001      0.03      0.01     0.002
 41          0.005      0.01     0.001      0.03      0.01     0.002
 51          0.005      0.01     0.001      0.03      0.01     0.002
 61          0.005      0.01     0.001      0.03      0.01     0.002
END PLNK-PARM3
```

```
  PHYTO-PARM
    RCHRES      SEED    MXSTAY      OREF    CLALDH    PHYSET    REFSET ***
    # -  #      mg/l      mg/l                ug/l                     ***
    2             .5        2.       20.        20       .02       .02
    3             .5        2.       20.        20       .02       .02
    4             .5        2.       20.        20       .02       .02
    5             .5        2.       20.        20       .02       .02
    6             .5        2.       20.        20       .02       .02
    7             .5        2.       20.        20       .02       .02
    8             .5        2.       20.        20       .02       .02
    9             .5        2.       20.        20       .02       .02
   10             .5        2.       20.        20       .02       .02
   11             .5        2.       20.        20       .02       .02
   12             .5        2.       20.        20       .02       .02
   13             .5        2.       20.        20       .02       .02
   14             .5        2.       20.        20       .02       .02
   15             .5        2.       20.        20       .02       .02
   16             .5        2.       20.        20       .02       .02
   31             .5        2.       20.        20       .02       .02
   41             .5        2.       20.        20       .02       .02
   51             .5        2.       20.        20       .02       .02
   61             .5        2.       20.        20       .02       .02
  END PHYTO-PARM

  PLNK-INIT
    RCHRES     PHYTO       ZOO     BENAL       ORN       ORP       ORC ***
    # -  #      mg/l     org/l     mg/m2      mg/l      mg/l      mg/l ***
    2   61       .05                             .02      0.01       0.1
  END PLNK-INIT
END RCHRES

COPY
  TIMESERIES
  Copy-opn***
*** x -  x  NPT  NMN
  101  106         7
    1    4        20
  END TIMESERIES
END COPY

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   x <Name> x tem strg<-factor->strg <Name>   x   x        <Name> x x  ***

*** Precip
*** DSN  70 = Disaggregated hourly rainfall for Conserv sites 601-604, based on
*** DSN  71 = Disaggregated hourly rainfall for L-101, based on Orlando r
*** DSN  73 = Disaggregated hourly rainfall for Conserv sites 701-901, based on
*** DSN  75 = Disaggregated hourly rainfall for L-410, modified based on 701-901

*** Segment 1
WDM1    71 PREC   0 ENGL           .45     PERLND  11  19 EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           .50     PERLND  11  19 EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .05     PERLND  11  19 EXTNL  PREC   1 1
WDM1    71 PREC   0 ENGL           .45     IMPLND  14   0 EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           .50     IMPLND  14   0 EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .05     IMPLND  14   0 EXTNL  PREC   1 1
WDM1    71 PREC   0 ENGL           .45     RCHRES   1  16 EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           .50     RCHRES   1  16 EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .05     RCHRES   1  16 EXTNL  PREC   1 1
```

```
*** Segment 3
WDM1    70 PREC   0 ENGL           .15     PERLND  31  39 EXTNL  PREC   1 1
WDM1    71 PREC   0 ENGL           .02     PERLND  31  39 EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .80     PERLND  31  39 EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           .03     PERLND  31  39 EXTNL  PREC   1 1
WDM1    70 PREC   0 ENGL           .15     IMPLND  34   0 EXTNL  PREC   1 1
WDM1    71 PREC   0 ENGL           .02     IMPLND  34   0 EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .80     IMPLND  34   0 EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           .03     IMPLND  34   0 EXTNL  PREC   1 1
WDM1    70 PREC   0 ENGL           .15     RCHRES  31  41 EXTNL  PREC   1 1
WDM1    71 PREC   0 ENGL           .02     RCHRES  31  41 EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .80     RCHRES  31  41 EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           .03     RCHRES  31  41 EXTNL  PREC   1 1

*** Segment 5
WDM1    75 PREC   0 ENGL           .80     PERLND  51  59 EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .20     PERLND  51  59 EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           .80     IMPLND  54      EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .20     IMPLND  54      EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           .80     RCHRES  51      EXTNL  PREC   1 1
WDM1    73 PREC   0 ENGL           .20     RCHRES  51      EXTNL  PREC   1 1

*** Segment 6
WDM1    75 PREC   0 ENGL           1.0     PERLND  61  65 EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           1.0     IMPLND  64      EXTNL  PREC   1 1
WDM1    75 PREC   0 ENGL           1.0     RCHRES  61      EXTNL  PREC   1 1

*** Evap
*** DSN 80 = PET from mo. pan coefficients x pan evap at Lisbon
WDM1    80 PET      ENGL                   PERLND  11  69 EXTNL  PETINP
WDM1    80 PET      ENGL                   IMPLND  14  64 EXTNL  PETINP
WDM1    80 PET      ENGL                   RCHRES   1  61 EXTNL  POTEV

*** RIBS application - dataset in units of acre-inches
*** Divide by total area of ribs for all three lines following
WDM1    91 RIBS     ENGL      .0384615     PERLND  19      EXTNL  PREC
WDM1    91 RIBS     ENGL      .0316456     PERLND  39      EXTNL  PREC
WDM1    91 RIBS     ENGL      .0355872     PERLND  59      EXTNL  PREC

*** Well water pumped into Bay Lake and Seven Seas Lagoon
WDM     92 PUMP     ENGL                   RCHRES   2      EXTNL  IVOL

*** Grove Irrigation as PREC (sprinkler) or SURLI (drip)
WDM1    94 IRRG     ENGL                   PERLND  11      EXTNL  PREC
WDM1    94 IRRG     ENGL                   PERLND  21      EXTNL  PREC
WDM1    94 IRRG     ENGL                   PERLND  31      EXTNL  PREC
WDM1    94 IRRG     ENGL                   PERLND  51      EXTNL  PREC
WDM1    94 IRRG     ENGL                   PERLND  61      EXTNL  PREC

*** Buzzard site diversion
*** Data set units are in cubic feet per second
WDM     95 FLOW     ENGL              SAME RCHRES  15      EXTNL  OUTDGT 1
```

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*** Cypress Creek discharge (treated as a point)
WDM1    22 FLOW     ENGL       .082645SAME RCHRES  11     EXTNL  IVOL

***Cypress Creek water-quality (treated as point source)
***do, bod, ammon, no3, po4, orn, orp, orc
WDM    820 DO       ENGL              DIV  RCHRES  11     INFLOW OXIF   1
WDM    821 BOD      ENGL              DIV  RCHRES  11     INFLOW OXIF   2
WDM    822 NH3      ENGL              DIV  RCHRES  11     INFLOW NUIF1  2
WDM    823 NO3      ENGL              DIV  RCHRES  11     INFLOW NUIF1  1
WDM    824 PO4      ENGL              DIV  RCHRES  11     INFLOW NUIF1  4

*** Hourly air temperature at ORL MCO (degrees F)
WDM1    85 TEMP     ENGL                   PERLND  11  65 EXTNL  GATMP
WDM1    85 TEMP     ENGL                   IMPLND  14  64 EXTNL  GATMP
WDM1    85 TEMP     ENGL                   RCHRES   1  61 EXTNL  GATMP

*** Daily wind speed (mph)
WDM1    82 WIND     ENGL              SAME RCHRES   1  61 EXTNL  WIND

*** Hourly solar radiation at Daytona Beach (ly/hr)
WDM1    81 SOLR     ENGL                   RCHRES   1  61 EXTNL  SOLRAD

*** Water Temperature (degrees C)
WDM1   603 TH2O     METR                   RCHRES   2   7 HTRCH  TW
WDM1   602 TH2O     METR                   RCHRES   8     HTRCH  TW
WDM1   603 TH2O     METR                   RCHRES   9  12 HTRCH  TW
WDM1   602 TH2O     METR                   RCHRES  13     HTRCH  TW
WDM1   601 TH2O     METR                   RCHRES  14  16 HTRCH  TW
WDM1   603 TH2O     METR                   RCHRES  31  41 HTRCH  TW
WDM1   604 TH2O     METR                   RCHRES  51  61 HTRCH  TW

*** Atmospheric Deposition (lb/ac)
WDM1    86 NH4D     ENGL              DIV  PERLND  11  65 EXTNL  PQADFX 1 1
WDM1    86 NH4D     ENGL              DIV  IMPLND  14  64 EXTNL  IQADFX 1
WDM1    86 NH4D     ENGL              DIV  RCHRES   1  61 EXTNL  NUADFX 2 1
WDM1    87 NO3D     ENGL              DIV  PERLND  11  65 EXTNL  PQADFX 2 1
WDM1    87 NO3D     ENGL              DIV  IMPLND  14  64 EXTNL  IQADFX 2
WDM1    87 NO3D     ENGL              DIV  RCHRES   1  61 EXTNL  NUADFX 1 1

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Aggr Amd ***
<Name>   x        <Name> x x<-factor->strg <Name>   x <Name>qf  tem strg strg***

*** Seven Seas Lagoon/Bay Lake combined outflow (RCHRES 2)
RCHRES   2 HYDR   RO                       WDM    102 FLOW     ENGL AGGR REPL
*** Lake Mabel/South Lake Outflow (RCHRES 9)
RCHRES   9 HYDR   RO                       WDM    109 FLOW     ENGL AGGR REPL
*** Reedy Creek below S40 near Loughman
RCHRES  15 HYDR   RO                       WDM    115 FLOW     ENGL AGGR REPL
*** Upper East Reedy Creek - Lateral 405 at S-405A
RCHRES  31 HYDR   RO                       WDM    131 FLOW     ENGL AGGR REPL
*** Upper West Reedy Creek - Reedy Creek at S46 near Vineland
RCHRES  41 HYDR   RO                       WDM    141 FLOW     ENGL AGGR REPL
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*** Whittenhorse creek stage
RCHRES  51 HYDR   STAGE                    WDM    251 STAG     ENGL AGGR REPL
*** Davenport creek stage
RCHRES  61 HYDR   STAGE                    WDM    261 STAG     ENGL AGGR REPL

*** Miscellaneous temporary calibration
RCHRES   2 OXRX   SATDO                    WDM   1002 TEST     ENGL AGGR REPL
RCHRES   3 OXRX   SATDO                    WDM   1003 TEST     ENGL AGGR REPL
RCHRES   4 OXRX   SATDO                    WDM   1004 TEST     ENGL AGGR REPL
RCHRES   5 OXRX   SATDO                    WDM   1005 TEST     ENGL AGGR REPL
RCHRES   6 OXRX   SATDO                    WDM   1006 TEST     ENGL AGGR REPL
RCHRES   7 OXRX   SATDO                    WDM   1007 TEST     ENGL AGGR REPL
RCHRES   8 OXRX   SATDO                    WDM   1008 TEST     ENGL AGGR REPL
RCHRES   9 OXRX   SATDO                    WDM   1009 TEST     ENGL AGGR REPL
RCHRES  10 OXRX   SATDO                    WDM   1010 TEST     ENGL AGGR REPL
