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Regression Analysis of Dissolved Heavy Metals in Storm Water Runoff from Elevated Roadways

Ruben Erlacher
University of New Orleans

REGRESSION ANALYSIS OF DISSOLVED HEAVY METALS IN STORM WATER RUNOFF FROM ELEVATED ROADWAYS

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Ruben Erlacher

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LIST OF ABBREVIATIONS

$\bar{x}$	Mean of the variable
@	at
µmhos/cm	Micromhos per centimeter
µs/cm	Microsiemens per centimeter
A.D.	Ante diem
amu	Atomic Mass Units
APHA	American Public Health Association
As	Arsenic
BCT	Best Conventional Pollutant Control Technology
BMPs	Best Management Practices
BOD	Biochemical Oxygen Demand
BPJ	Best Professional Judgment
BPT	Best Practicable Control Technology
C°	Degrees Celsius
Cd	Cadmium
CFR	Ciffre
COD	Chemical Oxygen Demand
COV	Coefficient of Variation

Cr	Chromium
CSOs	Combined Sewer Overflows
Cu	Copper
CWA	Clean Water Act
D.I.	Diplom Ingenieur
DO	Dissolved Oxygen
ELGs	Effluent Limitations Guidelines
EPA	Environmental Protection Agency
F°	Fahrenheit
Fe	Iron
Hg	Mercury
ICP	Inductively Coupled Plasma
ICP-OES	Inductively Coupled Plasma-Optical Emission Spectrometer
K	Kelvin
LSU	Louisiana State University
Mn	Manganese
MS4s	Municipal Separate Storm Sewer Systems
mV	Millivolts
Ni	Nickel
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint source
Pb	Lead
pH	Pondus Hydrogenii

POTWs	Publicly Owned Treatment Works
S	Standard Deviation
SSOs	Sanitary Sewer Overflows
TDS	Total Dissolved Solids
TMDLs	Total Maximum Daily Loads
TSS	Total Suspended Solids
UNO	University of New Orleans
USA	United States of America
U.S.EPA	United State Environmental Protection Agency
VDS	Volatile Dissolved Solids
VSS	Volatile Suspended Solids
WLA	Waste Load Allocation
Zn	Zinc

ABSTRACT

This proposed research focused on the prediction and identification of dissolved heavy metals in storm water runoff from elevated roadways. Storm water runoff from highways transports a significant load of contaminants, especially heavy metals and particulate matter, to receiving waters. Heavy metals, either in dissolved or particulate-bound phases, are unique in the fact that unlike organic compounds, they are not degraded in the environment.

The objective of this research was to develop a mathematical model to relate dissolved heavy metal concentration to different measurable parameters which are easily available and routinely measurable for elevated roadways. The reliability of the developed models was then evaluated by comparing the raw data versus data predicted by the models.

The test site for this research was selected at the intersection of the Interstate-10 and Interstate-610, Orleans Parish, New Orleans, Louisiana. Subsequently a research test site was developed and highway storm water runoff was collected. Volumetric flow rates were measured with every collected sample by measuring the amount of collected water and the collection time. Storm water runoff from the examined elevated roadway section was sampled for 10 storm events throughout the course of the study from which hydrologic and water quality data were collected.

The measurement of different parameters made it possible to determine the percentage of dissolved heavy metal mass loading and the characterization of high runoff flow intensity and low runoff flow intensity storm events.

Another very important achievement in this research was the construction of a predictive model for dissolved heavy metal concentrations based on field measurements. Data analysis proceeded by applying different variable selection statistical methods as well as multiple regression analyses in order to evaluate the simultaneous effects of all variables on the concentration of dissolved heavy metals in storm water runoff. The developed model enables the user to predict dissolved heavy metal concentrations with known field measurements within a prediction interval of 95 % confidence.

The reliability of the models was verified by carrying out significant-difference tests for both sets of data, observed and predicted, for a 5% of significance level.

CHAPTER 1

INTRODUCTION

Anthropogenic constituents in highway runoff include metal elements and suspended solids which result from traffic activities, atmospheric deposition, roadway degradation and highway maintenance. Storm water runoff from urban areas transports significant loads of heavy metals, a wide gradation of particulate matter, dissolved solids, organic compounds and inorganic constituents. Heavy metals are not degraded in the environment and constitute an important class of contaminants generated through modern urban activities and infrastructure. In urban areas one major source of heavy metals are traffic activities. In urban runoff discharges levels of Zn, Cu, Cd, Pb, Cr and Ni are significantly above ambient background levels, and for many urban areas, Zn, Cu, and Cd often exceed United State Environmental Protection Agency(U.S.EPA)and State EPA surface water discharge criteria on an event basis. Treatment of storm water continues to pose unique challenges due to unsteady nature of processes including rainfall-runoff, mobilization and transport of heavy metal as well as other constituent loads. Additionally, kinetics of heavy metal partitioning as a function of pH, residence time and particulate matter characteristics can have a profound effect on the selection and effectiveness of treatment systems. (Sansalone, John J, 2000)

The enormous demands being placed on water supply and wastewater disposal facilities today have necessitated the development and implementation of far broader concepts in environmental engineering than those envisioned only a few years ago. The regulations and standards for water quality have significantly increased concurrently with a decrease in water quality. Evidence of water supply contamination by toxic and hazardous materials has become common and concern about broad water-related environmental issues has heightened. As populations throughout the world multiply at an alarming rate, environmental control and water management become increasingly urgent. (Viessman, 1998)

During the past century, large areas were filled with urban construction to create business and residential centers and to enhance human lifestyle. Infrastructures such as roadway pavements, parking lots, rooftops, sidewalks and driveways were built in order to improve people's mobility and quality of life. These pavement surfaces are highly impervious in nature and were designed for a rapid and efficient transport of storm water flows. This higher hydraulic efficiency enhances the amount and velocity of urban storm water runoff and consequently promotes the pollutant transport from infrastructures.

A consequence of the growing population densities in many areas of the world is increasing traffic and the associated traffic-generated pollution. Increasing traffic causes a rise in the amount of contaminants accumulating on road surfaces which results in higher concentrations of contaminants and contaminant loads transported off the impermeable infrastructures into receiving waters.

Storm water runoff from highways transports a significant load of contaminants, especially heavy metals and particulate matter, to receiving waters. Heavy metals, either in dissolved or particulate-bound phases, are unique in the fact that unlike organic compounds, they are not degraded in the environment. Because of their short- and long-term toxic effects, the maximum permissible concentrations of these heavy metals in drinking water as well as in municipal and industrial discharges are closely regulated through legislation. (SenGupta, 2002)

The U.S. EPA issued a policy memorandum on October 1, 1993, which was titled "Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Metals Policy" and stated:

"It is now the policy of the Office of Water that the use of dissolved metal to set and measure compliance with water quality standards is the recommended approach, because dissolved metal more closely approximates the bio-available fraction of metal in the water column than does total recoverable metal". Therefore this research can be useful, especially for non point sources, to assess and predict dissolved heavy metals in storm water runoff from roadways and similar. (U.S. EPA, 1996b)

A better understanding of dissolved heavy metals, their concentration and correlation of storm water runoff is necessary. The goal of this study is therefore to perform a thorough investigation on storm water runoff from elevated roadways in order to provide useful results for further research regarding the concentration of dissolved heavy metals.

CHAPTER 2

SCOPE AND OBJECTIVES

This proposed research focused on storm water runoff from highways. These runoffs represent a considerable contaminant source for the surrounding receiving waters. During this study eleven storm events were observed and multiple storm water runoff samples were collected from each storm event and analyzed for many different parameters.

The Environmental Protection Agency (EPA) recommends that state water quality standards should be based on dissolved heavy metal concentrations because the dissolved fraction is a better representation of the biologically active portion of the metal in water than is the total or total recoverable fraction. (U.S. EPA, 1996b)

Therefore, this document will focus on dissolved heavy metals and their correlation with different water parameters in order to create a predictive model for dissolved heavy metals.

Based on this, the proposed research focuses on three primary objectives:

Objective 1: The first objective of this research was to analyse samples collected from different storm events utilizing Standard Method methods and to evaluate the data gathered in order to determine the most important variables affecting highway storm water runoff. (APHA, 1999)

Objective 2: The second objective of this study focused on calculating and evaluating scatter plots and statistical correlations between several variables such as pollutant concentrations, runoff volume, traffic flow, antecedent dry hours, runoff intensity, pH, redox, temperature, runoff time, etc.

Objective 3: The third objective in this research was to construct a mathematical regression model to predict dissolved heavy metal concentrations in storm water runoff. The importance of such a model should be emphasized since the duration of the analyses of highway storm water samples for many different elements is a considerable time and cost factor. The goal was to determine storm water parameters that are relatively easy and fast to analyze and show a strong correlation with dissolved heavy metals. Especially dissolved heavy metal analyses require an enormous technical expenditure and expensive laboratory equipment which result in high costs and time expenses.

The use of this mathematical model makes it possible to predict dissolved heavy metal concentrations in the storm water runoff from roads and highways. The achievement of this objective may save considerable time and money for future rainfall runoff analyses and may consequently ease the assessment of pollutant concentrations in storm water runoffs.

CHAPTER 3

LITERATURE REVIEW

3.1 The Clean Water Act

In December 1970, as an outgrowth of the administration's environmental interests, a new independent body, the Environmental Protection Agency (EPA), was created. This organization assumed the functions of several existing agencies relative to matters of environmental management. It brought together under one roof all of the pollution control programs related to water, air, solid wastes, pesticides, and radiation. The EPA was seen by the administration as the most effective way of recognizing that the environment must be looked on as a single, interrelated system. It is noteworthy, however, that the creation of the EPA made even more pronounced the separation of water quality programs from other water programs.

Even with the enactment of EPA, it was clear that a comprehensive response to water pollution issues was still lacking. It became evident during Congressional hearings in 1971 that, relative to the construction grants program, the program was under-funded. To rectify this situation, Congress passed the Water Pollution Control Act Amendments of 1972. Responding to public demand for cleaner water, the law ended two years of intense debate, negotiation, and compromise and resulted in the most assertive step taken in the history of national water pollution control activities, the Clean Water Act.

The act departed in several ways from previous water pollution control legislation. It expanded the federal role in water pollution control, increased the level of federal funding for construction of publicly owned treatment works, elevated planning to a new level of significance, opened new avenues for public participation, and created a regulatory mechanism requiring uniform technology-based effluent standards, together with a national permit system for all point-source dischargers as the means of enforcement. As pollution control measures for industrial process wastewater and municipal sewage were implemented and refined, it became increasingly evident that more diffuse sources of water pollution were also significant causes of water quality impairment. Specifically, storm water runoff draining from large surface areas, such as urban land, was found to be a major cause of water quality impairment, including the non-attainment of designated beneficial uses. (Viessman, et al., 1998)

The Clean Water Act (CWA) is the cornerstone of surface water quality protection in the United States. The Act does not deal directly with ground water or with water quantity issues. The statute employs a variety of regulatory and non-regulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters.

For many years following the passage of CWA in 1972, the EPA and different states focused mainly on the chemical aspects of the integrity goal. During the last decade, however, more attention has been given to physical and biological integrity. Also, in the early decades of the Act's implementation, efforts focused on regulating discharges from traditional point source facilities, such as municipal sewage plants and industrial facilities, with little attention paid to runoff from streets, construction sites, farms, and other wet-weather sources.

Starting in the late 1980s, efforts to address polluted runoff have increased significantly. For nonpoint runoff, voluntary programs, including cost-sharing with landowners are the key tool. For wet weather point sources like urban storm sewer systems and construction sites, a regulatory approach is being employed. Evolution of CWA programs over the last decade has also included something of a shift from a program-by-program, source-by-source, pollutant-by-pollutant approach to more holistic watershed-based strategies. (U.S. EPA, 2003b)

3.2 Development of the NPDES Storm Water Program

The National Pollutant Discharge Elimination System (NPDES) Storm Water Program has been established with the intention to regulate storm water runoff from point sources through permits. To accomplish these regulations a two phase program was induced. These two different phases will be discussed in the following sections.

3.2.1 Phase I NPDES Storm Water Program

In response to the need for comprehensive NPDES requirements for discharges of storm water, Congress amended the CWA in 1987 to require the EPA to establish phased NPDES regulations for storm water discharges.

Phase I of the U.S. Environmental Protection Agency's (EPA) storm water program was promulgated in 1990 under the CWA. The Phase I program addressed sources of storm water runoff that had the greatest potential to negatively impact water quality. Phase I relies on National Pollutant Discharge Elimination System (NPDES) permit coverage to address storm water runoff from:

- "Medium" and "large" municipal separate storm sewer systems (MS4s) generally serving populations of 100,000 or greater
- Construction activity disturbing 5 acres of land or greater
- Ten categories of industrial activity.

Operators of the facilities, systems, and construction sites regulated under the Phase I NPDES Storm Water Program can obtain permit coverage under an individually tailored NPDES permit or a general NPDES permit. The first permit was developed for MS4 and some industrial facilities, whereas the second permit was used by most operators of industrial facilities and construction sites. (U.S. EPA, 2000)
(U.S. EPA, 1999b)

3.2.2 **Phase II NPDES Storm Water Program**

The Storm Water Phase II Final Rule is the next step in EPA's effort to preserve, protect, and improve the Nation's water resources from polluted storm water runoff. On August 7, 1995, EPA promulgated application regulations for Phase II of the NPDES Storm Water Program. The Phase II program expands the Phase I program by requiring additional operators of MS4s in urbanized areas and operators of small construction sites, through the use of NPDES permits, to implement programs and practices to control polluted storm water runoff. Phase II is intended to further reduce adverse impacts to water quality and aquatic habitat by instituting the use of controls on the unregulated sources of storm water discharges that have the greatest likelihood of causing continued environmental degradation.

The Phase II regulations established a sequential application process for all Phase II storm water discharges, which included all discharges, composed entirely of storm water, except those specifically classified as Phase I discharges. Such discharges included storm water from small municipal separate storm sewer systems, and commercial and institutional facilities. The application regulations included two tiers. The first tier was for Phase II dischargers, that the NPDES permitting authority determined were contributing to water quality impairment or were a significant contributor of pollutants to waters of the United States. Dischargers that have been designated by the permitting authority were required to obtain a permit and had to submit a permit application within 180 days of notification that an application was required. The second tier of the Phase II storm water application regulations required all remaining Phase II sources (i.e., all Phase II sources not designated by the permitting authority) to submit a permit application by August 7, 2001, but only if the Phase II regulatory Program in place at that time required permits.

Three new classes of facilities were designated for automatic coverage on a nationwide basis:

- Operators of small municipal separate storm sewer systems (MS4s) serving population centers (or equivalents) of at least 10,000 and satellite areas with a population density of 1,000 people per square mile. (about 3500 municipalities)

- Construction activity disturbing between 1 and 5 acres of land, such as small construction activities.
- All highways and streets discharging to MS4s

In addition to expanding the NPDES Storm Water Program, the Phase II Final Rule revises the "no exposure" exclusion and the temporary exemption for certain industrial facilities under Phase I of the NPDES Storm Water Program. (U.S. EPA, Office of Water, January 2000)

3.2.3 Wet Weather Discharges

"Wet weather discharges" refers collectively to point source discharges that result from precipitation events, such as rainfall and snowmelt. Wet weather discharges include storm water runoff, combined sewer overflows (CSOs), and wet weather sanitary sewer overflows (SSOs). Storm water runoff accumulates contaminants such as oil and grease, chemicals, nutrients, metals, and bacteria as it travels across land. CSOs and wet weather SSOs contain a mixture of raw sewage, industrial wastewater and storm water, and have resulted in beach closings, shellfish bed closings, and aesthetic problems. Under the NPDES permit program, there are the following three program areas: storm water runoff, CSOs and SSOs. Those address each of the wet weather discharges described above. EPA believes that wet weather discharges should be addressed in a coordinated and comprehensive fashion to reduce the threat to water

quality, reduce redundant contamination control costs, and provide State and local governments with greater flexibility to solve wet weather discharge problems. To identify and address cross-cutting issues and promote coordination, EPA established the Urban Wet Weather Flows Federal Advisory Committee in 1995.
(U.S. EPA, 1995a")

3.3 Contaminant Sources and their Effects

In this section some background information on storm water runoff from highways will be discussed. Furthermore, definitions and explanations of the most important aspects of the special topic of storm water runoff from elevated highways will be provided.

3.3.1 Distinction between Non-Point- and Point-Sources

Since there is often a misunderstanding in the meaning of non-point and point sources a definition is given in the following section.

3.3.1.1 Point Sources

Point sources of contamination are discrete conveyances, such as pipes or man made ditches that discharge pollutants into waters of the United States. This includes not only discharges from municipal sewage plants and industrial facilities, but also collected storm drainage from larger urban areas, certain animal feedlots and fish farms, some types of ships, tank trucks, offshore oil platforms, and collected runoff from many construction sites. (U.S. EPA, 2003a)

3.3.1.2 Non-Point sources

Nonpoint source (NPS) pollution, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water. Loadings of pollutants from NPS enter water-bodies via sheet flow, rather than through a pipe, ditch or other conveyance.

These pollutants include:

- Excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas;
- Oil, grease, and toxic chemicals from urban runoff and energy production;
- Sediment from improperly managed construction sites, crop and forest lands, and eroding stream-banks;
- Salt from irrigation practices and acid drainage from abandoned mines;
- Bacteria and nutrients from livestock, pet wastes, and faulty septic systems;

Atmospheric deposition and hydro-modification are also sources of nonpoint source pollution.

States report that nonpoint source pollution is the leading remaining cause of water quality problems. The effects of nonpoint source pollutants on specific waters vary and may not always be fully assessed. However, we know that these pollutants have harmful effects on drinking water supplies, recreation, fisheries, and wildlife.

Other impacts associated with urbanization are the increasing amount of storm water runoff, contribution to stream bank erosion and possibility of downstream flooding. Impervious concrete and asphalt surfaces of new roadways prevent storm water from soaking into the ground, where it was once absorbed. This increases the total volume of storm water runoff. It also increases the value of the peak storm water discharge, and decreases the time it takes to reach this peak. Increased runoff volumes and peak discharge levels result in increased levels of flooding risk.

Collecting runoff water from non-point sources, such as roadway shoulders, is difficult, thus in this research project, storm water runoff from an elevated highway has been analyzed. Samples were collected from the drainage pipe of this elevated highway, which collects water from a known impervious area. Consequently, calculating the volume of the storm water runoff and addressing the contaminant loading to this known area was possible. (U.S. EPA, 2002b) (U.S. EPA, 2003a)

3.3.2 Factors affecting Runoff Quality

Identifying the characteristics of the contaminants from elevated highways is an important aspect of this research effort.