RCHRES  11 OXRX   SATDO                    WDM   1011 TEST     ENGL AGGR REPL
RCHRES  12 OXRX   SATDO                    WDM   1012 TEST     ENGL AGGR REPL
RCHRES  13 OXRX   SATDO                    WDM   1013 TEST     ENGL AGGR REPL
RCHRES  14 OXRX   SATDO                    WDM   1014 TEST     ENGL AGGR REPL
RCHRES  15 OXRX   SATDO                    WDM   1015 TEST     ENGL AGGR REPL
RCHRES  16 OXRX   SATDO                    WDM   1016 TEST     ENGL AGGR REPL
RCHRES  31 OXRX   SATDO                    WDM   1031 TEST     ENGL AGGR REPL
RCHRES  41 OXRX   SATDO                    WDM   1041 TEST     ENGL AGGR REPL
RCHRES  51 OXRX   SATDO                    WDM   1051 TEST     ENGL AGGR REPL
RCHRES  61 OXRX   SATDO                    WDM   1061 TEST     ENGL AGGR REPL

*** WQ DSNS for Loughman ***
*** REACH 16 ***
RCHRES  16 NUTRX  DNUST  1            AVER WDM1  2001 NO3X     ENGL AGGR REPL
RCHRES  16 NUTRX  DNUST  2            AVER WDM1  2002 NH3X     ENGL AGGR REPL
RCHRES  16 PLANK  PKST3  4            AVER WDM1  2003 ORGN     ENGL AGGR REPL
RCHRES  16 PLANK  PKST4  1            AVER WDM1  2004 TOTN     ENGL AGGR REPL
RCHRES  16 NUTRX  DNUST  4            AVER WDM1  2005 PO4X     ENGL AGGR REPL
RCHRES  16 PLANK  PKST3  5            AVER WDM1  2006 ORGP     ENGL AGGR REPL
RCHRES  16 PLANK  PKST4  2            AVER WDM1  2007 TOTP     ENGL AGGR REPL
RCHRES  16 PLANK  PHYCLA              AVER WDM1  2008 CHLA     ENGL AGGR REPL
RCHRES  16 PLANK  PKST3  6            AVER WDM1  2009 TOCX     ENGL AGGR REPL
RCHRES  16 OXRX   DOX                 AVER WDM1  2010 DOXX     ENGL AGGR REPL
RCHRES  16 OXRX   BOD                 AVER WDM1  2011 BODX     ENGL AGGR REPL
RCHRES  16 PLANK  TPKCF1 4            SUM  WDM1  2012 TNLD     ENGL AGGR REPL
RCHRES  16 PLANK  TPKCF1 5            SUM  WDM1  2013 TPLD     ENGL AGGR REPL
RCHRES  16 NUTRX  NUCF1  1            SUM  WDM1  2014 NO3L     ENGL AGGR REPL
RCHRES  16 NUTRX  NUCF1  2            SUM  WDM1  2225 NH3L     ENGL AGGR REPL
RCHRES  16 NUTRX  NUCF1  4            SUM  WDM1  2226 PO4L     ENGL AGGR REPL

*** WQ DSNS for Davenport Creek ***
*** REACH 61 ***
RCHRES  61 NUTRX  DNUST  1            AVER WDM1  2015 NO3X     ENGL AGGR REPL
RCHRES  61 NUTRX  DNUST  2            AVER WDM1  2016 NH3X     ENGL AGGR REPL
RCHRES  61 PLANK  PKST3  4            AVER WDM1  2017 ORGN     ENGL AGGR REPL
RCHRES  61 PLANK  PKST4  1            AVER WDM1  2018 TOTN     ENGL AGGR REPL
RCHRES  61 NUTRX  DNUST  4            AVER WDM1  2019 PO4X     ENGL AGGR REPL
RCHRES  61 PLANK  PKST3  5            AVER WDM1  2020 ORGP     ENGL AGGR REPL
RCHRES  61 PLANK  PKST4  2            AVER WDM1  2021 TOTP     ENGL AGGR REPL
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RCHRES  61 PLANK  PHYTO               AVER WDM1  2022 CHLA     ENGL AGGR REPL
RCHRES  61 PLANK  PKST3  6            AVER WDM1  2023 TOCX     ENGL AGGR REPL
RCHRES  61 OXRX   DOX                 AVER WDM1  2024 DOXX     ENGL AGGR REPL
RCHRES  61 OXRX   BOD                 AVER WDM1  2025 BODX     ENGL AGGR REPL
RCHRES  61 PLANK  TPKCF1 4            SUM  WDM1  2026 TNLD     ENGL AGGR REPL
RCHRES  61 PLANK  TPKCF1 5            SUM  WDM1  2027 TPLD     ENGL AGGR REPL
RCHRES  61 NUTRX  NUCF1  1            SUM  WDM1  2028 NO3L     ENGL AGGR REPL
RCHRES  61 NUTRX  NUCF1  2            SUM  WDM1  2227 NH3L     ENGL AGGR REPL
RCHRES  61 NUTRX  NUCF1  4            SUM  WDM1  2228 PO4L     ENGL AGGR REPL

*** WQ DSNS for Reedy Creek at S-40 ***
*** REACH 15 ***
RCHRES  15 NUTRX  DNUST  1            AVER WDM1  2029 NO3X     ENGL AGGR REPL
RCHRES  15 NUTRX  DNUST  2            AVER WDM1  2030 NH3X     ENGL AGGR REPL
RCHRES  15 PLANK  PKST3  4            AVER WDM1  2031 ORGN     ENGL AGGR REPL
RCHRES  15 PLANK  PKST4  1            AVER WDM1  2032 TOTN     ENGL AGGR REPL
RCHRES  15 NUTRX  DNUST  4            AVER WDM1  2033 PO4X     ENGL AGGR REPL
RCHRES  15 PLANK  PKST3  5            AVER WDM1  2034 ORGP     ENGL AGGR REPL
RCHRES  15 PLANK  PKST4  2            AVER WDM1  2035 TOTP     ENGL AGGR REPL
RCHRES  15 PLANK  PHYTO               AVER WDM1  2036 CHLA     ENGL AGGR REPL
RCHRES  15 PLANK  PKST3  6            AVER WDM1  2037 TOCX     ENGL AGGR REPL
RCHRES  15 OXRX   DOX                 AVER WDM1  2038 DOXX     ENGL AGGR REPL
RCHRES  15 OXRX   BOD                 AVER WDM1  2039 BODX     ENGL AGGR REPL
RCHRES  15 PLANK  TPKCF1 4            SUM  WDM1  2040 TNLD     ENGL AGGR REPL
RCHRES  15 PLANK  TPKCF1 5            SUM  WDM1  2041 TPLD     ENGL AGGR REPL
RCHRES  15 NUTRX  NUCF1  1            SUM  WDM1  2042 NO3L     ENGL AGGR REPL
RCHRES  15 NUTRX  NUCF1  2            SUM  WDM1  2229 NH3L     ENGL AGGR REPL
RCHRES  15 NUTRX  NUCF1  4            SUM  WDM1  2230 PO4L     ENGL AGGR REPL

*** WQ DSNS for Reedy Creek near Vineland ***
*** REACH 7 ***
RCHRES   7 NUTRX  DNUST  1            AVER WDM1  2043 NO3X     ENGL AGGR REPL
RCHRES   7 NUTRX  DNUST  2            AVER WDM1  2044 NH3X     ENGL AGGR REPL
RCHRES   7 PLANK  PKST3  4            AVER WDM1  2045 ORGN     ENGL AGGR REPL
RCHRES   7 PLANK  PKST4  1            AVER WDM1  2046 TOTN     ENGL AGGR REPL
RCHRES   7 NUTRX  DNUST  4            AVER WDM1  2047 PO4X     ENGL AGGR REPL
RCHRES   7 PLANK  PKST3  5            AVER WDM1  2048 ORGP     ENGL AGGR REPL
RCHRES   7 PLANK  PKST4  2            AVER WDM1  2049 TOTP     ENGL AGGR REPL
RCHRES   7 PLANK  PHYTO               AVER WDM1  2050 CHLA     ENGL AGGR REPL
RCHRES   7 PLANK  PKST3  6            AVER WDM1  2051 TOCX     ENGL AGGR REPL
RCHRES   7 OXRX   DOX                 AVER WDM1  2052 DOXX     ENGL AGGR REPL
RCHRES   7 OXRX   BOD                 AVER WDM1  2053 BODX     ENGL AGGR REPL
RCHRES   7 PLANK  TPKCF1 4            SUM  WDM1  2054 TNLD     ENGL AGGR REPL
RCHRES   7 PLANK  TPKCF1 5            SUM  WDM1  2055 TPLD     ENGL AGGR REPL
RCHRES   7 NUTRX  NUCF1  1            SUM  WDM1  2056 NO3L     ENGL AGGR REPL
RCHRES   7 NUTRX  NUCF1  2            SUM  WDM1  2231 NH3L     ENGL AGGR REPL
RCHRES   7 NUTRX  NUCF1  4            SUM  WDM1  2232 PO4L     ENGL AGGR REPL

*** WQ DSNS for Bonnet Creek near Vineland ***
*** REACH 13 ***
RCHRES  13 NUTRX  DNUST  1            AVER WDM1  2057 NO3X     ENGL AGGR REPL
RCHRES  13 NUTRX  DNUST  2            AVER WDM1  2058 NH3X     ENGL AGGR REPL
RCHRES  13 PLANK  PKST3  4            AVER WDM1  2059 ORGN     ENGL AGGR REPL
RCHRES  13 PLANK  PKST4  1            AVER WDM1  2060 TOTN     ENGL AGGR REPL
RCHRES  13 NUTRX  DNUST  4            AVER WDM1  2061 PO4X     ENGL AGGR REPL
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RCHRES  13 PLANK  PKST3  5            AVER WDM1  2062 ORGP      ENGL AGGR REPL
RCHRES  13 PLANK  PKST4  2            AVER WDM1  2063 TOTP      ENGL AGGR REPL
RCHRES  13 PLANK  PHYTO               AVER WDM1  2064 CHLA      ENGL AGGR REPL
RCHRES  13 PLANK  PKST3  6            AVER WDM1  2065 TOCX      ENGL AGGR REPL
RCHRES  13 OXRX   DOX                 AVER WDM1  2066 DOXX      ENGL AGGR REPL
RCHRES  13 OXRX   BOD                 AVER WDM1  2067 BODX      ENGL AGGR REPL
RCHRES  13 PLANK  TPKCF1 4            SUM  WDM1  2068 TNLD      ENGL AGGR REPL
RCHRES  13 PLANK  TPKCF1 5            SUM  WDM1  2069 TPLD      ENGL AGGR REPL
RCHRES  13 NUTRX  NUCF1  1            SUM  WDM1  2070 NO3L      ENGL AGGR REPL
RCHRES  13 NUTRX  NUCF1  2            SUM  WDM1  2233 NH3L      ENGL AGGR REPL
RCHRES  13 NUTRX  NUCF1  4            SUM  WDM1  2234 PO4L      ENGL AGGR REPL

*** WQ DSNS for Whittenhorse Creek ***
*** REACH 51 ***
RCHRES  51 NUTRX  DNUST  1            AVER WDM1  2071 NO3X      ENGL AGGR REPL
RCHRES  51 NUTRX  DNUST  2            AVER WDM1  2072 NH3X      ENGL AGGR REPL
RCHRES  51 PLANK  PKST3  4            AVER WDM1  2073 ORGN      ENGL AGGR REPL
RCHRES  51 PLANK  PKST4  1            AVER WDM1  2074 TOTN      ENGL AGGR REPL
RCHRES  51 NUTRX  DNUST  4            AVER WDM1  2075 PO4X      ENGL AGGR REPL
RCHRES  51 PLANK  PKST3  5            AVER WDM1  2076 ORGP      ENGL AGGR REPL
RCHRES  51 PLANK  PKST4  2            AVER WDM1  2077 TOTP      ENGL AGGR REPL
RCHRES  51 PLANK  PHYTO               AVER WDM1  2078 CHLA      ENGL AGGR REPL
RCHRES  51 PLANK  PKST3  6            AVER WDM1  2079 TOCX      ENGL AGGR REPL
RCHRES  51 OXRX   DOX                 AVER WDM1  2080 DOXX      ENGL AGGR REPL
RCHRES  51 OXRX   BOD                 AVER WDM1  2081 BODX      ENGL AGGR REPL
RCHRES  51 PLANK  TPKCF1 4            SUM  WDM1  2082 TNLD      ENGL AGGR REPL
RCHRES  51 PLANK  TPKCF1 5            SUM  WDM1  2083 TPLD      ENGL AGGR REPL
RCHRES  51 NUTRX  NUCF1  1            SUM  WDM1  2084 NO3L      ENGL AGGR REPL
RCHRES  51 NUTRX  NUCF1  2            SUM  WDM1  2235 NH3L      ENGL AGGR REPL
RCHRES  51 NUTRX  NUCF1  4            SUM  WDM1  2236 PO4L      ENGL AGGR REPL

*** WQ DSNS for Upper West Reedy Creek @ S-46 ***
*** REACH 41 ***
RCHRES  41 NUTRX  DNUST  1            AVER WDM1  2085 NO3X      ENGL AGGR REPL
RCHRES  41 NUTRX  DNUST  2            AVER WDM1  2086 NH3X      ENGL AGGR REPL
RCHRES  41 PLANK  PKST3  4            AVER WDM1  2087 ORGN      ENGL AGGR REPL
RCHRES  41 PLANK  PKST4  1            AVER WDM1  2088 TOTN      ENGL AGGR REPL
RCHRES  41 NUTRX  DNUST  4            AVER WDM1  2089 PO4X      ENGL AGGR REPL
RCHRES  41 PLANK  PKST3  5            AVER WDM1  2090 ORGP      ENGL AGGR REPL
RCHRES  41 PLANK  PKST4  2            AVER WDM1  2091 TOTP      ENGL AGGR REPL
RCHRES  41 PLANK  PHYTO               AVER WDM1  2092 CHLA      ENGL AGGR REPL
RCHRES  41 PLANK  PKST3  6            AVER WDM1  2093 TOCX      ENGL AGGR REPL
RCHRES  41 OXRX   DOX                 AVER WDM1  2094 DOXX      ENGL AGGR REPL
RCHRES  41 OXRX   BOD                 AVER WDM1  2095 BODX      ENGL AGGR REPL
RCHRES  41 PLANK  TPKCF1 4            SUM  WDM1  2096 TNLD      ENGL AGGR REPL
RCHRES  41 PLANK  TPKCF1 5            SUM  WDM1  2097 TPLD      ENGL AGGR REPL
RCHRES  41 NUTRX  NUCF1  1            SUM  WDM1  2098 NO3L      ENGL AGGR REPL
RCHRES  41 NUTRX  NUCF1  2            SUM  WDM1  2237 NH3L      ENGL AGGR REPL
RCHRES  41 NUTRX  NUCF1  4            SUM  WDM1  2238 PO4L      ENGL AGGR REPL
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*** WQ DSNS for Upper East Reedy Creek @ S-405A ***
*** REACH 31 ***
RCHRES  31 NUTRX  DNUST  1            AVER WDM1  2099 NO3X     ENGL AGGR REPL