3.3.2.1 Sources

One of the major contaminant sources of storm water runoff is traffic. All means of transportation directly and indirectly contribute much to the contamination found in highway runoff. Vehicles are a source of metals, oil, grease, lead, asbestos, and rubber. Sometimes de-icing chemicals such as salts or other materials deposited on highways are also indirectly contributed to vehicles. Other major sources of contaminants in the runoff include dust that settles on the road and shoulders and dissolved constituents, such as acids and particulate matter from atmospheric fallout. Urban construction sites contribute sediment, plant debris, and asphalt. Storm water runoff also contains refuse such as street litter. A number of common highway maintenance practices, such as salting, also may adversely affect water quality. The nature of the materials, methods used, and the proximity of the maintenance activity to a body of water increase the likelihood of adverse effects. (Schöpf, R., August 2002)

3.3.2.2 Highway Runoff Quality

Numerous factors may affect the quality of highway runoff including traffic volume, precipitation characteristics, roadway surface type, and the nature of the contaminants themselves. Research continues into the relationship between these factors and the concentration of contaminants in highway runoff because of the complexity and importance of this topic. The precipitation characteristics that may impact the water quality of highway runoff include the number of dry days preceding the event, the intensity of the actual and preceding storm events, and their durations. Intensity of the actual storm event has a significant impact because many of the contaminants are associated with particulate matter, such as dust, which are more easily mobilized in high intensity storms. Constituents in storm water runoff showing a strong correlation with suspended solids include metals, organic compounds, total organic carbon, and biochemical oxygen demand.

Higher concentrations of contaminants are often observed in the first runoff from a storm, a phenomenon referred to as first flush effect. This is especially true for dissolved components including nutrients, organic lead, and ionic constituents.

In general, concentrations of particle-associated contaminants show a more complex temporal variation related to rainfall intensity and the flushing of sediment through the drainage system.

The effect of highway paving material (asphalt versus concrete) on the quality of highway runoff appears to be minimal. Most studies have found that highway surface type was relatively unimportant compared to such factors as surrounding land use. It has also been reported that the type of collection and conveyance system for highway runoff, such as storm sewer, grassy swale has a greater effect on runoff quality than pavement type. (Department of Environmental Resources, 2003)

3.3.2.3 Contaminants in Runoff Pollution

Roads, highways, and bridges are a source of significant contributions of pollutants to our nation's waters. Contaminants from vehicles and activities associated with road and highway construction and maintenance are washed from roads and roadsides following rain or snow melt. A large amount of this runoff pollution is carried directly to water bodies.

Runoff pollution is that associated with rainwater or melting snow that washes off roads, bridges, parking lots, rooftops, and other impermeable surfaces. As it flows over these surfaces, the water picks up dirt and dust, rubber and metal deposits from tire wear, antifreeze and engine oil that has dripped onto the pavement, pesticides and fertilizers, and discarded cups, plastic bags, cigarette butts, pet waste, and other litter. These contaminants are carried into our lakes, rivers, streams, and oceans.

Contaminants in runoff pollution from roads, highways, and bridges include:

Sediment: It is mainly produced when soil particles are eroded from the land and transported to surface waters. Natural erosion usually occurs gradually because vegetation protects the ground. When land is cleared or disturbed to build a road or bridge, however, the rate of erosion increases. The vegetation is removed and the soil is left exposed, to be quickly washed away in the next rain. Erosion around bridge structures, road pavements, and drainage ditches can damage and weaken these structures.

Soil particles settle out of the water in a lake, stream, or bay onto aquatic plants, rocks, and the bottom. This sediment prevents sunlight from reaching aquatic plants, clogs fish gills, chokes other organisms, and can smother fish spawning and nursery areas.

Other pollutants such as heavy metals and pesticides adhere to sediment and are transported with it by wind and water. These pollutants degrade water quality and can harm aquatic life by interfering with photosynthesis, respiration, growth, and reproduction.

Oils and Grease: Oils and grease are leaked onto road surfaces from car and truck engines, spilled at fueling stations, and discarded directly onto pavement or into storm sewers instead of being taken to recycling stations. Rain and snowmelt transport these pollutants directly to surface waters.

Heavy Metals: Heavy metals come from some "natural" sources such as minerals in rocks, vegetation, sand, and salt. But they also come from car and truck exhaust, worn tires and engine parts, brake linings, weathered paint, and rust. Heavy metals are toxic to aquatic life and can potentially contaminate ground water.

Debris: Grass and shrub clippings, pet waste, food containers, and other household wastes and litter can lead to unsightly and polluted waters. Pet waste from urban areas can add enough nutrients to estuaries to cause premature aging, or "eutrophication."

Road Salts: In the snowbelt, road salts can be a major pollutant in both urban and rural areas. Snow runoff containing salt can produce high sodium and chloride concentrations in ponds, lakes, and bays. This can cause unnecessary fish kills and changes to water chemistry.

Fertilizers, Pesticides, and Herbicides: If these are applied excessively or improperly, fertilizers, pesticides, and herbicides can be carried by rain waters from the green parts of public rights-of-way. In rivers, streams, lakes, and bays, fertilizers contribute to algal blooms and excessive plant growth, and can lead to eutrophication. Pesticides and herbicides can be harmful to human and aquatic life. (U.S. EPA, Office of Water, August 1995)

3.3.2.4 Effects of Highway Runoff

The type and size of the receiving body, the potential for dispersion, the size of the catchment's area, the relative amount of highway runoff, and the biological diversity of the receiving water ecosystem are just some of the factors that determine the extent and importance of highway runoff effects. Concentrations of contaminants in the water columns of receiving waters generally show small changes due to highway runoff. This may be the result of dilution of the highway runoff by flow from the rest of the watershed. However, stream and lake sediments have been found to have high concentrations of heavy metals and are the primary source for the bioconcentration of metals in aquatic biota.

Bioassay tests of organisms from streams and lakes receiving highway runoff generally have not demonstrated acute toxicity, although very high traffic volumes or other site-specific conditions may produce a toxic response. Chronic toxicity resulting from bioaccumulation of contaminants in highway runoff has not been thoroughly investigated, although studies have documented higher concentrations of metals in fish and other aquatic biota living near highways (Department of Environmental Resources, 2003).

Highways can have an impact on groundwater, including changes in water quality in surface and shallow aquifers. Highway runoff that infiltrates into the ground may result in the contamination of groundwater with contaminants including metals, nitrogen, and organic compounds. The effects of highway runoff on groundwater are highly variable depending on depth to the water table, hydrological conditions, and soil characteristics. Soils can prevent or reduce the amount of some contaminants reaching groundwater through retention, modification, decomposition, or adsorption. Therefore, groundwater contamination is a particular concern where the aquifer is shallow (less than 4 feet). (U.S. EPA, Office of Water, August 1995, 12.04.2003)

3.4 NPDES Effluent Limits

When developing effluent limits for a NPDES permit, a permit writer must consider limits based on both the technology available to treat the pollutants (i.e., technology-based effluent limits), and limits that are protective of the water quality standards of the receiving water (i.e., water quality-based effluent limits). (U.S. EPA, April 1996a)

3.4.1 Quality-based Effluent Limits

On August 26, 1996, the EPA published in the Federal Register a policy outlining an interim approach for incorporating water quality-based effluent limitations into National Pollution Discharge Elimination System (NPDES) storm water permits. The policy was developed to address the variable nature In response to recent questions regarding the type of water quality based effluent limitations that are most appropriate for National Pollutant Discharge Elimination System (NPDES) storm water permits, the Environmental Protection Agency (EPA) is adopting an interim permitting approach for regulating wet weather storm water discharges. Due to the nature of storm water discharges, and the typical lack of information on which to base numeric water quality-based effluent limitations (expressed as concentration and mass), EPA will use an interim permitting approach for NPDES storm water permits. The interim permitting approach uses best management practices (BMPs) in first-round storm water permits, and expanded or better-tailored BMPs in subsequent permits, where necessary, to provide for the attainment of water quality standards. In cases where adequate information exists to develop more specific conditions or limitations to meet water quality standards, these conditions or limitations are to be incorporated into storm water permits, as necessary and appropriate. This interim permitting approach is not intended to affect those storm water permits that already include appropriately derived numeric water quality-based effluent limitations. Since the policy only applies to water quality based effluent limitations, it is not intended to affect technology-based limitations, such as those based on effluent guidelines or the permit writer's best professional judgment, that are incorporated into storm water permits.

Each storm water permit should include a coordinated and cost-effective monitoring program to gather necessary information to determine the extent to which the permit provides for attainment of applicable water quality standards and to determine the appropriate conditions or limitations for subsequent permits. Such a monitoring program may include ambient monitoring, receiving water assessment, discharge monitoring (as needed), or a combination of monitoring procedures designed to gather necessary information.

This interim permitting approach applies only to EPA; however, EPA also encourages authorized States and Tribes to adopt similar policies for storm water permits. This interim permitting approach provides time to more fully assess the range of issues and possible options for the control of storm water discharges for the protection of water quality. This interim permitting approach may be modified as a result of the ongoing

Urban Wet Weather Flows Federal Advisory Committee policy dialogue on this subject. (U.S. EPA, 2003c) (lity-Based Permitting") (U.S.EPA, 2003e)

3.4.2 Technology-based Effluent Limits

There are two general approaches for developing technology-based effluent limits for industrial facilities:

1. Using National Effluent Limitations Guidelines (ELGs) and
2. Using Best Professional Judgment (BPJ) on a case-by-case basis (in the absence of ELGs).

3.4.2.1 National Effluent Limitation Guideline (ELGs)

Technology-based effluent limits for Publicly Owned Treatment Works (POTWs) are derived from secondary treatment standards (Table 1). The intent of a technology-based effluent limitation is to require a minimum level of treatment for industrial/municipal point sources based on currently available treatment technologies while allowing the discharger to use any available control technique to meet the limitations. For industrial sources, the national ELGs are developed based on the demonstrated performance of a reasonable level of treatment that is within the economic means of specific categories of industrial facilities. Where national ELGs have not been developed, the same performance-based approach is applied to a specific industrial facility based on the permit writer's BPJ. In some cases, effluent limits based on ELGs and BPJ (as well as water quality considerations) may be included in a single permit. When developing technology-based effluent limitations for non-municipal dischargers, the permit writer must consider all applicable standards and requirements for all pollutants discharged. As indicated above, applicable technology-based requirements may include national standards and requirements applicable to all facilities in specified industrial categories, or facility-specific technology-based requirements based on the permit writer's BPJ. It is important, therefore, that permit writers understand the basis of the national standards and the differences between the various required levels of treatment performance.

An important aspect of municipal wastewater is that it is amenable to biological treatment. The biological treatment component of a municipal treatment plant is termed secondary treatment and is usually preceded by simple settling (primary treatment). In response to the CWA requirements, EPA evaluated performance data for POTWs practicing secondary treatment and established performance standards based on its evaluation. Secondary treatment standards, therefore, are defined by the limitations provided in Table 1.

Parameter	30-Day Average	7-Day Average
5-Day BOD	30mg/l	45mg/l
TSS	30mg/l	45mg/l
pH	6 – 9 s.u. (instantaneous)	---
Removal	85% BOD_5 and TSS	---

Table 1: Secondary Treatment Standards (Viessman, 1998)

Table 2 shows typical concentrations which can be found in untreated domestic wastewater.

Contaminants	Unit	Concentration		
		Weak	Medium	Strong
TSS	[mg/L]	100	220	350
VSS	[mg/L]	80	165	275
TDS	[mg/L]	250	500	850
VDS	[mg/L]	105	200	325
COD	[mg/L]	250	500	1000
Alkalinity	[mg/L]	50	100	200

Table 2: Typical Components in Untreated Domestic Wastewater (U.S. EPA, 2001, "Water Quality-Based Permitting", 2003)

Effluent limitations guidelines and performance standards are established by EPA for different industrial categories since the best control technology for one industry is not necessarily the best for another. These guidelines are developed based on the degree of pollutant reduction attainable by an industrial category through the application of control technologies, irrespective of the facility location. Using these factors, similar facilities are regulated in the same manner. In theory, for example, a pulp and paper mill on the west coast of the United States would be required to meet the same technology-based limitations as an identical plant located on the east coast (unless there were special site-specific concerns that had to be addressed). To date, EPA has established guidelines and standards for more than 50 different industrial categories (e.g., metal finishing facilities, steam electric power plants, iron and steel manufacturing facilities). (U.S. EPA, 2001,) (U.S.EPA, 2003e) (U.S.EPA, 1996a) (U.S. EPA, 2003c)

3.4.2.2 Best Professional Judgment (BPJ) Limits

Best Professional Judgment limits (BPJ-based limits) are technology-based limits derived on a case-by-case basis for non-municipal (industrial) facilities. BPJ limits are established in cases where ELGs are not available for, or do not regulate, a particular pollutant of concern. BPJ is defined as the highest quality technical opinion developed by a permit writer after consideration of all reasonably available and pertinent data or information that forms the basis for the terms and conditions of a NPDES permit. The authority for BPJ is contained in Section 402(a)(1) of the CWA, which authorizes the EPA Administrator to issue a permit containing “such conditions as the Administrator determines are necessary to carry out the provisions of this Act”, prior to taking the necessary implementing actions, such as the establishment of ELGs.

During the first round of NPDES permits in the early-to-mid-1970s, a majority of permits were based on the authority of Section 402(a)(1) of the CWA. These first round so-called best engineering judgment permits were drafted because effluent guidelines were not available for many industries. As effluent guidelines began to be promulgated, permit writers had to rely less on their best engineering judgment and could apply the ELGs in permits. As the implementation of the age of toxic pollutant control continues, the use of BPJ conditions in permits has again become more common. However, the statutory deadline for compliance with technology-based effluent limits (including BPJ-based pollutant limits) was March 31, 1989. Therefore, compliance schedules cannot be placed in permits to allow for extensions in meeting BPJ pollutant limits. BPJ has proven to be a valuable tool for NPDES permit writers over the years. Because it is so broad in scope, BPJ allows the permit writer considerable flexibility in establishing permit terms and conditions. Inherent in this flexibility, however, is the burden on the permit writer to show that the BPJ is reasonable and based on sound engineering analysis. If this evaluation of reasonableness does not exist, the BPJ condition is vulnerable to a challenge by the permittee. Therefore, the need for and derivation of the permit condition, and the basis for its establishment, should be clearly defined and documented. References used to determine the BPJ condition should be identified. In short, the rationale for a BPJ permit must be carefully drafted to withstand the scrutiny of not only the permittee, but also the public and, ultimately, an administrative law judge. (U.S. EPA, April 1996 a)

3.4.2.3 Establishment of BPJ Permit Limits

The NPDES regulations state that permits developed on a case-by-case basis of the CWA must consider:

- The appropriate technology for the category class of point sources of which the applicant is a member, based on all available information, and
- Any unique factors relating to the applicant.

To set BPJ limits, a permit writer must first determine a need for additional controls beyond existing ELGs. The need for additional controls may be the result of the facility not falling under any of the categories for which ELGs exist (e.g., barrel reclaimers, transportation equipment cleaning facilities, or industrial laundries) or discharging pollutants of concern that are not directly or indirectly addressed by the development of the ELGs (e.g., a pharmaceutical manufacturer or a petroleum refiner may discharge elevated levels of organic solvents for which category-specific guidelines do not exist). It should be noted that prior to establishing BPJ-based limits for a pollutant not regulated in an effluent guideline, the permit writer should ensure that the pollutant was not considered by EPA while developing the ELGs (i.e., BPJ based effluent limits are not required for pollutants that were considered by EPA for regulation under the effluent guidelines, but for which EPA determined that no ELG was necessary).

In setting BPJ limitations, the permit writer must consider several specific factors as they appear in 40 CFR §125.3(d). These factors, which are enumerated below, are the same factors required to be considered by EPA in the development of ELGs and, therefore, are often referred to as the Section 304(b) factors:

- For best practicable control technology (BPT) requirements:
  - The total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application

  - The age of equipment and facilities involved
  - The process employed
  - The engineering aspects of the application of various types of control techniques
  - Process changes*
  - Non-water quality environmental impact including energy requirements*
- For best conventional pollutant control technology (BCT) requirements:
  - All items in the (BPT) requirements indicated by an asterisk (*) above
  - The reasonableness of the relationship between the costs of attaining a reduction in effluent and the effluent reduction benefits derived
  - The comparison of the cost and level of reduction of such pollutants from the discharge of POTWs to the cost and level of reduction of such pollutants from a class or category of industrial sources
- For best available technology (BAT) requirements:
  - All items in the BPT requirements indicated
  - The cost of achieving such effluent reduction.

A permit writer must consider each of these factors in establishing BPJ-based conditions in permits. Since BPJ contains an element of judgment or educated opinion, a permit writer with the proper tools should be able to establish BPJ conditions in permits that are both technically sound and reasonable. A technically sound and reasonable permit is not likely to be successfully challenged by the permittee or a third party. In this context, "technically sound permit conditions" means that the conditions are achievable

with existing technology. "Reasonable" means that the conditions are achievable at a cost that the facility can afford. Historically, some of the other factors, such as age, process employed and non-water quality impacts have assumed lesser importance than the technical and economic feasibility evaluations.
(U.S. EPA, April 1996a)

3.5 Total Maximum Daily Loads (TMDLs)

Over 40 % of United States waters still do not meet the water quality standards states, territories, and authorized tribes have set for them. This amounts to over 20,000 individual river segments, lakes, and estuaries. These impaired waters include approximately 300,000 miles of rivers and shorelines and approximately 5 million acres of lakes - polluted mostly by sediments, excess nutrients, and harmful microorganisms. An overwhelming majority of the population (218 million) lives within 10 miles of the impaired waters.

Under section 303(d) of the 1972 Clean Water Act, states, territories, and authorized tribes are required to develop lists of impaired waters. These impaired waters do not meet water quality standards that states, territories, and authorized tribes have set for them, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop TMDLs for these waters.

A TMDL specifies the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and allocates pollutant loadings among point and non-point pollutant sources. By law, EPA must approve or disapprove lists and TMDLs established by states, territories, and authorized tribes. If a state, territory, or authorized tribe submission is inadequate, EPA must establish the list or the TMDL. EPA issued regulations in 1985 and 1992 that implement section 303(d) of the Clean Water Act - the TMDL provisions.

In an effort to speed the Nation's progress toward achieving water quality standards and improving the TMDL program, EPA began, in 1996, a comprehensive evaluation of EPA's and the states' implementation of their Clean Water Act section 303(d) responsibilities. EPA convened a committee under the Federal Advisory Committee Act, composed of 20 individuals with diverse backgrounds, including agriculture, forestry, environmental advocacy, industry, and state, local, and tribal governments. The committee issued its recommendations in 1998.

These recommendations were used to guide the development of proposed changes to the TMDL regulations, which EPA issued in draft in August 1999. After a long comment period, hundreds of meetings and conference calls, much debate, and the Agency's review and serious consideration of over 34,000 comments, the final rule was published on July 13, 2000. However, Congress added a "rider" to one of their appropriations bills that prohibits EPA from spending “FY2000” and “FY2001” money to implement this new rule.