RCHRES  31 NUTRX  DNUST  2            AVER WDM1  2100 NH3X     ENGL AGGR REPL
RCHRES  31 PLANK  PKST3  4            AVER WDM1  2101 ORGN     ENGL AGGR REPL
RCHRES  31 PLANK  PKST4  1            AVER WDM1  2102 TOTN     ENGL AGGR REPL
RCHRES  31 NUTRX  DNUST  4            AVER WDM1  2103 PO4X     ENGL AGGR REPL
RCHRES  31 PLANK  PKST3  5            AVER WDM1  2104 ORGP     ENGL AGGR REPL
RCHRES  31 PLANK  PKST4  2            AVER WDM1  2105 TOTP     ENGL AGGR REPL
RCHRES  31 PLANK  PHYTO               AVER WDM1  2106 CHLA     ENGL AGGR REPL
RCHRES  31 PLANK  PKST3  6            AVER WDM1  2107 TOCX     ENGL AGGR REPL
RCHRES  31 OXRX   DOX                 AVER WDM1  2108 DOXX     ENGL AGGR REPL
RCHRES  31 OXRX   BOD                 AVER WDM1  2109 BODX     ENGL AGGR REPL
RCHRES  31 PLANK  TPKCF1 4            SUM  WDM1  2110 TNLD     ENGL AGGR REPL
RCHRES  31 PLANK  TPKCF1 5            SUM  WDM1  2111 TPLD     ENGL AGGR REPL
RCHRES  31 NUTRX  NUCF1  1            SUM  WDM1  2112 NO3L     ENGL AGGR REPL
RCHRES  31 NUTRX  NUCF1  2            SUM  WDM1  2239 NH3L     ENGL AGGR REPL
RCHRES  31 NUTRX  NUCF1  4            SUM  WDM1  2240 PO4L     ENGL AGGR REPL

*** WQ DSNS for Lateral 405 at S-405 ***
*** REACH 3 ***
RCHRES   3 NUTRX  DNUST  1            AVER WDM1  2113 NO3X     ENGL AGGR REPL
RCHRES   3 NUTRX  DNUST  2            AVER WDM1  2114 NH3X     ENGL AGGR REPL
RCHRES   3 PLANK  PKST3  4            AVER WDM1  2115 ORGN     ENGL AGGR REPL
RCHRES   3 PLANK  PKST4  1            AVER WDM1  2116 TOTN     ENGL AGGR REPL
RCHRES   3 NUTRX  DNUST  4            AVER WDM1  2117 PO4X     ENGL AGGR REPL
RCHRES   3 PLANK  PKST3  5            AVER WDM1  2118 ORGP     ENGL AGGR REPL
RCHRES   3 PLANK  PKST4  2            AVER WDM1  2119 TOTP     ENGL AGGR REPL
RCHRES   3 PLANK  PHYTO               AVER WDM1  2120 CHLA     ENGL AGGR REPL
RCHRES   3 PLANK  PKST3  6            AVER WDM1  2121 TOCX     ENGL AGGR REPL
RCHRES   3 OXRX   DOX                 AVER WDM1  2122 DOXX     ENGL AGGR REPL
RCHRES   3 OXRX   BOD                 AVER WDM1  2123 BODX     ENGL AGGR REPL
RCHRES   3 PLANK  TPKCF1 4            SUM  WDM1  2124 TNLD     ENGL AGGR REPL
RCHRES   3 PLANK  TPKCF1 5            SUM  WDM1  2125 TPLD     ENGL AGGR REPL
RCHRES   3 NUTRX  NUCF1  1            SUM  WDM1  2126 NO3L     ENGL AGGR REPL
RCHRES   3 NUTRX  NUCF1  2            SUM  WDM1  2241 NH3L     ENGL AGGR REPL
RCHRES   3 NUTRX  NUCF1  4            SUM  WDM1  2242 PO4L     ENGL AGGR REPL

*** WQ DSNS for Reedy Creek at I-4 ***
*** REACH 8 ***
RCHRES   8 NUTRX  DNUST  1            AVER WDM1  2127 NO3X     ENGL AGGR REPL
RCHRES   8 NUTRX  DNUST  2            AVER WDM1  2128 NH3X     ENGL AGGR REPL
RCHRES   8 PLANK  PKST3  4            AVER WDM1  2129 ORGN     ENGL AGGR REPL
RCHRES   8 PLANK  PKST4  1            AVER WDM1  2130 TOTN     ENGL AGGR REPL
RCHRES   8 NUTRX  DNUST  4            AVER WDM1  2131 PO4X     ENGL AGGR REPL
RCHRES   8 PLANK  PKST3  5            AVER WDM1  2132 ORGP     ENGL AGGR REPL
RCHRES   8 PLANK  PKST4  2            AVER WDM1  2133 TOTP     ENGL AGGR REPL
RCHRES   8 PLANK  PHYTO               AVER WDM1  2134 CHLA     ENGL AGGR REPL
RCHRES   8 PLANK  PKST3  6            AVER WDM1  2135 TOCX     ENGL AGGR REPL
RCHRES   8 OXRX   DOX                 AVER WDM1  2136 DOXX     ENGL AGGR REPL
RCHRES   8 OXRX   BOD                 AVER WDM1  2137 BODX     ENGL AGGR REPL
RCHRES   8 PLANK  TPKCF1 4            SUM  WDM1  2138 TNLD     ENGL AGGR REPL
RCHRES   8 PLANK  TPKCF1 5            SUM  WDM1  2139 TPLD     ENGL AGGR REPL
RCHRES   8 NUTRX  NUCF1  1            SUM  WDM1  2140 NO3L     ENGL AGGR REPL
RCHRES   8 NUTRX  NUCF1  2            SUM  WDM1  2243 NH3L     ENGL AGGR REPL
RCHRES   8 NUTRX  NUCF1  4            SUM  WDM1  2244 PO4L     ENGL AGGR REPL
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*** WQ DSNS for Bay Lake/Seven Seas ***
*** REACH 2 ***
RCHRES   2 NUTRX  DNUST  1            AVER WDM1  2141 NO3X     ENGL AGGR REPL
RCHRES   2 NUTRX  DNUST  2            AVER WDM1  2142 NH3X     ENGL AGGR REPL
RCHRES   2 PLANK  PKST3  4            AVER WDM1  2143 ORGN     ENGL AGGR REPL
RCHRES   2 PLANK  PKST4  1            AVER WDM1  2144 TOTN     ENGL AGGR REPL
RCHRES   2 NUTRX  DNUST  4            AVER WDM1  2145 PO4X     ENGL AGGR REPL
RCHRES   2 PLANK  PKST3  5            AVER WDM1  2146 ORGP     ENGL AGGR REPL
RCHRES   2 PLANK  PKST4  2            AVER WDM1  2147 TOTP     ENGL AGGR REPL
RCHRES   2 PLANK  PHYTO               AVER WDM1  2148 CHLA     ENGL AGGR REPL
RCHRES   2 PLANK  PKST3  6            AVER WDM1  2149 TOCX     ENGL AGGR REPL
RCHRES   2 OXRX   DOX                 AVER WDM1  2150 DOXX     ENGL AGGR REPL
RCHRES   2 OXRX   BOD                 AVER WDM1  2151 BODX     ENGL AGGR REPL
RCHRES   2 PLANK  TPKCF1 4            SUM  WDM1  2152 TNLD     ENGL AGGR REPL
RCHRES   2 PLANK  TPKCF1 5            SUM  WDM1  2153 TPLD     ENGL AGGR REPL
RCHRES   2 NUTRX  NUCF1  1            SUM  WDM1  2154 NO3L     ENGL AGGR REPL
RCHRES   2 NUTRX  NUCF1  2            SUM  WDM1  2245 NH3L     ENGL AGGR REPL
RCHRES   2 NUTRX  NUCF1  4            SUM  WDM1  2246 PO4L     ENGL AGGR REPL

*** WQ DSNS for Lake Mabel/South Lake
*** REACH 9 ***
RCHRES   9 NUTRX  DNUST  1            AVER WDM1  2155 NO3X     ENGL AGGR REPL
RCHRES   9 NUTRX  DNUST  2            AVER WDM1  2156 NH3X     ENGL AGGR REPL
RCHRES   9 PLANK  PKST3  4            AVER WDM1  2157 ORGN     ENGL AGGR REPL
RCHRES   9 PLANK  PKST4  1            AVER WDM1  2158 TOTN     ENGL AGGR REPL
RCHRES   9 NUTRX  DNUST  4            AVER WDM1  2159 PO4X     ENGL AGGR REPL
RCHRES   9 PLANK  PKST3  5            AVER WDM1  2160 ORGP     ENGL AGGR REPL
RCHRES   9 PLANK  PKST4  2            AVER WDM1  2161 TOTP     ENGL AGGR REPL
RCHRES   9 PLANK  PHYTO               AVER WDM1  2162 CHLA     ENGL AGGR REPL
RCHRES   9 PLANK  PKST3  6            AVER WDM1  2163 TOCX     ENGL AGGR REPL
RCHRES   9 OXRX   DOX                 AVER WDM1  2164 DOXX     ENGL AGGR REPL
RCHRES   9 OXRX   BOD                 AVER WDM1  2165 BODX     ENGL AGGR REPL
RCHRES   9 PLANK  TPKCF1 4            SUM  WDM1  2166 TNLD     ENGL AGGR REPL
RCHRES   9 PLANK  TPKCF1 5            SUM  WDM1  2167 TPLD     ENGL AGGR REPL
RCHRES   9 NUTRX  NUCF1  1            SUM  WDM1  2168 NO3L     ENGL AGGR REPL
RCHRES   9 NUTRX  NUCF1  2            SUM  WDM1  2247 NH3L     ENGL AGGR REPL
RCHRES   9 NUTRX  NUCF1  4            SUM  WDM1  2248 PO4L     ENGL AGGR REPL

*** WQ DSNS for Lower L-405 ***
*** REACH 6 ***
RCHRES   6 NUTRX  DNUST  1            AVER WDM1  2169 NO3X     ENGL AGGR REPL
RCHRES   6 NUTRX  DNUST  2            AVER WDM1  2170 NH3X     ENGL AGGR REPL
RCHRES   6 PLANK  PKST3  4            AVER WDM1  2171 ORGN     ENGL AGGR REPL
RCHRES   6 PLANK  PKST4  1            AVER WDM1  2172 TOTN     ENGL AGGR REPL
RCHRES   6 NUTRX  DNUST  4            AVER WDM1  2173 PO4X     ENGL AGGR REPL
RCHRES   6 PLANK  PKST3  5            AVER WDM1  2174 ORGP     ENGL AGGR REPL
RCHRES   6 PLANK  PKST4  2            AVER WDM1  2175 TOTP     ENGL AGGR REPL
RCHRES   6 PLANK  PHYTO               AVER WDM1  2176 CHLA     ENGL AGGR REPL
RCHRES   6 PLANK  PKST3  6            AVER WDM1  2177 TOCX     ENGL AGGR REPL
RCHRES   6 OXRX   DOX                 AVER WDM1  2178 DOXX     ENGL AGGR REPL
RCHRES   6 OXRX   BOD                 AVER WDM1  2179 BODX     ENGL AGGR REPL
RCHRES   6 PLANK  TPKCF1 4            SUM  WDM1  2180 TNLD     ENGL AGGR REPL
RCHRES   6 PLANK  TPKCF1 5            SUM  WDM1  2181 TPLD     ENGL AGGR REPL
RCHRES   6 NUTRX  NUCF1  1            SUM  WDM1  2182 NO3L     ENGL AGGR REPL
RCHRES   6 NUTRX  NUCF1  2            SUM  WDM1  2249 NH3L     ENGL AGGR REPL
RCHRES   6 NUTRX  NUCF1  4            SUM  WDM1  2250 PO4L     ENGL AGGR REPL
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*** WQ DSNS for L-103, Buena Vista ***
*** REACH 11 ***
RCHRES  11 NUTRX  DNUST  1            AVER WDM1  2183 NO3X     ENGL AGGR REPL
RCHRES  11 NUTRX  DNUST  2            AVER WDM1  2184 NH3X     ENGL AGGR REPL
RCHRES  11 PLANK  PKST3  4            AVER WDM1  2185 ORGN     ENGL AGGR REPL
RCHRES  11 PLANK  PKST4  1            AVER WDM1  2186 TOTN     ENGL AGGR REPL
RCHRES  11 NUTRX  DNUST  4            AVER WDM1  2187 PO4X     ENGL AGGR REPL
RCHRES  11 PLANK  PKST3  5            AVER WDM1  2188 ORGP     ENGL AGGR REPL
RCHRES  11 PLANK  PKST4  2            AVER WDM1  2189 TOTP     ENGL AGGR REPL
RCHRES  11 PLANK  PHYTO               AVER WDM1  2190 CHLA     ENGL AGGR REPL
RCHRES  11 PLANK  PKST3  6            AVER WDM1  2191 TOCX     ENGL AGGR REPL
RCHRES  11 OXRX   DOX                 AVER WDM1  2192 DOXX     ENGL AGGR REPL
RCHRES  11 OXRX   BOD                 AVER WDM1  2193 BODX     ENGL AGGR REPL
RCHRES  11 PLANK  TPKCF1 4            SUM  WDM1  2194 TNLD     ENGL AGGR REPL
RCHRES  11 PLANK  TPKCF1 5            SUM  WDM1  2195 TPLD     ENGL AGGR REPL
RCHRES  11 NUTRX  NUCF1  1            SUM  WDM1  2196 NO3L     ENGL AGGR REPL
RCHRES  11 NUTRX  NUCF1  2            SUM  WDM1  2251 NH3L     ENGL AGGR REPL
RCHRES  11 NUTRX  NUCF1  4            SUM  WDM1  2252 PO4L     ENGL AGGR REPL

*** WQ DSNS for L-105 ***
*** REACH 10 ***
RCHRES  10 NUTRX  DNUST  1            AVER WDM1  2197 NO3X     ENGL AGGR REPL
RCHRES  10 NUTRX  DNUST  2            AVER WDM1  2198 NH3X     ENGL AGGR REPL
RCHRES  10 PLANK  PKST3  4            AVER WDM1  2199 ORGN     ENGL AGGR REPL
RCHRES  10 PLANK  PKST4  1            AVER WDM1  2200 TOTN     ENGL AGGR REPL
RCHRES  10 NUTRX  DNUST  4            AVER WDM1  2201 PO4X     ENGL AGGR REPL
RCHRES  10 PLANK  PKST3  5            AVER WDM1  2202 ORGP     ENGL AGGR REPL
RCHRES  10 PLANK  PKST4  2            AVER WDM1  2203 TOTP     ENGL AGGR REPL
RCHRES  10 PLANK  PHYTO               AVER WDM1  2204 CHLA     ENGL AGGR REPL
RCHRES  10 PLANK  PKST3  6            AVER WDM1  2205 TOCX     ENGL AGGR REPL
RCHRES  10 OXRX   DOX                 AVER WDM1  2206 DOXX     ENGL AGGR REPL
RCHRES  10 OXRX   BOD                 AVER WDM1  2207 BODX     ENGL AGGR REPL
RCHRES  10 PLANK  TPKCF1 4            SUM  WDM1  2208 TNLD     ENGL AGGR REPL
RCHRES  10 PLANK  TPKCF1 5            SUM  WDM1  2209 TPLD     ENGL AGGR REPL
RCHRES  10 NUTRX  NUCF1  1            SUM  WDM1  2210 NO3L     ENGL AGGR REPL
RCHRES  10 NUTRX  NUCF1  2            SUM  WDM1  2253 NH3L     ENGL AGGR REPL