The current rule remains in effect until 30 days after Congress permits EPA to implement the new rule. TMDLs continue to be developed and completed under the current rule, as required by the 1972 law and many court orders. The regulations that currently apply are those that were issued in 1985 and amended in 1992 (40 CFR Part 130, section 130.7). These regulations mandate that states, territories, and authorized tribes list impaired and threatened waters and develop TMDLs.

(U.S. EPA, 2002a)

3.6 Best Management Practice

Best Management Practices (BMP) can be either structural or non-structural practices that are implemented to minimize the impacts of anthropogenic constituents generated by urban and traffic activities on water quality. The term was first used in the 1970s to refer to practices that could be used to mitigate both urban runoff quantity and quality. Common in-situ BMPs include detention/retention basins, filters, vegetated swales, infiltration/exfiltration trenches and porous pavement. Less common, but innovative BMPs include a variety of infiltration systems that passively incorporate adsorption and filtration. No single BMP can address all storm water problems. Each type has certain limitations based on drainage area served, available land space, cost, pollutant removal efficiency, as well as a variety of site-specific factors such as soil types, slopes, depth of groundwater table, etc. Careful consideration of these factors is necessary in order to select the appropriate BMP or group of BMPs for a particular location. (John J. Sansalone, 2001) (U.S. EPA, 1999a)

3.6.1 Types of Storm Water BMPs

There are a variety of storm water BMPs available for managing urban runoff. Regardless of the type, storm water BMPs are most effective when implemented as part of a comprehensive storm water management program that includes proper selection, design, construction, inspection and maintenance. Storm water BMPs can be grouped into two broad categories: structural and non-structural. Structural BMPs are used to treat the storm water at either the point of generation or the point of discharge to either the storm sewer system or to receiving waters. Non-structural BMPs include a range of pollution prevention, education, institutional, management and development practices designed to limit the conversion of rainfall to runoff and to prevent pollutants from entering runoff at the source of runoff generation.
(U.S. EPA, 1999a)

3.6.2 BMP Selection

BMP selection is a complex process. There are a number of competing factors that need to be addressed when selecting the appropriate BMP or suite of BMPs for an area. It should be stressed that BMPs should be incorporated into a comprehensive storm water management program. Without proper BMP selection, design, construction and maintenance, BMPs will not be effective in managing urban runoff. BMP selection can be tailored to address the various sources of runoff produced from urbanized areas. For example, a particular suite of BMPs may be developed for use on construction sites and

new land development, where opportunities exist for incorporating BMPs that are focused on runoff prevention, reducing impervious surfaces and maintaining natural drainage patterns. In established urban communities, a different suite of BMPs may be more appropriate due to space constraints. In these areas, BMPs may be selected to focus on pollution prevention practices along with retrofit of the established storm drain system with regional BMPs. Site suitability for selecting a particular BMP strategy is key to successful performance. Most BMPs have limitations for their applicability, and therefore cannot be applied nationwide.
(U.S. EPA, 1999a)

3.6.3 Effectiveness of BMPs

The effectiveness of BMPs can be measured in various ways. Non-structural BMPs deal mainly with pollution prevention and limiting the amounts of pollutants that are carried away by runoff. Their effectiveness is best measured in terms of the degree of change in people's habits following implementation of the management program or by the degree of reduction of various pollutant sources. It is oftentimes very difficult to measure the success of non-structural BMPs in terms of pollution reduction and receiving stream improvements. Structural BMPs can be measured in terms in the reductions of pollutants discharged from the system and by the degree of attenuation of storm water flow rates and volumes discharged to the environment. Various physical, chemical and biological evaluation methods exist for determining the pollutant removal efficiency of structural BMPs. (U.S. EPA, 1999, "Description and Performance of Storm Water Best Management Practices", Urban Storm Water BMP Study)

3.7 Heavy Metals

Heavy metals are elements having atomic weights between 63.546 and 200.590, and a specific gravity greater than 4.0. Living organisms require trace amounts of some heavy metals, including cobalt, copper, iron, manganese, molybdenum, vanadium, strontium, and zinc. Excessive levels of essential metals, however, can be detrimental to the organism. Non-essential heavy metals of particular concern to surface water systems are cadmium, chromium, mercury, lead, arsenic, and antimony.

All heavy metals exist in surface waters in colloidal, particulate, and dissolved phases, although dissolved concentrations are generally low. The colloidal and particulate metal may be found in

1) Hydroxides, oxides, silicates, or sulfides; or

2) Adsorbed to clay, silica, or organic matter.

The soluble forms are generally ions or unionized organometallic chelates or complexes. The solubility of trace metals in surface waters is predominately controlled by the water pH, the type and concentration of ligands on which the metal could adsorb, and the oxidation state of the mineral components and the redox environment of the system.

The behavior of metals in natural waters is a function of the substrate sediment composition, the suspended sediment composition, and the water chemistry. Sediment composed of fine sand and silt will generally have higher levels of adsorbed metal than will quartz, feldspar, and detrital carbonate-rich sediment. Metals also have a high affinity for humic acids, organo-clays, and oxides coated with organic matter.

The water chemistry of the system controls the rate of adsorption and desorbtion of metals to and from sediment. Adsorption removes the metal from the water column and stores the metal in the substrate. Desorption returns the metal to the water column, where recirculation and bioassimilation may take place. Metals may be desorbed from the sediment if the water experiences increases in salinity, decreases in redox potential, or decreases in pH.

1. Salinity increase: Elevated salt concentrations create increased competition between cations and metals for binding sites. Often, metals will be driven off into the overlying water. (Estuaries are prone to this phenomenon because of fluctuating river flow inputs.)
2. Redox Potential decrease: A decreased redox potential, as is often seen under oxygen deficient conditions, will change the composition of metal complexes and release the metal ions into the overlying water.
3. pH decrease: A lower pH increases the competition between metal and hydrogen ions for binding sites. A decrease in pH may also dissolve metal-carbonate complexes, releasing free metal ions into the water column (Connell et al., 1984).

Heavy metals in surface water systems can be from natural or anthropogenic sources. Currently, anthropogenic inputs of metals exceed natural inputs. Excess metal levels in surface water may pose a health risk to humans and to the environment.

Although living organisms require trace amounts of some heavy metals, including cobalt, copper, iron, manganese, molybdenum, vanadium, strontium, and zinc, excessive levels, however, can be detrimental. (Water Quality Group, "Heavy Metals in Watersheds", 2003)

	Freshwater (µg/L)		Marine (µg/L)	
Metal	*Acute*	*Chronic*	*Acute*	*Chronic*
Cadmium	4.3	2.2	42	9.3
Copper	13	9	4.8	3.1
Lead	65	2.5	210	8.1
Zinc	120	120	90	81

Table 3. Discharge Limits for Selected Heavy Metals in Freshwater and Marine Environments. Limits are based on Total Metal Concentrations (Dissolved and Particulate) and a Hardness of 100-mg/L (U.S.EPA 1999). (ASCE (Dean et al.) 19 May 2003)

3.7.1 <u>Aluminum</u>

Basic Information

Name: Aluminum

Symbol: Al

Atomic Number: 13

Atomic Mass: 26.981539 amu

Melting Point: 660.37 °C (933.52 °K, 1220.666 °F)

Boiling Point: 2467.0 °C (2740.15 °K, 4472.6 °F)

Number of Protons/Electrons: 13

Number of Neutrons: 14

Classification: Other Metals

Crystal Structure: Cubic

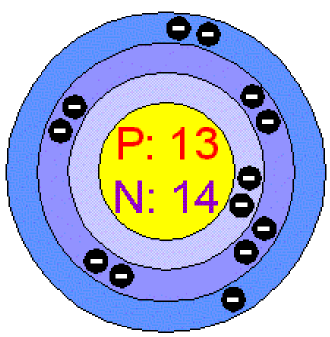
Density @ 293 K: 2.702 g/cm3

Color: Silver

British Spelling: Aluminium

IUPAC Spelling: Aluminium

Atomic Structure



Number of Energy Levels: 3

First Energy Level: 2

Second Energy Level: 8

Third Energy Level**:** 3

Isotopes

Isotope	Half Life
Al-26	730000.0 years
Al-27	Stable
Al-28	2.3 minutes

Facts

Date of Discovery: 1825

Discoverer: Hans Christian Oersted

Name Origin: From the Latin word *alumen*

Uses: As the pure metal or as alloys (magnalium, aluminum bronze, etc.) for aircraft, utensils, apparatus, electrical conductors; instead of copper in dental alloys. The coarse powder is used in aluminothermics (thermite process); the fine powder as flashlight in Photography, in explosives, fireworks and in aluminum paints; for absorbing occluded gases in manufactories of steel. In testing for Au, As, Hg; coagulating colloidal solution. of As or Sb; reducer for determining nitrates and nitrites; instead of Zn for generating hydrogen in testing for As.

Aluminum toxicity has been recognized in many settings where exposure is heavy or prolonged, where renal function is limited, or where previously accumulated bone burden is released in stress or illness. Toxicity may include: encephalopathy (stuttering, gait disturbance, myoclonic jerks, seizures, coma, abnormal EEG) osteomalacia or aplastic bone disease (associated with painful spontaneous fractures, hypercalcemia, tumorous calcinosis) proximal myopathy, increased risk of infection, increased left ventricular mass and decreased myocardial function microcytic anemia with very high levels, sudden death.