RCHRES  10 NUTRX  NUCF1  4            SUM  WDM1  2254 PO4L     ENGL AGGR REPL

*** WQ DSNS for L-403 - EPCOT ***
*** REACH 5 ***
RCHRES   5 NUTRX  DNUST  1            AVER WDM1  2211 NO3X     ENGL AGGR REPL
RCHRES   5 NUTRX  DNUST  2            AVER WDM1  2212 NH3X     ENGL AGGR REPL
RCHRES   5 PLANK  PKST3  4            AVER WDM1  2213 ORGN     ENGL AGGR REPL
RCHRES   5 PLANK  PKST4  1            AVER WDM1  2214 TOTN     ENGL AGGR REPL
RCHRES   5 NUTRX  DNUST  4            AVER WDM1  2215 PO4X     ENGL AGGR REPL
RCHRES   5 PLANK  PKST3  5            AVER WDM1  2216 ORGP     ENGL AGGR REPL
RCHRES   5 PLANK  PKST4  2            AVER WDM1  2217 TOTP     ENGL AGGR REPL
RCHRES   5 PLANK  PHYTO               AVER WDM1  2218 CHLA     ENGL AGGR REPL
RCHRES   5 PLANK  PKST3  6            AVER WDM1  2219 TOCX     ENGL AGGR REPL
RCHRES   5 OXRX   DOX                 AVER WDM1  2220 DOXX     ENGL AGGR REPL
RCHRES   5 OXRX   BOD                 AVER WDM1  2221 BODX     ENGL AGGR REPL
RCHRES   5 PLANK  TPKCF1 4            SUM  WDM1  2222 TNLD     ENGL AGGR REPL
RCHRES   5 PLANK  TPKCF1 5            SUM  WDM1  2223 TPLD     ENGL AGGR REPL
RCHRES   5 NUTRX  NUCF1  1            SUM  WDM1  2224 NO3L     ENGL AGGR REPL
RCHRES   5 NUTRX  NUCF1  2            SUM  WDM1  2255 NH3L     ENGL AGGR REPL
RCHRES   5 NUTRX  NUCF1  4            SUM  WDM1  2256 PO4L     ENGL AGGR REPL
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*** WQ DSNS for C-4 ***
*** REACH 4 ***
RCHRES   4 NUTRX  DNUST  1            AVER WDM1  2257 NO3X     ENGL AGGR REPL
RCHRES   4 NUTRX  DNUST  2            AVER WDM1  2258 NH3X     ENGL AGGR REPL
RCHRES   4 PLANK  PKST3  4            AVER WDM1  2259 ORGN     ENGL AGGR REPL
RCHRES   4 PLANK  PKST4  1            AVER WDM1  2260 TOTN     ENGL AGGR REPL
RCHRES   4 NUTRX  DNUST  4            AVER WDM1  2261 PO4X     ENGL AGGR REPL
RCHRES   4 PLANK  PKST3  5            AVER WDM1  2262 ORGP     ENGL AGGR REPL
RCHRES   4 PLANK  PKST4  2            AVER WDM1  2263 TOTP     ENGL AGGR REPL
RCHRES   4 PLANK  PHYTO               AVER WDM1  2264 CHLA     ENGL AGGR REPL
RCHRES   4 PLANK  PKST3  6            AVER WDM1  2265 TOCX     ENGL AGGR REPL
RCHRES   4 OXRX   DOX                 AVER WDM1  2266 DOXX     ENGL AGGR REPL
RCHRES   4 OXRX   BOD                 AVER WDM1  2267 BODX     ENGL AGGR REPL
RCHRES   4 PLANK  TPKCF1 4            SUM  WDM1  2268 TNLD     ENGL AGGR REPL
RCHRES   4 PLANK  TPKCF1 5            SUM  WDM1  2269 TPLD     ENGL AGGR REPL
RCHRES   4 NUTRX  NUCF1  1            SUM  WDM1  2270 NO3L     ENGL AGGR REPL
RCHRES   4 NUTRX  NUCF1  2            SUM  WDM1  2271 NH3L     ENGL AGGR REPL
RCHRES   4 NUTRX  NUCF1  4            SUM  WDM1  2272 PO4L     ENGL AGGR REPL

*** WQ DSNS for L-107/UPPER C-1 ***
*** REACH 12 ***
RCHRES  12 NUTRX  DNUST  1            AVER WDM1  2273 NO3X     ENGL AGGR REPL
RCHRES  12 NUTRX  DNUST  2            AVER WDM1  2274 NH3X     ENGL AGGR REPL
RCHRES  12 PLANK  PKST3  4            AVER WDM1  2275 ORGN     ENGL AGGR REPL
RCHRES  12 PLANK  PKST4  1            AVER WDM1  2276 TOTN     ENGL AGGR REPL
RCHRES  12 NUTRX  DNUST  4            AVER WDM1  2277 PO4X     ENGL AGGR REPL
RCHRES  12 PLANK  PKST3  5            AVER WDM1  2278 ORGP     ENGL AGGR REPL
RCHRES  12 PLANK  PKST4  2            AVER WDM1  2279 TOTP     ENGL AGGR REPL
RCHRES  12 PLANK  PHYTO               AVER WDM1  2280 CHLA     ENGL AGGR REPL
RCHRES  12 PLANK  PKST3  6            AVER WDM1  2281 TOCX     ENGL AGGR REPL
RCHRES  12 OXRX   DOX                 AVER WDM1  2282 DOXX     ENGL AGGR REPL
RCHRES  12 OXRX   BOD                 AVER WDM1  2283 BODX     ENGL AGGR REPL
RCHRES  12 PLANK  TPKCF1 4            SUM  WDM1  2284 TNLD     ENGL AGGR REPL
RCHRES  12 PLANK  TPKCF1 5            SUM  WDM1  2285 TPLD     ENGL AGGR REPL
RCHRES  12 NUTRX  NUCF1  1            SUM  WDM1  2286 NO3L     ENGL AGGR REPL
RCHRES  12 NUTRX  NUCF1  2            SUM  WDM1  2287 NH3L     ENGL AGGR REPL
RCHRES  12 NUTRX  NUCF1  4            SUM  WDM1  2288 PO4L     ENGL AGGR REPL

*** WQ DSNS for LOWER C-1 ***
*** REACH 14 ***
RCHRES  14 NUTRX  DNUST  1            AVER WDM1  2289 NO3X     ENGL AGGR REPL
RCHRES  14 NUTRX  DNUST  2            AVER WDM1  2290 NH3X     ENGL AGGR REPL
RCHRES  14 PLANK  PKST3  4            AVER WDM1  2291 ORGN     ENGL AGGR REPL
RCHRES  14 PLANK  PKST4  1            AVER WDM1  2292 TOTN     ENGL AGGR REPL
RCHRES  14 NUTRX  DNUST  4            AVER WDM1  2293 PO4X     ENGL AGGR REPL
RCHRES  14 PLANK  PKST3  5            AVER WDM1  2294 ORGP     ENGL AGGR REPL
RCHRES  14 PLANK  PKST4  2            AVER WDM1  2295 TOTP     ENGL AGGR REPL
RCHRES  14 PLANK  PHYTO               AVER WDM1  2296 CHLA     ENGL AGGR REPL
RCHRES  14 PLANK  PKST3  6            AVER WDM1  2297 TOCX     ENGL AGGR REPL
RCHRES  14 OXRX   DOX                 AVER WDM1  2298 DOXX     ENGL AGGR REPL
RCHRES  14 OXRX   BOD                 AVER WDM1  2299 BODX     ENGL AGGR REPL
RCHRES  14 PLANK  TPKCF1 4            SUM  WDM1  2300 TNLD     ENGL AGGR REPL
RCHRES  14 PLANK  TPKCF1 5            SUM  WDM1  2301 TPLD     ENGL AGGR REPL
RCHRES  14 NUTRX  NUCF1  1            SUM  WDM1  2302 NO3L     ENGL AGGR REPL
RCHRES  14 NUTRX  NUCF1  2            SUM  WDM1  2303 NH3L     ENGL AGGR REPL
RCHRES  14 NUTRX  NUCF1  4            SUM  WDM1  2304 PO4L     ENGL AGGR REPL
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*** WHITTENHORSE CREEK
*** All acreage of segment 5 in Whittenhorse basin, i.e. area rch 51
RCHRES  51 HYDR   RO              1.0     WDM    411 FLOW     ENGL AGGR REPL
RCHRES  51 ROFLOW ROVOL      .00163049     WDM    418 SIMQ     ENGL AGGR REPL
COPY   102 OUTPUT MEAN   1   0.0001359     WDM    412 SURO     ENGL AGGR REPL
COPY   102 OUTPUT MEAN   2   0.0001359     WDM    413 IFWO     ENGL AGGR REPL
COPY   102 OUTPUT MEAN   3   0.0001359     WDM    414 AGWO     ENGL AGGR REPL
COPY   102 OUTPUT MEAN   4   0.0001359     WDM    419 PETX     ENGL AGGR REPL
COPY   102 OUTPUT MEAN   5   0.0001359     WDM    415 SAET     ENGL AGGR REPL
COPY   102 OUTPUT MEAN   6   0.0001359     WDM    416 UZSX     ENGL AGGR REPL
COPY   102 OUTPUT MEAN   7   0.0001359     WDM    417 LZSX     ENGL AGGR REPL

*** DAVENPORT CREEK
*** All acreage of segment 6 in Davenport basin, i.e. area rch 61
RCHRES  61 HYDR   RO              1.0     WDM    421 FLOW     ENGL AGGR REPL
RCHRES  61 ROFLOW ROVOL      .00116923     WDM    428 SIMQ     ENGL AGGR REPL
COPY   103 OUTPUT MEAN   1   0.0000974     WDM    422 SURO     ENGL AGGR REPL
COPY   103 OUTPUT MEAN   2   0.0000974     WDM    423 IFWO     ENGL AGGR REPL
COPY   103 OUTPUT MEAN   3   0.0000974     WDM    424 AGWO     ENGL AGGR REPL
COPY   103 OUTPUT MEAN   4   0.0000974     WDM    429 PETX     ENGL AGGR REPL
COPY   103 OUTPUT MEAN   5   0.0000974     WDM    425 SAET     ENGL AGGR REPL
COPY   103 OUTPUT MEAN   6   0.0000974     WDM    426 UZSX     ENGL AGGR REPL
COPY   103 OUTPUT MEAN   7   0.0000974     WDM    427 LZSX     ENGL AGGR REPL

*** REEDY CREEK @ HWY 192
*** Sum of areas rch 1, 2 (except half direct lake contrib area), rch 3-7
*** All segment 3
*** All Whittenhorse
RCHRES   7 HYDR   RO              1.0     WDM    431 FLOW     ENGL AGGR REPL
RCHRES   7 ROFLOW ROVOL      2.7686E-4     WDM    438 SIMQ     ENGL AGGR REPL
COPY   104 OUTPUT MEAN   1   2.3223E-5     WDM    432 SURO     ENGL AGGR REPL
COPY   104 OUTPUT MEAN   2   2.3223E-5     WDM    433 IFWO     ENGL AGGR REPL
COPY   104 OUTPUT MEAN   3   2.3223E-5     WDM    434 AGWO     ENGL AGGR REPL
COPY   104 OUTPUT MEAN   4   2.3223E-5     WDM    439 PETX     ENGL AGGR REPL
COPY   104 OUTPUT MEAN   5   2.3223E-5     WDM    435 SAET     ENGL AGGR REPL
COPY   104 OUTPUT MEAN   6   2.3223E-5     WDM    436 UZSX     ENGL AGGR REPL
COPY   104 OUTPUT MEAN   7   2.3223E-5     WDM    437 LZSX     ENGL AGGR REPL

*** BONNETT CREEK
*** Sum of areas rch 2 (except half direct lake contrib area), rch 9-13
*** All segment 2
RCHRES  13 HYDR   RO              1.0     WDM    441 FLOW     ENGL AGGR REPL
RCHRES  13 ROFLOW ROVOL      1.3820E-3     WDM    448 SIMQ     ENGL AGGR REPL
COPY   105 OUTPUT MEAN   1   1.1517E-4     WDM    442 SURO     ENGL AGGR REPL
COPY   105 OUTPUT MEAN   2   1.1517E-4     WDM    443 IFWO     ENGL AGGR REPL
COPY   105 OUTPUT MEAN   3   1.1517E-4     WDM    444 AGWO     ENGL AGGR REPL
COPY   105 OUTPUT MEAN   4   1.1517E-4     WDM    449 PETX     ENGL AGGR REPL
COPY   105 OUTPUT MEAN   5   1.1517E-4     WDM    445 SAET     ENGL AGGR REPL
COPY   105 OUTPUT MEAN   6   1.1517E-4     WDM    446 UZSX     ENGL AGGR REPL
COPY   105 OUTPUT MEAN   7   1.1517E-4     WDM    447 LZSX     ENGL AGGR REPL
```

```
*** REEDY CREEK @ LOUGHMAN
*** All segments 1-6
RCHRES  16 HYDR   RO                1.0      WDM    451 FLOW      ENGL AGGR REPL
RCHRES  16 ROFLOW ROVOL       1.5678E-4      WDM    458 SIMQ      ENGL AGGR REPL
COPY   106 OUTPUT MEAN   1   1.3065E-5      WDM    452 SURO      ENGL AGGR REPL
COPY   106 OUTPUT MEAN   2   1.3065E-5      WDM    453 IFWO      ENGL AGGR REPL
COPY   106 OUTPUT MEAN   3   1.3065E-5      WDM    454 AGWO      ENGL AGGR REPL
COPY   106 OUTPUT MEAN   4   1.3065E-5      WDM    459 PETX      ENGL AGGR REPL
COPY   106 OUTPUT MEAN   5   1.3065E-5      WDM    455 SAET      ENGL AGGR REPL
COPY   106 OUTPUT MEAN   6   1.3065E-5      WDM    456 UZSX      ENGL AGGR REPL
COPY   106 OUTPUT MEAN   7   1.3065E-5      WDM    457 LZSX      ENGL AGGR REPL

END EXT TARGETS

SCHEMATIC
<-Volume->                  <--Area-->     <-Volume->  <ML#> ***
<Name>   x                  <-factor->     <Name>   x        ***
*** Internal Basin
PERLND  11        ***              0.0     RCHRES   2      1
PERLND  12                         4.4     RCHRES   2      1
PERLND  13        ***              0.0     RCHRES   2      1
PERLND  14                         3.5     RCHRES   2      1
PERLND  15                         0.5     RCHRES   2      1
IMPLND  14                        19.6     RCHRES   2      2

PERLND  11                         2.0     RCHRES   3      1
PERLND  12                       219.6     RCHRES   3      1
PERLND  13                         1.3     RCHRES   3      1
PERLND  14                       287.3     RCHRES   3      1
PERLND  15                       555.7     RCHRES   3      1
IMPLND  14                      1622.3     RCHRES   3      2

PERLND  11                       149.8     RCHRES   4      1
PERLND  12                        65.5     RCHRES   4      1
PERLND  13                         5.5     RCHRES   4      1
PERLND  14                       192.7     RCHRES   4      1
PERLND  16                       792.8     RCHRES   4      1
PERLND  19        ***              0.0     RCHRES   4      1
IMPLND  14                      1904.0     RCHRES   4      2

PERLND  11        ***              0.0     RCHRES   5      1
PERLND  12                         4.4     RCHRES   5      1
PERLND  13        ***              0.0     RCHRES   5      1
PERLND  14                        96.7     RCHRES   5      1
PERLND  15                        86.6     RCHRES   5      1
IMPLND  14                       548.2     RCHRES   5      2

PERLND  11                       549.3     RCHRES   6      1
PERLND  12                       190.5     RCHRES   6      1
PERLND  13                       981.1     RCHRES   6      1
PERLND  14                      1006.9     RCHRES   6      1
PERLND  16                      3188.3     RCHRES   6      1
IMPLND  14                      2116.3     RCHRES   6      2

PERLND  11                         1.6     RCHRES   7      1
```

```
PERLND  12                        27.7     RCHRES    7      1
PERLND  13                        31.7     RCHRES    7      1
PERLND  14                       302.3     RCHRES    7      1
PERLND  15                      1041.3     RCHRES    7      1
IMPLND  14                      1675.8     RCHRES    7      2

PERLND  11                      1088.3     RCHRES    8      1
PERLND  12                       267.8     RCHRES    8      1
PERLND  13                       189.5     RCHRES    8      1
PERLND  14                        40.3     RCHRES    8      1
PERLND  18                      1636.3     RCHRES    8      1
IMPLND  14                       227.4     RCHRES    8      2

PERLND  11                       138.2     RCHRES    9      1
PERLND  12                        20.9     RCHRES    9      1
PERLND  13                       163.5     RCHRES    9      1
PERLND  14                       214.9     RCHRES    9      1
PERLND  15                       447.2     RCHRES    9      1
IMPLND  14                        68.2     RCHRES    9      2

PERLND  11        ***              0.0     RCHRES   10      1
PERLND  12                         0.2     RCHRES   10      1
PERLND  13                         9.1     RCHRES   10      1
PERLND  14                        79.0     RCHRES   10      1
PERLND  15                       283.9     RCHRES   10      1
IMPLND  14                       447.6     RCHRES   10      2

PERLND  11        ***              0.0     RCHRES   11      1
PERLND  12                        99.1     RCHRES   11      1
PERLND  13                         8.8     RCHRES   11      1
PERLND  14                       126.0     RCHRES   11      1
PERLND  15                       333.8     RCHRES   11      1
IMPLND  14                      1529.2     RCHRES   11      2

PERLND  11                        60.9     RCHRES   12      1
PERLND  12                        89.9     RCHRES   12      1
PERLND  13                        15.6     RCHRES   12      1
PERLND  14                       213.8     RCHRES   12      1
PERLND  15                       822.8     RCHRES   12      1
IMPLND  14                       806.2     RCHRES   12      2

PERLND  11        ***              0.0     RCHRES   13      1
PERLND  12                       202.8     RCHRES   13      1
PERLND  13                       942.6     RCHRES   13      1
PERLND  14                        87.7     RCHRES   13      1
PERLND  15                       724.6     RCHRES   13      1
IMPLND  14                       567.7     RCHRES   13      2

PERLND  11                       332.8     RCHRES   14      1
PERLND  12                       114.3     RCHRES   14      1
PERLND  13                       684.0     RCHRES   14      1
PERLND  14                       265.1     RCHRES   14      1
PERLND  17                      2304.1     RCHRES   14      1
IMPLND  14                       884.7     RCHRES   14      2
```

```
PERLND  11                      1319.6     RCHRES  15      1
PERLND  12                       120.3     RCHRES  15      1
PERLND  13                      1267.8     RCHRES  15      1
PERLND  14                       471.7     RCHRES  15      1
PERLND  18                      2925.2     RCHRES  15      1
IMPLND  14                       225.0     RCHRES  15      2

PERLND  11        ***              0.0     RCHRES  16      1
PERLND  12                       111.3     RCHRES  16      1
PERLND  13                       530.0     RCHRES  16      1
PERLND  14                        47.6     RCHRES  16      1
PERLND  18                      1098.5     RCHRES  16      1
IMPLND  14                        19.8     RCHRES  16      2

*** East Upper Reedy
PERLND  31                      2160.1     RCHRES  31      1
PERLND  32                       169.6     RCHRES  31      1
PERLND  33                      2305.3     RCHRES  31      1
PERLND  34                        64.3     RCHRES  31      1
PERLND  35                      2656.7     RCHRES  31      1
IMPLND  34                        30.1     RCHRES  31      2

*** West Upper Reedy
PERLND  31                      3806.0     RCHRES  41      1
PERLND  32                       215.9     RCHRES  41      1
PERLND  33                      3555.4     RCHRES  41      1
PERLND  34                       197.4     RCHRES  41      1
PERLND  35                      2085.8     RCHRES  41      1
PERLND  39        ***              0.0     RCHRES  41      1
IMPLND  34                       392.6     RCHRES  41      2

*** Whittenhorse
PERLND  51                      2002.0     RCHRES  51      1
PERLND  52                       173.3     RCHRES  51      1
PERLND  53                      1398.0     RCHRES  51      1
PERLND  54                       165.9     RCHRES  51      1
PERLND  55                      3200.9     RCHRES  51      1
PERLND  59        ***              0.0     RCHRES  51      1
IMPLND  54                       428.5     RCHRES  51      2

*** Davenport
PERLND  61                      4863.9     RCHRES  61      1
PERLND  62                       299.4     RCHRES  61      1
PERLND  63                      1706.0     RCHRES  61      1
PERLND  64                       388.9     RCHRES  61      1
PERLND  65                      2853.8     RCHRES  61      1
IMPLND  64                       156.3     RCHRES  61      2

*** Reach Connections
RCHRES  31                                 RCHRES   3      3
RCHRES  41                                 RCHRES   4      3
RCHRES  51                                 RCHRES   4      3
RCHRES   2                                 RCHRES   3      4
RCHRES   2                                 RCHRES  10      5
RCHRES   3                                 RCHRES   6      3
```

```
RCHRES   4                                 RCHRES   6      3
RCHRES   5                                 RCHRES   6      3
RCHRES   6                                 RCHRES   7      3
RCHRES   7                                 RCHRES   8      3
RCHRES   8                                 RCHRES  15      3
RCHRES   9                                 RCHRES  12      3
RCHRES  10                                 RCHRES  12      3
RCHRES  11                                 RCHRES  13      3
RCHRES  12                                 RCHRES  13      3
RCHRES  13                                 RCHRES  14      3
RCHRES  14                                 RCHRES  15      3
RCHRES  61                                 RCHRES  15      3
RCHRES  15                                 RCHRES  16      5

*** HSPEXP Datasets

*** Whittenhorse 02266200
*** All acreage of Segment 5
PERLND  51                      2002.0     COPY   102     90
PERLND  52                       173.3     COPY   102     90
PERLND  53                      1398.0     COPY   102     90
PERLND  54                       165.9     COPY   102     90
PERLND  55                      3200.9     COPY   102     90
PERLND  59        ***              0.0     COPY   102     90
IMPLND  54                       428.5     COPY   102     91

*** Davenport 02266480
*** All acreage of Segment 6
PERLND  61                      4863.9     COPY   103     90
PERLND  62                       299.4     COPY   103     90
PERLND  63                      1706.0     COPY   103     90
PERLND  64                       388.9     COPY   103     90
PERLND  65                      2853.8     COPY   103     90
IMPLND  64                       156.3     COPY   103     91

*** Reedy @ Hwy 192 02266300
*** sum areas rch 1, 2 (except half direct lake contrib area), 3-7
PERLND  11                      8670.8     COPY   104     90
PERLND  12                      1068.7     COPY   104     90
PERLND  13                      8278.3     COPY   104     90
PERLND  14                      2315.2     COPY   104     90
PERLND  15                      9627.4     COPY   104     90
PERLND  16                      3981.1     COPY   104     90
PERLND  19        ***              0.0     COPY   104     90
IMPLND  14                      7503.0     COPY   104     91

*** all Segment 3
PERLND  31                      5966.1     COPY   104     90
PERLND  32                       385.5     COPY   104     90
PERLND  33                      5860.7     COPY   104     90
PERLND  34                       261.7     COPY   104     90
PERLND  35                      4742.5     COPY   104     90
PERLND  39        ***              0.0     COPY   104     90
IMPLND  34                       422.7     COPY   104     91
```

```
*** all Whittenhorse
PERLND  51                      2002.0     COPY   104     90
PERLND  52                       173.3     COPY   104     90
PERLND  53                      1398.0     COPY   104     90
PERLND  54                       165.9     COPY   104     90
PERLND  55                      3200.9     COPY   104     90
PERLND  59        ***              0.0     COPY   104     90
IMPLND  54                       428.5     COPY   104     91

*** Bonnett 02264100
*** sum areas rch 2 (half lake contrib area only), 9-13
PERLND  11                       199.1     COPY   105     90
PERLND  12                       415.2     COPY   105     90