Aluminum is ubiquitous in our environment; it is the third most prevalent element in the earth's crust. The gastrointestinal tract is relatively impervious to aluminum, absorption normally being only about 2%. Aluminum is absorbed by a mechanism related to that for calcium. Gastric acidity and oral citrate favors absorption, and H2-blockers reduce absorption. As is true for several trace elements, transferrin is the primary protein binder and carrier for aluminum in the plasma, where 80% is protein bound and 20% is free or complexed to small molecules such as citrate.

Aluminum toxicity has been reported to impair the formation and release of parathyroid hormone. The parathyroid glands concentrate aluminum above levels in surrounding tissues. Treatment of aluminum toxicity in renal failure patients often reactivates hyperparathyroidism, which to a certain extent is helpful for bone remodeling and healing. (Tortoise Shell, 11.13.2003) (Yinin Bentor, 11.13.2003)

3.7.2 <u>Arsenic</u>

Basic Information

Name: Arsenic

Symbol: As

Atomic Number: 33

Atomic Mass: 74.9216 amu

Melting Point: 817.0 °C (1090.15 °K, 1502.6 °F)

Boiling Point: 613.0 °C (886.15 °K, 1135.4 °F)

Number of Protons/Electrons: 33

Number of Neutrons: 42

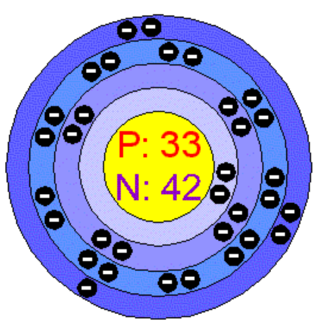
Classification: Metalloid

Crystal Structure: Rhombohedral

Density @ 293 K: 5.72 g/cm3

Color: Gray

Atomic Structure



Number of Energy Levels: **4**

First Energy Level: **2**

Second Energy Level: **8**

Third Energy Level: **18**

Fourth Energy Level: **5**

Isotopes

Isotope	Half Life
As-71	2.7 days
As-72	26.0 hours
As-73	80.3 days
As-74	17.8 days
As-75	Stable
As-76	26.3 hours
As-77	39.0 hours
As-79	9.0 minutes

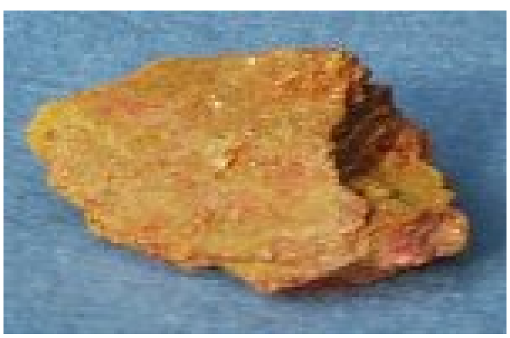
Facts

Date of Discovery: Known to the ancients

Discoverer: Unknown

Name Origin: From the Greek word *arsenikos* and the Latin word *arsenicum*

Uses: Poison, conducts electricity, semiconductors



Although arsenic has almost exclusively been associated with criminal poisoning for many centuries, the matter of concern today is its contribution to environmental pollution through man's use of pesticides, non-ferrous smelters and coal-fired and geo-thermal power plants. The long-term consequences of exposure to inorganic forms of arsenic are important because these compounds are recognized as carcinogens affecting especially the lungs, and in some countries, drinking water contaminated through natural sources was linked to skin cancer. When discussing arsenic, speciation plays an especially important role: hydrides, halogenides, oxides, sulfides, arsenites, arsenates, and organic arsenic compounds all have very different properties (i.e., arsenic trihydride is a colorless, extremely poisonous neutral gas). (Merian, E., 1991)

Arsenic ingestion can cause severe toxicity through ingestion of contaminated food and water. Ingestion causes vomiting, diarrhea and cardiac abnormalities. (Water Quality Group, 05.13.2002) (Yinin Bentor, 11.13.2003)

3.7.3 Cadmium

Basic Information

Name: Cadmium

Symbol: Cd

Atomic Number: 48

Atomic Mass: 112.411 amu

Melting Point: 320.9 °C (594.05 °K, 609.62 °F)

Boiling Point: 765.0 °C (1038.15 °K, 1409.0 °F)

Number of Protons/Electrons: 48

Number of Neutrons: 64

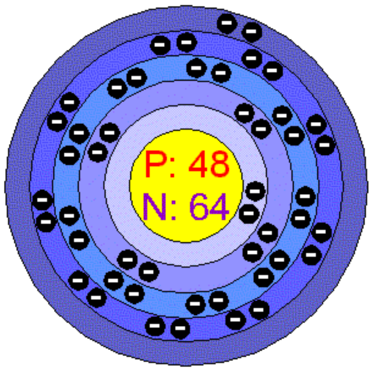
Classification: Transition Metal

Crystal Structure: Hexagonal

Density @ 293 K: 8.65 g/cm^3

Color: Silvery

Atomic Structure



Number of Energy Levels: **5**

First Energy Level: **2**

Second Energy Level: **8**

Third Energy Level: **18**

Fourth Energy Level: **18**

Fifth Energy Level: **2**

Isotopes

Isotope	**Half Life**
Cd-106	Stable
Cd-108	Stable
Cd-109	462.0 days
Cd-110	Stable
Cd-111	Stable
Cd-111m	48.5 minutes
Cd-112	Stable
Cd-113	9.0E15 years
Cd-113m	14.1 years
Cd-114	Stable
Cd-115	2.2 days
Cd-115m	44.6 days
Cd-116	Stable
Cd-117	2.5 hours
Cd-118	3.4 hours

Facts

Date of Discovery: 1817

Discoverer: Fredrich Stromeyer

Name Origin: From the Greek word *kadmeia* (ancient name for calamine) and from the Latin word *cadmia*

Uses: A constituent of easily fusible alloys, e.g., Lichtenberg's, Abel's, Lipowitz', Newton's, and Wood's metal; soft solder and solder for aluminum; electroplating, deoxidizer in Ni plating; process engraving, electrodes for cadmium vapor lamps, photoelectric cells; photometry of ultraviolet sun-rays; filaments for incandescent lights; daguerreotypes.

Cadmium has been emitted in minor amounts into the environment from the rise of industrialization, but in greatly increased quantities after World War II, in the form of dusts and aerosols into the atmosphere, effluents into rivers and lakes, and as solids from point sources. Especially since about 1950, this has led to some global and regional redistribution as well as to a regional and local increase of cadmium levels in the human environment.

Cadmium is a relatively volatile element and is, from present knowledge, not essential for plants, animals and human beings. Higher doses of cadmium can lead to toxic effects. Because cadmium occurs together with zinc, from which it must be separated, cadmium production depends on the production of zinc. Since eight times more cadmium has been consumed in the last 40 years than in the entire history of mankind before, problems associated with cadmium have only accelerated since about 1950. Worldwide cadmium production at present is around 17,000 metric tons per year with a tendency to decrease in the future. (Merian, E., 1991)

Cadmium may interfere with the metallothionein's ability to regulate zinc and copper concentrations in the body. Metallothionein is a protein that binds to excess essential metals to render them unavailable When cadmium induces metallothionein activity, it binds to copper and zinc, disrupting the homeostasis levels (Kennish, 1992). Cadmium is used in industrial manufacturer and is a byproduct of the metallurgy of zinc.

(Water Quality Group, 05.13.2002) (Yinin Bentor, 11.13.2003)

3.7.4 Chromium

Basic Information

Name: Chromium

Symbol: Cr

Atomic Number: 24

Atomic Mass: 51.9961 amu

Melting Point: 1857.0 °C (2130.15 °K, 3374.6 °F)

Boiling Point: 2672.0 °C (2945.15 °K, 4841.6 °F)

Number of Protons/Electrons: 24

Number of Neutrons: 28

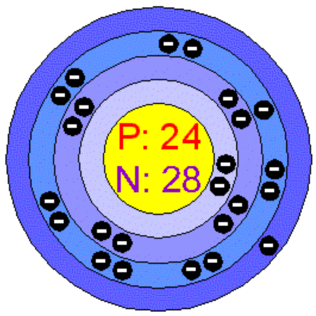
Classification: Transition Metal

Crystal Structure: Cubic

Density @ 293 K: 7.19 g/cm^3

Color: gray

Atomic Structure



Number of Energy Levels: **4**

First Energy Level: **2**

Second Energy Level: **8**

Third Energy Level: **13**

Fourth Energy Level: **1**

Isotopes

Isotope	Half Life
Cr-49	42.3 minutes
Cr-50	Stable
Cr-51	27.7 days
Cr-52	Stable
Cr-53	Stable
Cr-54	Stable

Facts

Date of Discovery: 1797

Discoverer: Louis Vauquelin

Name Origin: From the Greek word *chrôma* (color)

Uses: Stainless steel

Chromium is an element found in many minerals, which are widely distributed in the earth's crust. It is in the 21st position on the index of the most commonly occurring elements in the earth's crust and considered to be essential to a part of the living organisms. A deficiency of chromium in animals can produce diabetes, arteriosclerosis, growth problems, and eye cataracts. Over the past several decades increased quantities of chromium compounds have been used by man and introduced into the environment. (Merian, E., 1991)

The presence of abundant chromium anions in the water is generally a result of industrial waste. The chronic adverse health effects are respiratory and dermatologic. (Water Quality Group, 05.13.2002) (Yinin Bentor, 11.13.2003)

3.7.5 Copper

Basic Information

Name: Copper

Symbol: Cu

Atomic Number: 29

Atomic Mass: 63.546 amu

Melting Point: 1083.0 °C (1356.15 °K, 1981.4 °F)