PERLND  13                      1139.6     COPY   105     90
PERLND  14                       723.2     COPY   105     90
PERLND  15                      2612.5     COPY   105     90
IMPLND  14                      3428.8     COPY   105     91

*** Reedy @ Loughman 02266500
*** all segment 1
PERLND  11                      3642.3     COPY   106     90
PERLND  12                      1538.9     COPY   106     90
PERLND  13                      4830.5     COPY   106     90
PERLND  14                      3435.4     COPY   106     90
PERLND  15                      4296.3     COPY   106     90
PERLND  16                      3981.1     COPY   106     90
PERLND  17                      2304.1     COPY   106     90
PERLND  18                      5660.0     COPY   106     90
PERLND  19        ***              0.0     COPY   106     90
IMPLND  14                     11437.6     COPY   106     91

*** all segment 3
PERLND  31                      5966.1     COPY   106     90
PERLND  32                       385.5     COPY   106     90
PERLND  33                      5860.7     COPY   106     90
PERLND  34                       261.7     COPY   106     90
PERLND  35                      4742.5     COPY   106     90
PERLND  39        ***              0.0     COPY   106     90
IMPLND  34                       422.7     COPY   106     91

*** all segment 5
PERLND  51                      2002.0     COPY   106     90
PERLND  52                       173.3     COPY   106     90
PERLND  53                      1398.0     COPY   106     90
PERLND  54                       165.9     COPY   106     90
PERLND  55                      3200.9     COPY   106     90
PERLND  59        ***              0.0     COPY   106     90
IMPLND  54                       428.5     COPY   106     91

*** All Segment 6
PERLND  61                      4863.9     COPY   106     90
PERLND  62                       299.4     COPY   106     90
PERLND  63                      1706.0     COPY   106     90
PERLND  64                       388.9     COPY   106     90
PERLND  65                      2853.8     COPY   106     90
IMPLND  64                       156.3     COPY   106     91
```

```
*** Total loadings report
*** all segment 1
PERLND  11                  3642.3     REPORT   1      8              1
PERLND  12                  1538.9     REPORT   1      8              2
PERLND  13                  4830.5     REPORT   1      8              3
PERLND  14                  3435.4     REPORT   1      8              4
PERLND  15                  4296.3     REPORT   1      8              5
PERLND  16                  3981.1     REPORT   1      8              5
PERLND  17                  2304.1     REPORT   1      8              5
PERLND  18                  5660.0     REPORT   1      8              5
PERLND  19        ***          0.0     REPORT   1      8              6
IMPLND  14                 11437.6     REPORT   1      9              7

*** all segment 3
PERLND  31                  5966.1     REPORT   3      8              1
PERLND  32                   385.5     REPORT   3      8              2
PERLND  33                  5860.7     REPORT   3      8              3
PERLND  34                   261.7     REPORT   3      8              4
PERLND  35                  4742.5     REPORT   3      8              5
PERLND  39        ***          0.0     REPORT   3      8              6
IMPLND  34                   422.7     REPORT   3      9              7

*** all segment 5
PERLND  51                  2002.0     REPORT   5      8              1
PERLND  52                   173.3     REPORT   5      8              2
PERLND  53                  1398.0     REPORT   5      8              3
PERLND  54                   165.9     REPORT   5      8              4
PERLND  55                  3200.9     REPORT   5      8              5
PERLND  59        ***          0.0     REPORT   5      8              6
IMPLND  54                   428.5     REPORT   5      9              7

*** all segment 6
PERLND  61                  4863.9     REPORT   6      8              1
PERLND  62                   299.4     REPORT   6      8              2
PERLND  63                  1706.0     REPORT   6      8              3
PERLND  64                   388.9     REPORT   6      8              4
PERLND  65                  2853.8     REPORT   6      8              5
IMPLND  64                   156.3     REPORT   6      9              7


*** Per acre loadings report ***
*** all segment 1
PERLND  11                             REPORT  11      8              1
PERLND  12                             REPORT  11      8              2
PERLND  13                             REPORT  11      8              3
PERLND  14                             REPORT  11      8              4
PERLND  15                    .3444    REPORT  11      8              5
PERLND  16                    .2361    REPORT  11      8              5
PERLND  17                    .1282    REPORT  11      8              5
PERLND  18                    .2913    REPORT  11      8              5
PERLND  19                             REPORT  11      8              6
IMPLND  14                             REPORT  11      9              7
```

```
*** all segment 3
PERLND  31                                REPORT  13      8              1
PERLND  32                                REPORT  13      8              2
PERLND  33                                REPORT  13      8              3
PERLND  34                                REPORT  13      8              4
PERLND  35                                REPORT  13      8              5
PERLND  39                                REPORT  13      8              6
IMPLND  34                                REPORT  13      9              7

*** all segment 5
PERLND  51                                REPORT  15      8              1
PERLND  52                                REPORT  15      8              2
PERLND  53                                REPORT  15      8              3
PERLND  54                                REPORT  15      8              4
PERLND  55                                REPORT  15      8              5
PERLND  59                                REPORT  15      8              6
IMPLND  54                                REPORT  15      9              7

*** all segment 6
PERLND  61                                REPORT  16      8              1
PERLND  62                                REPORT  16      8              2
PERLND  63                                REPORT  16      8              3
PERLND  64                                REPORT  16      8              4
PERLND  65                                REPORT  16      8              5
IMPLND  64                                REPORT  16      9              7


*** Percent loads report
*** all segment 1
PERLND  11                      3642.3     REPORT  21      8              1
PERLND  12                      1538.9     REPORT  21      8              2
PERLND  13                      4830.5     REPORT  21      8              3
PERLND  14                      3435.4     REPORT  21      8              4
PERLND  15                      4296.3     REPORT  21      8              5
PERLND  16                      3981.1     REPORT  21      8              5
PERLND  17                      2304.1     REPORT  21      8              5
PERLND  18                      5660.0     REPORT  21      8              5
PERLND  19        ***              0.0     REPORT  21      8              6
IMPLND  14                     11437.6     REPORT  21      9              7

*** all segment 3
PERLND  31                      5966.1     REPORT  23      8              1
PERLND  32                       385.5     REPORT  23      8              2
PERLND  33                      5860.7     REPORT  23      8              3
PERLND  34                       261.7     REPORT  23      8              4
PERLND  35                      4742.5     REPORT  23      8              5
PERLND  39        ***              0.0     REPORT  23      8              6
IMPLND  34                       422.7     REPORT  23      9              7

*** all segment 5
PERLND  51                      2002.0     REPORT  25      8              1
PERLND  52                       173.3     REPORT  25      8              2
PERLND  53                      1398.0     REPORT  25      8              3
PERLND  54                       165.9     REPORT  25      8              4
PERLND  55                      3200.9     REPORT  25      8              5
PERLND  59        ***              0.0     REPORT  25      8              6
IMPLND  54                       428.5     REPORT  25      9              7
```

```
*** all segment 6
PERLND  61                      4863.9     REPORT  26      8              1
PERLND  62                       299.4     REPORT  26      8              2
PERLND  63                      1706.0     REPORT  26      8              3
PERLND  64                       388.9     REPORT  26      8              4
PERLND  65                      2853.8     REPORT  26      8              5
IMPLND  64                       156.3     REPORT  26      9              7

RCHRES  31                                 REPORT 100     10              1
RCHRES  41                                 REPORT 100     10              2
RCHRES  51                                 REPORT 100     10              3
RCHRES  61                                 REPORT 100     10              4
RCHRES   2                                 REPORT 100     10              5
RCHRES   3                                 REPORT 100     10              6
RCHRES   4                                 REPORT 100     10              7
RCHRES   5                                 REPORT 100     10              8
RCHRES   6                                 REPORT 100     10              9
RCHRES   7                                 REPORT 100     10             10
RCHRES   8                                 REPORT 100     10             11
RCHRES   9                                 REPORT 100     10             12
RCHRES  10                                 REPORT 100     10             13
RCHRES  11                                 REPORT 100     10             14
RCHRES  12                                 REPORT 100     10             15