Boiling Point: 2567.0 °C (2840.15 °K, 4652.6 °F)

Number of Protons/Electrons: 29

Number of Neutrons: 35

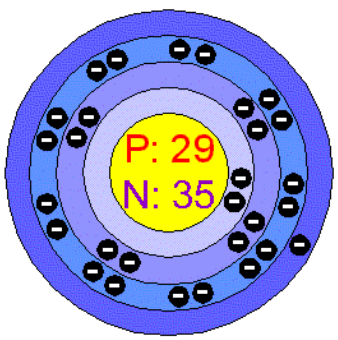
Classification: Transition Metal

Crystal Structure: Cubic

Density @ 293 K: 8.96 g/cm^3

Color: red/orange

Atomic Structure



Number of Energy Levels: **4**

First Energy Level: **2**

Second Energy Level: **8**

Third Energy Level: **18**

Fourth Energy Level: **1**

Isotopes

Isotope	Half Life
Cu-61	3.4 hours
Cu-62	9.7 minutes
Cu-63	Stable
Cu-64	12.7 hours
Cu-65	Stable
Cu-67	2.6 days

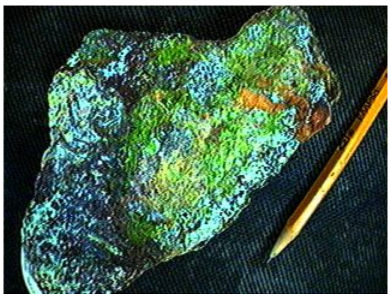
Facts

Date of Discovery: Known to the ancients

Discoverer: Unknown

Name Origin: From the Latin word *cyprium*, after the island of Cyprus

Uses: electrical conductor, jewelry, coins, plumbing



Although specific functions have not been Determined for this element, here again the evidence points to their roles as catalysts and regulators. Like iron and manganese, these two elements have been suggested as of importance in oxidation-reduction reactions. Deficiencies of both are associated with chlorosis and a serious general collapse of vital growth processes. Since catalysts are not used up in the chemical reactions which they promote, we can understand how it comes about that quite small or even minute of the "trace elements", iron, manganese, boron, zinc and copper, may never the less be essential to the plant's health and growth. (Yinin Bentor, 11.13.2003) (Tortoise Shell, 11.13.2003)

3.7.6 Iron

Basic Information

Name: Iron

Symbol: Fe

Atomic Number: 26

Atomic Mass: 55.845 amu

Melting Point: 1535.0 °C (1808.15 °K, 2795.0 °F)

Boiling Point: 2750.0 °C (3023.15 °K, 4982.0 °F)

Number of Protons/Electrons: 26

Number of Neutrons: 30

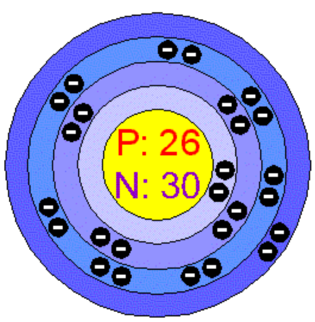
Classification: Transition Metal

Crystal Structure: Cubic

Density @ 293 K: 7.86 g/cm^3

Color: Silvery

Atomic Structure



Number of Energy Levels: **4**

First Energy Level: **2**

Second Energy Level: **8**

Third Energy Level: **14**

Fourth Energy Level: **2**

Isotopes

Isotope	**Half Life**
Fe-52	8.3 hours
Fe-54	Stable
Fe-55	2.7 years
Fe-56	Stable
Fe-57	Stable
Fe-58	Stable
Fe-59	54.5 days
Fe-60	1500000.0 years

Facts

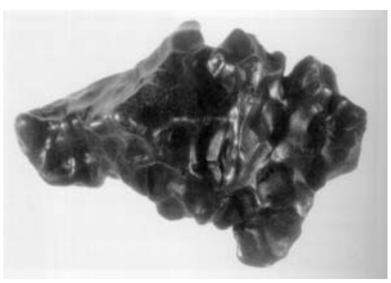
Date of Discovery: Known to the ancients

Discoverer: Unknown

Name Origin: Latin

Symbol Origin: From the Latin word *ferrum* (iron)

Uses: steel, hemoglobin (carries oxygen in blood)



Iron is the most abundant element in the core of the earth and one of the most abundant in the earth's crust. Besides aluminum, it is the most important metallic element in the terrestrial environment. With regard to its biological activity, iron is also the most versatile of al the elements. Life without iron is, in all likelihood, impossible since the enormous quantities of this metal in the earth's core resulted and still result in the formation of an effective shield that deflects various forms of solar and cosmic radiation. The unique properties of iron undoubtedly also led to its key role in the catalysis of metabolic processes. Because of the myriad number of important reactions in which iron participates, all organisms require a mechanisms for its assimilation so as to avoid the ill effects that result from iron deficiency, which afflicts hundreds of millions of people in the world, particularly children and menstruating women. As well as being extremely useful, iron can also be highly toxic to cellular constituents when present in excess, but the problem of toxic iron overload is virtually limited to man and is far less frequent than iron deficiency. Iron overload is a consequence of a malfunction in the regulation of iron absorption. Since iron overload develops on a “normal” diet, the medical approach must be one of improved detection and individual treatment. In conclusion, iron is a metal of low toxicity. (Merian, E., 1991) (Yinin Bentor, 11.13.2003)

3.7.7 Lead

Basic Information

Name: Lead

Symbol: Pb

Atomic Number: 82

Atomic Mass: 207.2 amu

Melting Point: 327.5 °C (600.65 °K, 621.5 °F)

Boiling Point: 1740.0 °C (2013.15 °K, 3164.0 °F)

Number of Protons/Electrons: 82

Number of Neutrons: 125

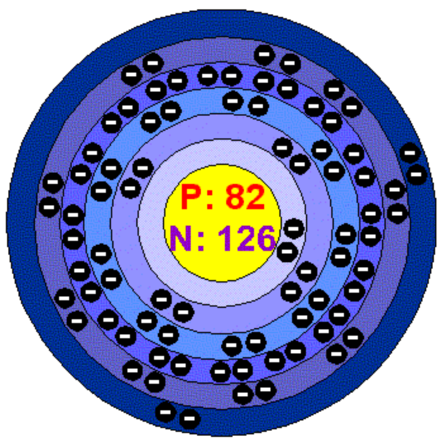
Classification: Other Metals

Crystal Structure: Cubic

Density @ 293 K: 11.34 g/cm^3

Color: bluish

Atomic Structure



Number of Energy Levels: **6**

First Energy Level: **2**

Second Energy Level: **8**

Third Energy Level: **18**

Fourth Energy Level: **32**

Fifth Energy Level: **18**

Sixth Energy Level: **4**

Isotopes

Isotope	**Half Life**
Pb-202	53000.0 years
Pb-203	2.16 days
Pb-204	Stable
Pb-204m	1.12 hours
Pb-205	1.5E7 years
Pb-206	Stable
Pb-207	Stable
Pb-208	Stable
Pb-209	3.25 hours

Pb-210	22.3 years
Pb-211	36.1 minutes
Pb-212	10.64 hours
Pb-214	27.0 minutes

Facts

Date of Discovery: Known to the ancients

Discoverer: Unknown

Name Origin: From the Greek word *protos* (first)

Symbol Origin: From the Latin word *plumbum* (lead)

Uses: Mainly in manufactories. tetraethyl lead; for constructional purposes in manufacturing and handling sulfuric acid; in manufacturing phosphoric acid, chlorination or sulfonation processes, oil refining, gas production; manufacturing various chemical equipment: pipes, valves, stirrers, coils, kettles, pumps, evaporators, condensers; for lining tanks of various electroplating solutions; in manufacturing Babbitt metal, type metal, solder, cable covering, foil, matrices, storage batteries, plumbing-(water pipes, "goose necks", soldering joints, pipe joint compounds), weights; shot; solder and shielding against radiation, batteries

Because of size and charge similarities, lead can substitute for calcium and included in bone. Children are especially susceptible to lead because developing skeletal systems require high calcium levels. Lead that is stored in bone is not harmful, but if high levels of calcium are ingested later, the lead in the bone may be replaced by calcium and mobilized. Once free in the system, lead may cause nephrotoxicity, neurotoxicity, and hypertension

Further reduction of lead emissions is necessary because lead compounds introduced into the environment by human activities are not decomposed and accumulate locally and in biological organisms. (Merian, E., 1991) (Yinin Bentor, 11.13.2003)

3.7.8 Manganese

Basic Information

Name: Manganese

Symbol: Mn

Atomic Number: 25

Atomic Mass: 54.93805 amu

Melting Point: 1245.0 °C (1518.15 °K, 2273.0 °F)

Boiling Point: 1962.0 °C (2235.15 °K, 3563.6 °F)

Number of Protons/Electrons: 25

Number of Neutrons: 30

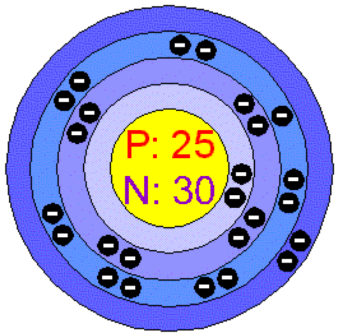
Classification: Transition Metal

Crystal Structure: Cubic

Density @ 293 K: 7.43 g/cm^3

Color: silverish/grayish

Atomic Structure



Number of Energy Levels: **4**

First Energy Level: **2**

Second Energy Level: **8**

Third Energy Level: **13**

Fourth Energy Level: **2**

Isotopes

Isotope	Half Life
Mn-52	5.59 days
Mn-52m	21.1 minutes
Mn-53	3700000.0 years
Mn-54	312.2 days
Mn-55	Stable
Mn-56	2.57 hours
Mn-57	1.45 minutes