RCHRES  13                                 REPORT 100     10             16
RCHRES  14                                 REPORT 100     10             17
RCHRES  15                                 REPORT 100     10             18
RCHRES  16                                 REPORT 100     10             19

END SCHEMATIC

MASS-LINK
  MASS-LINK       10
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
RCHRES     OXRX   OXIF   1                 REPORT         INPUT  TIMSER 1
RCHRES     OXRX   OXCF3  1                 REPORT         INPUT  TIMSER 2
RCHRES     OXRX   OXCF3  2                 REPORT         INPUT  TIMSER 3
RCHRES     OXRX   OXCF3  3                 REPORT         INPUT  TIMSER 4
RCHRES     OXRX   OXCF3  4                 REPORT         INPUT  TIMSER 5
RCHRES     OXRX   OXCF3  5                 REPORT         INPUT  TIMSER 6
RCHRES     OXRX   OXIF   2                 REPORT         INPUT  TIMSER 7
RCHRES     OXRX   OXCF4  1                 REPORT         INPUT  TIMSER 8
RCHRES     OXRX   OXCF4  2                 REPORT         INPUT  TIMSER 9
RCHRES     OXRX   OXCF4  3                 REPORT         INPUT  TIMSER10
RCHRES     OXRX   OXCF4  4                 REPORT         INPUT  TIMSER11
RCHRES     OXRX   OXCF4  5                 REPORT         INPUT  TIMSER12
RCHRES     NUTRX  NUIF1  2                 REPORT         INPUT  TIMSER13
RCHRES     NUTRX  NUCF5  1                 REPORT         INPUT  TIMSER14
RCHRES     NUTRX  NUCF5  2                 REPORT         INPUT  TIMSER15
RCHRES     NUTRX  NUCF5  3                 REPORT         INPUT  TIMSER16
RCHRES     NUTRX  NUCF5  4                 REPORT         INPUT  TIMSER17
RCHRES     NUTRX  NUCF5  5                 REPORT         INPUT  TIMSER18
RCHRES     NUTRX  NUIF1  1                 REPORT         INPUT  TIMSER19
RCHRES     NUTRX  NUCF4  1                 REPORT         INPUT  TIMSER20
```

```
RCHRES     NUTRX  NUCF4  2                 REPORT         INPUT  TIMSER21
RCHRES     NUTRX  NUCF4  3                 REPORT         INPUT  TIMSER22
RCHRES     NUTRX  NUCF4  4                 REPORT         INPUT  TIMSER23
RCHRES     NUTRX  NUIF1  4                 REPORT         INPUT  TIMSER24
RCHRES     NUTRX  NUCF7  1                 REPORT         INPUT  TIMSER25
RCHRES     NUTRX  NUCF7  2                 REPORT         INPUT  TIMSER26
RCHRES     NUTRX  NUCF7  3                 REPORT         INPUT  TIMSER27
RCHRES     PLANK  PKIF   1                 REPORT         INPUT  TIMSER28
RCHRES     PLANK  PKCF5  1                 REPORT         INPUT  TIMSER29
RCHRES     PLANK  PKCF5  3                 REPORT         INPUT  TIMSER30
RCHRES     PLANK  PKCF5  4                 REPORT         INPUT  TIMSER31
RCHRES     PLANK  PKIF   3                 REPORT         INPUT  TIMSER32
RCHRES     PLANK  PKCF8  1                 REPORT         INPUT  TIMSER33
RCHRES     PLANK  PKCF8  2                 REPORT         INPUT  TIMSER34
RCHRES     PLANK  PKIF   4                 REPORT         INPUT  TIMSER35
RCHRES     PLANK  PKCF9  1                 REPORT         INPUT  TIMSER36
RCHRES     PLANK  PKCF9  2                 REPORT         INPUT  TIMSER37
RCHRES     PLANK  PKIF   5                 REPORT         INPUT  TIMSER38
RCHRES     PLANK  PKCF10 1                 REPORT         INPUT  TIMSER39
RCHRES     PLANK  PKCF10 2                 REPORT         INPUT  TIMSER40
  END MASS-LINK   10
  MASS-LINK        9
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
IMPLND     IQUAL  SOQUAL 1                 REPORT         INPUT  TIMSER 1
IMPLND     IQUAL  SOQUAL 2                 REPORT         INPUT  TIMSER 2
IMPLND     IQUAL  SOQUAL 4   0.0480        REPORT         INPUT  TIMSER 3
IMPLND     IQUAL  SOQUAL 1                 REPORT         INPUT  TIMSER 4
IMPLND     IQUAL  SOQUAL 2                 REPORT         INPUT  TIMSER 4
IMPLND     IQUAL  SOQUAL 4   0.0480        REPORT         INPUT  TIMSER 4
IMPLND     IQUAL  SOQUAL 3                 REPORT         INPUT  TIMSER 5
IMPLND     IQUAL  SOQUAL 4   0.0023        REPORT         INPUT  TIMSER 6
IMPLND     IQUAL  SOQUAL 3                 REPORT         INPUT  TIMSER 7
IMPLND     IQUAL  SOQUAL 4   0.0023        REPORT         INPUT  TIMSER 7
IMPLND     IQUAL  SOQUAL 4   0.400         REPORT         INPUT  TIMSER 8
IMPLND     IQUAL  SOQUAL 4   0.301         REPORT         INPUT  TIMSER 9
  END MASS-LINK    9
  MASS-LINK        8
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
PERLND     PQUAL  POQUAL 1                 REPORT         INPUT  TIMSER 1
PERLND     PQUAL  POQUAL 2                 REPORT         INPUT  TIMSER 2
PERLND     PQUAL  POQUAL 4   0.0480        REPORT         INPUT  TIMSER 3
PERLND     PQUAL  POQUAL 1                 REPORT         INPUT  TIMSER 4
PERLND     PQUAL  POQUAL 2                 REPORT         INPUT  TIMSER 4
PERLND     PQUAL  POQUAL 4   0.0480        REPORT         INPUT  TIMSER 4
PERLND     PQUAL  POQUAL 3                 REPORT         INPUT  TIMSER 5
PERLND     PQUAL  POQUAL 4   0.0023        REPORT         INPUT  TIMSER 6
PERLND     PQUAL  POQUAL 3                 REPORT         INPUT  TIMSER 7
PERLND     PQUAL  POQUAL 4   0.0023        REPORT         INPUT  TIMSER 7
PERLND     PQUAL  POQUAL 4   0.400         REPORT         INPUT  TIMSER 8
PERLND     PQUAL  POQUAL 4   0.301         REPORT         INPUT  TIMSER 9
  END MASS-LINK    8
```

```
  MASS-LINK        1
<-Volume-> <-Grp> <-Member-><--Mult--> Tran<-Target vols> <-Grp> <-Member->***
<Name>***         <Name> x x<-factor-> strg<Name>                <Name> x x
PERLND     PWATER PERO       0.0833333     RCHRES         INFLOW IVOL
PERLND     PWTGAS PODOXM                   RCHRES         INFLOW OXIF   1
PERLND     PQUAL  POQUAL 1                 RCHRES         INFLOW NUIF1  2
PERLND     PQUAL  POQUAL 2                 RCHRES         INFLOW NUIF1  1
PERLND     PQUAL  POQUAL 3                 RCHRES         INFLOW NUIF1  4
PERLND     PQUAL  POQUAL 4   0.40          RCHRES         INFLOW OXIF   2
PERLND     PQUAL  POQUAL 4   0.048         RCHRES         INFLOW PKIF   3
PERLND     PQUAL  POQUAL 4   0.0023        RCHRES         INFLOW PKIF   4
PERLND     PQUAL  POQUAL 4   0.301         RCHRES         INFLOW PKIF   5
  END MASS-LINK    1

  MASS-LINK        2
<-Volume-> <-Grp> <-Member-><--Mult--> Tran<-Target vols> <-Grp> <-Member->***
<Name>***         <Name> x x<-factor-> strg<Name>                <Name> x x
IMPLND     IWATER SURO       0.0833333     RCHRES         INFLOW IVOL
IMPLND     IWTGAS SODOXM                   RCHRES         INFLOW OXIF   1
IMPLND     IQUAL  SOQUAL 1                 RCHRES         INFLOW NUIF1  2
IMPLND     IQUAL  SOQUAL 2                 RCHRES         INFLOW NUIF1  1
IMPLND     IQUAL  SOQUAL 3                 RCHRES         INFLOW NUIF1  4
IMPLND     IQUAL  SOQUAL 4   0.40          RCHRES         INFLOW OXIF   2
IMPLND     IQUAL  SOQUAL 4   0.048         RCHRES         INFLOW PKIF   3
IMPLND     IQUAL  SOQUAL 4   0.0023        RCHRES         INFLOW PKIF   4
IMPLND     IQUAL  SOQUAL 4   0.301         RCHRES         INFLOW PKIF   5
  END MASS-LINK    2

  MASS-LINK        3
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
RCHRES     ROFLOW                          RCHRES         INFLOW
  END MASS-LINK    3

  MASS-LINK        4
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
RCHRES     OFLOW         1                 RCHRES         INFLOW
  END MASS-LINK    4

  MASS-LINK        5
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
RCHRES     OFLOW         2                 RCHRES         INFLOW
  END MASS-LINK    5

  MASS-LINK        6
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
RCHRES     OFLOW         3                 RCHRES         INFLOW
  END MASS-LINK    6

  MASS-LINK        7
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
RCHRES     OFLOW         4                 RCHRES         INFLOW
  END MASS-LINK    7
```

```
  MASS-LINK       90
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
PERLND     PWATER SURO                     COPY           INPUT  MEAN   1
PERLND     PWATER IFWO                     COPY           INPUT  MEAN   2
PERLND     PWATER AGWO                     COPY           INPUT  MEAN   3
PERLND     PWATER PET                      COPY           INPUT  MEAN   4
PERLND     PWATER TAET                     COPY           INPUT  MEAN   5
PERLND     PWATER UZS                      COPY           INPUT  MEAN   6
PERLND     PWATER LZS                      COPY           INPUT  MEAN   7
  END MASS-LINK   90

  MASS-LINK       91
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>            <Name> x x<-factor->strg <Name>                <Name> x x  ***
IMPLND     IWATER SURO                     COPY           INPUT  MEAN   1
IMPLND     IWATER PET                      COPY           INPUT  MEAN   4
IMPLND     IWATER IMPEV                    COPY           INPUT  MEAN   5
  END MASS-LINK   91
END MASS-LINK

FTABLES
  FTABLE      2
   14    5
     DEPTH      AREA    VOLUME    DISCH1    DISCH2 ***
      (FT)   (ACRES)   (AC-FT)     (CFS)     (CFS) ***
       0.0       0.0       0.0         0         0
       1.0       2.1       0.7         0         0
       6.0       8.2      29.9         0         0
      10.0      36.9     123.3         0         0
      14.0     124.6     408.1         0         0
      18.0     332.5    1054.3         0         0
      22.0     411.2    2424.5         0         0
      26.0     466.4    4185.8         0         0
      30.0     524.2    6178.6         0         0
      31.0     527.1    6702.8         0         0
      32.0     569.8    7229.9         0         0
      33.0     583.5    7745.6     52.00    208.01
      34.0     596.5    8266.5    104.52    418.08
      35.0     611.5    8788.3    157.14    628.55
  END FTABLE  2

  FTABLE      3
   15    4
     DEPTH      AREA    VOLUME     DISCH ***
      (FT)   (ACRES)   (AC-FT)     (CFS) ***
      0.00       0.0       0.0       0.0
      0.74      25.1      17.1      13.6
      1.48      29.0      37.0      44.7
      2.21      32.9      59.9      91.3
      2.95      36.8      85.6     153.6
      3.69      40.7     114.2     231.9
      4.43      44.6     145.6     327.0
      5.90      52.4     217.2     570.9
```

```
    7.38      60.2     300.2     892.0
    8.85      68.0     394.8     1297.
   11.80     635.5    1432.5     3104.
   14.75    1203.1    4144.4     7550.
   17.70    1770.6    8530.5    16025.
   20.65    2338.1   14590.8    29680.
   23.60    2905.6   22325.3    49543.
END FTABLE  3

FTABLE      4
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    1.00       2.3       1.9       0.2
    2.00       3.2       4.6       0.9
    3.00       4.1       8.2       1.9
    4.00       4.9      12.7       3.5
    5.00       5.8      18.1       5.6
    6.00       6.7      24.4       8.3
    8.00       8.5      39.5      15.9
   10.00      10.2      58.2      26.6
   12.00      12.0      80.4      40.9
   16.00     306.5     717.4     123.2
   20.00     601.0    2532.4     367.5
   24.00     895.5    5525.4     863.3
   28.00    1190.0    9696.5     1685.
   32.00    1484.5   15045.6     2898.
END FTABLE  4

FTABLE      5
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    1.33      14.3      17.6     128.9
    2.67      16.7      38.3     423.1
    4.00      19.0      62.1     863.4
    5.33      21.4      89.0     1451.
    6.67      23.7     119.1     2190.
    8.00      26.0     152.2     3090.
   10.67      30.7     227.9     5399.
   13.33      35.4     316.1     8445.
   16.00      40.1     416.8    12294.
   21.33     660.3    2284.6    26168.
   26.67    1280.6    7460.3    50366.
   32.00    1900.8   15944.0    89001.
   37.33    2521.0   27735.5   145505.
   42.67    3141.3   42835.0   222956.
END FTABLE  5
```

```
FTABLE      6
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    0.57      11.5       6.2       5.9
    1.13      12.7      13.0      19.1
    1.70      13.9      20.5      38.4
    2.27      15.1      28.7      63.4
    2.83      16.2      37.6      94.3
    3.40      17.4      47.1     131.0
    4.53      19.8      68.2     222.4
    5.67      22.2      92.0     339.0
    6.80      24.5     118.5     482.3
    9.07     220.8     396.5     997.8
   11.33     417.0    1119.4     1973.
   13.60     613.3    2287.1     3616.
   15.87     809.5    3899.7     6102.
   18.13    1005.8    5957.0     9584.
END FTABLE  6

FTABLE      7
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    0.38     269.6      98.3      56.7
    0.77     296.0     206.7     184.0
    1.15     322.3     325.2     369.9
    1.53     348.7     453.8     611.7
    1.92     375.0     592.6     909.0
    2.30     401.4     741.4     1262.
    3.07     454.1    1069.3     2140.
    3.83     506.8    1437.7     3258.
    4.60     559.5    1846.4     4629.
    6.13     666.1    2786.1     8807.
    7.67     772.7    3889.2    14237.
    9.20     879.3    5155.6    20997.
   10.73     985.8    6585.5    29160.
   12.27    1092.4    8178.9    38800.
END FTABLE  7

FTABLE      8
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    0.54      87.7      42.1      14.4
    1.08     107.6      95.0      48.7
    1.63     127.5     158.7     102.4
    2.17     147.4     233.1     176.5
    2.71     167.3     318.4     272.6
    3.25     187.2     414.4     392.5
    4.33     227.1     638.8     710.0
    5.42     266.9     906.4     1142.
```

```
    6.50     306.7    1217.1     1701.
    8.67     495.7    2086.4     3614.
   10.83     684.7    3365.2     6436.
   13.00     873.8    5053.6    10376.
   15.17    1062.8    7151.5    15616.
   17.33    1251.8    9658.9    22317.
END FTABLE  8

FTABLE      9
 10    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
       0         0         0         0
    0.01   406.641         0         0
       1   421.107   445.873         0
       2   435.720   896.251         0
       3   450.332  1346.628         0
       4   464.945  1797.005         0
       5   479.557  2247.382         0
       6   494.170  2697.760         0
       7   508.783  3148.137     227.1
       8   523.395  3598.514     454.1
END FTABLE  9

FTABLE     10
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    1.71       2.9       3.5       8.1
    3.42       4.4       9.8      32.4
    5.13       6.0      18.7      77.7
    6.83       7.6      30.3     148.3
    8.54       9.2      44.6     248.7
   10.25      10.7      61.6     382.6
   13.67      13.9     103.6     765.8
   17.08      17.0     156.4     1326.
   20.50      20.2     219.9     2089.
   27.33     439.0    1788.9     6256.
   34.17     857.9    6220.1    17971.
   41.00    1276.8   13513.7    41312.
   47.83    1695.7   23669.6    79656.
   54.67    2114.5   36687.8   136014.
END FTABLE 10

FTABLE     11
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    1.00       4.4       3.6       7.8
    2.00       6.0       8.8      28.0
    3.00       7.6      15.6      61.6
    4.00       9.2      24.0     110.6
    5.00      10.8      34.0     177.0
```

```
    6.00      12.4      45.6     262.6
    8.00      15.6      73.5     498.6
   10.00      18.7     107.8     832.1
   12.00      21.9     148.5     1276.
   16.00     425.9    1044.0     3792.
   20.00     829.8    3555.3    11204.
   24.00    1233.8    7682.5    26215.
   28.00    1637.7   13425.4    51062.
   32.00    2041.7   20784.1    87738.
END FTABLE 11

FTABLE     12
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    1.27      14.6      14.7      16.8
    2.54      20.6      37.2      62.0
    3.81      26.7      67.2     139.9
    5.08      32.7     104.9     256.1
    6.35      38.7     150.3     415.9
    7.63      44.8     203.4     624.3
   10.17      56.8     332.5     1206.
   12.71      68.9     492.2     2039.
   15.25      80.9     682.5     3155.
   20.33    1269.2    4114.1    10265.
   25.42    2457.5   13586.3    32999.
   30.50    3645.9   29099.1    80174.
   35.58    4834.2   50652.5   159080.
   40.67    6022.5   78246.5   276217.
END FTABLE 12

FTABLE     13
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    1.35      13.8      17.3      50.0
    2.70      15.8      37.3     163.9
    4.05      17.9      60.0     333.2
    5.40      19.9      85.5     557.7
    6.75      21.9     113.7     838.8
    8.10      23.9     144.6     1179.
   10.80      28.0     214.7     2045.
   13.50      32.0     295.7     3179.
   16.20      36.1     387.7     4603.
   21.60     479.3    1779.2    10436.
   27.00     922.5    5564.1    23326.
   32.40    1365.7   11742.4    46807.
   37.80    1809.0   20314.2    83810.
   43.20    2252.2   31279.3   136949.
END FTABLE 13
```

```
FTABLE     14
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    1.32      28.0      34.8      76.0
    2.64      31.5      74.1     247.0
    3.96      34.9     117.9     498.1
    5.28      38.3     166.2     827.0
    6.60      41.7     219.1     1234.
    7.92      45.2     276.5     1721.
   10.57      52.0     404.9     2947.
   13.21      58.9     551.4     4527.
   15.85      65.7     716.0     6486.
   21.13     891.3    3244.2    14395.
   26.42    1716.9   10134.2    31869.
   31.70    2542.5   21386.0    63733.
   36.98    3368.0   36999.5   113983.
   42.27    4193.6   56974.8   186187.
END FTABLE 14

FTABLE     15
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    0.88     229.4     176.5     107.8
    1.76     286.8     403.4     368.7
    2.64     344.1     680.7     780.9
    3.52     401.5    1008.5     1357.
    4.40     458.8    1386.6     2110.
    5.28     516.2    1815.2     3057.
    7.03     630.9    2823.7     5585.
    8.79     745.6    4033.9     9054.
   10.55     860.3    5445.7    13572.
   14.07    1206.1    9079.1    28863.
   17.58    1551.8   13928.4    50439.
   21.10    1897.6   19993.6    79279.
   24.62    2243.3   27274.7   116247.
   28.13    2589.1   35771.7   162147.
END FTABLE 15

FTABLE     16
 16    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00      0.00       0.0       0.0
    0.01      1.49       0.1       0.0
    0.23      1.72       0.2      0.14
    0.73      2.34      0.82      0.41
    1.23      3.18      2.34      1.11
    1.73      4.33      4.63      3.05
    2.23      5.89      7.69      8.34
    2.73      8.01      11.5      22.8
    3.23      10.9      16.1      62.4
```

```
    3.73      14.8      21.5     170.6
    4.23      20.1      27.7     466.6
    4.73      27.4      34.6     1276.
    5.23      37.2      42.3     3491.
    5.73      50.6      50.7     9550.
    6.23      68.9      60.0    26121.
    6.73      93.7      70.0    71450.
END FTABLE 16

FTABLE     31
 10    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    0.01     600.0       3.0       0.0
    1.00     612.4     603.2       0.0
    2.00     625.1    1221.9       0.0
    3.00     637.9    1853.5       0.0
    4.00     650.9    2497.8       0.0
    5.00     663.9    3155.2       0.0
    6.00     677.1    3825.7       0.0
    7.00     690.4    4509.5     446.6
    8.00     703.9    5206.7     901.9
END FTABLE 31

FTABLE     41
 10    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
    0.00       0.0       0.0       0.0
    0.01     435.8       2.2       0.0
    1.00     446.4     438.8       0.0
    2.00     457.2     890.6       0.0
    3.00     468.2    1353.3       0.0
    4.00     479.2    1827.0       0.0
    5.00     490.5    2311.9       0.0
    6.00     501.8    2808.0       0.0
    7.00     513.3    3315.6     331.5
    8.00     524.9    3834.7     670.5
END FTABLE 41

FTABLE     51
 15    4
   DEPTH      AREA    VOLUME     DISCH ***
    (FT)   (ACRES)   (AC-FT)     (CFS) ***
     0.0    820.00      0.00       0.0
     0.5    830.00    412.50       0.0
     1.0    840.00    830.00       0.0
     1.5    850.00   1252.50       0.0
     2.0    860.00   1680.00       0.0
     2.5    870.14   2112.54       0.1
     3.0    880.28   2550.14       4.0
     3.5    890.42   2992.82      17.0
     4.0    900.57   3440.56      60.0
     4.5    910.60   3893.36     280.0
```

```
      5.0    920.60   4351.16    1000.0
      5.5    930.60   4813.96    4500.0
      6.0    940.60   5281.76   17000.0
      6.5    950.60   5754.56   75000.0
      7.0    960.60   6232.36  250000.0
  END FTABLE 51

  FTABLE     61
   22    4
     DEPTH      AREA    VOLUME     DISCH ***
      (FT)   (ACRES)   (AC-FT)     (CFS) ***
      0.0      61.6       0.0       0.0
      0.2    104.67     16.63      1.00
      0.4    146.76     41.77      1.80
      1.0    272.92    167.68      6.90
      1.5    377.94    330.39      13.0
      2.0    482.87    545.60      21.0
      2.5    587.74    813.25      37.0
      3.0    692.54   1133.32      53.0
      3.5    797.29   1505.78      79.0
      4.0    902.00   1930.60     140.0
      4.5   1006.66   2407.76     220.0
      5.0   1111.19   2937.23     350.0
      5.5   1283.64   3535.94     725.0
      6.0   1456.06   4220.86    1100.0
      6.5   1628.46   4992.00    2000.0
      7.0   1800.83   5849.32    2600.0
      7.5   1973.18   6792.82    4800.0
      8.0   2145.52   7822.50    7000.0
      8.5   2317.83   8938.33   13000.0
      9.0   2490.13  10140.32   19000.0
      9.5   2662.41  11428.46   29500.0
     10.0   2834.68  12802.73   40000.0
  END FTABLE 61
END FTABLES

END RUN
```