Facts

Date of Discovery: 1774

Discoverer: Johann Gahn

Name Origin: From the Latin word *mangnes* (magnet)

Uses: steel, batteries, ceramics

Manganese is in its inorganic species a ubiquitous, essential element in nature and in its occurring concentrations hardly toxic. Relatively large doses can be tolerated without injury. The manganese cycle plays a role in surface waters (interactions with the aquatic biota). Interactions with other metal compounds are also known. Environmental damage caused by this metal is not known so far. It is available in plants and animal sells in relative high concentrations in the mitochondria, where it acts as a cofactor for the activation of some enzymes. (Merian, E., 1991) (Yinin Bentor, 11.13.2003)

3.7.9 Nickel

Basic Information

Name: Nickel

Symbol: Ni

Atomic Number: 28

Atomic Mass: 58.6934 amu

Melting Point: 1453.0 °C (1726.15 °K, 2647.4 °F)

Boiling Point: 2732.0 °C (3005.15 °K, 4949.6 °F)

Number of Protons/Electrons: 28

Number of Neutrons: 31

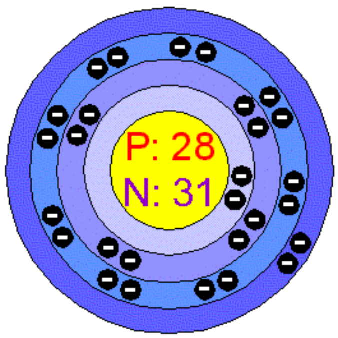
Classification: Transition Metal

Crystal Structure: Cubic

Density @ 293 K: 8.902 g/cm^3

Color: white

Atomic Structure



Number of Energy Levels: **4**

First Energy Level: **2**

Second Energy Level: **8**

Third Energy Level: **16**

Fourth Energy Level: 2

Isotopes

Isotope	**Half Life**
Ni-56	6.1 days
Ni-57	35.6 hours
Ni-58	Stable
Ni-59	76000.0 years
Ni-60	Stable
Ni-61	Stable
Ni-62	Stable
Ni-63	100.0 years
Ni-64	Stable
Ni-65	2.51 hours

Facts

Date of Discovery: 1751

Discoverer: Alex Cronstedt

Name Origin: From the German word *kupfernickel* (false copper)

Uses: electroplating metal alloys, nickel-cadmium batteries, nickel-plating; for various alloys such as new silver, Chinese silver, German silver; for coins, electrotypes, storage batteries; magnets, lightning-rod tips, electrical contacts and electrodes, spark plugs, machinery parts; catalyzer for hydrogenation of oils and other organic substances. See also Raney nickel. Probably the largest use of nickel is in the manufacture of monel metal, stainless steels, and nickel-chrome resistance wire.

Nickel, the twenty-fourth element in order of natural abundance in the earth's crust, is widely distributed in the human environment. To understand the bio-availability and biological effects of nickel, the various classes of nickel compounds must be differentiated.

At the concentrations prevalent in natural waters, soils, and foods, divalent nickel compounds are relatively nontoxic for plants, fishes, birds, and mammals. In humans, adverse effects of inorganic, water-soluble nickel compounds occur after skin contact, which causes nickel dermatitis, a troubling affliction of the general population (especially women), and after inhalation, which causes respiratory tract irritation and asthma in exposed workers, such as electroplaters. (Merian, E., 1991) (Yinin Bentor, 11.13.2003)

3.7.10 Zinc

Basic Information

Name: Zinc

Symbol: Zn

Atomic Number: 30

Atomic Mass: 65.39 amu

Melting Point: 419.58 °C (692.73 °K, 787.24396 °F)

Boiling Point: 907.0 °C (1180.15 °K, 1664.6 °F)

Number of Protons/Electrons: 30

Number of Neutrons: 35

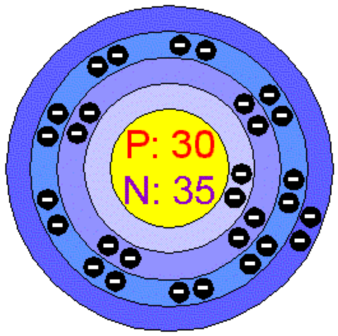
Classification: Transition Metal

Crystal Structure: Hexagonal

Density @ 293 K: 7.133 g/cm^3

Color: bluish

Atomic Structure



Number of Energy Levels: **4**

First Energy Level: **2**

Second Energy Level: **8**

Third Energy Level: **18**

Fourth Energy Level: **2**

Isotopes

Isotope	**Half Life**
Zn-62	9.26 hours
Zn-63	38.5 minutes
Zn-64	Stable
Zn-65	243.8 days
Zn-66	Stable
Zn-67	Stable
Zn-68	Stable
Zn-69m	13.76 hours
Zn-70	Stable
Zn-72	46.5 hours

Facts

Date of Discovery: 1746

Discoverer: Andreas Marggraf

Name Origin: From the German word *zin* (meaning tin)

Uses: metal coating, rust protection, brass, bronze, nickel, galvanizing sheet iron; as ingredient of alloys such as bronze, brass, Babbitt metal, German silver, and special alloys for die-casting; as a protective coating for other metals to prevent corrosion; for electrical apparatus, especially dry cell batteries, household utensils, castings, printing plates; building materials, railroad car linings, automotive equipment; as reducer (in form of the powder) in the manufacture of indigo and other vat dyes; for deoxidizing bronze

Zinc has been used unwillingly for the production of brass since the 4th century A.D. As a discrete element it was discovered in India during the 13th century and in Europe at the beginning of the 16th century. Today zinc is produced in amounts of the same order of magnitude of copper, chromium, or lead.

Zinc plays an important role as an essential trace element in all living systems from bacteria to humans. The detection of the metallothioneins and their biological role gradually proved to be a substantial contribution to a better understanding of zinc metabolism and its interactions with other essential and non-essential trace metals.

The toxicity of zinc and most zinc-containing compounds is generally low and, with certain exceptions, of minor importance compared with the significance of zinc deficiency in plants, animals, and man. Nevertheless, industrial and household wastes sometimes contain zinc concentrations which can be harmful to the environment, although for the most part the effects of zinc-accompanying impurities, such as cadmium and lead, are much more prominent. Some hazards to aquatic organisms and to horses by zinc exposure have been observed. (Merian, E., 1991) (Yinin Bentor, 11.13.2003)

3.8 Dissolved Metals

The toxicity of heavy metals to biota in urban catchments has been regarded as a very important non-point source pollution issue. Numerous studies on heavy metal pollution in urban receiving waters have found that metal transport by surface runoff is closely correlated to the partitioning of the metal forms between dissolved and particulate phases. (Yuan, Y., et al., February 2001)

The U.S. EPA issued a policy memorandum on October 1, 1993, which was titled "Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Metals Policy" and stated:

"It is now the policy of the Office of Water that the use of dissolved metal to set and measure compliance with water quality standards is the recommended approach, because dissolved metal more closely approximates the bio-available fraction of metal in the water column than does total recoverable metal".

The primary mechanism for toxicity to organisms that live in the water column is by adsorption to or uptake across the gills; this physiological process requires metal to be in a dissolved form. This is not to say that particulate metal is nontoxic, only that particulate metal appears to exhibit substantially less toxicity than does dissolved metal. On October 1, 1993, in recognition that the dissolved fraction is a better representation of the biologically active portion of the metal than is the total or total recoverable fraction, the Office of Water recommended that dissolved metal concentrations be used for the application of metals aquatic life criteria and that State water quality standards for the protection of aquatic life (with the exception of chronic mercury criterion) be based of dissolved metals. Consequently, with a few exceptions, each metal's total recoverable-based criterion must be multiplied by a conversion factor to obtain a dissolved criterion that should not be exceeded in the water column. The Waste Load Allocation (WLA) of Total Maximum Daily Loads (TMDLs) must then be translated into a total recoverable metals permit limit.

Dissolved metal is operationally defined as that which passes through a 0.45 μm filter and particulate metal is operationally defined as total recoverable metal minus dissolved metal. Even at that, a part of what is measured as dissolved is particulate metal that is small enough to pass through the filter, or that is adsorbed to or complexed with organic colloids and ligands. Some or all of this may be unavailable biologically. (U.S. EPA, Office of Water, June 1996)

3.8.1 Analytical Methods for Heavy Metals

There are a number of analytical methods available in principle for the determination of trace metals. In fact, however, there are only a few instrumental methods with sufficiently high detection power currently applied in routine analysis. In these methods one can distinguish between single element and multi-element methods that can reach detection limits close to or even below typical metal levels in environmental and biological materials. Therefore, in many cases, provided that sampling and sample preparation do not introduce significant bias, these methods, if properly applied, promise fairly accurate results. The methods most frequently used at present in routine and reference tasks are various modes of the multi-element method of plasma induced atomic emission spectrometry and plasma source mass spectrometry with impressive detection power.

3.8.1.1 Emission Spectroscopy based on Plasma Sources

By definition, a plasma is an electrical conducting gaseous mixture containing a significant concentration of cations and electrons (the concentrations of the two are such that the net charge approaches zero). In the argon plasma frequently employed for emission analyses, argon ions and electrons are the principle conducting species, although cations from the sample will also be present in lesser amounts. Argon ions, once formed in a plasma, are capable of absorbing sufficient power from an external source to maintain the temperature at a level at which further ionization sustains the plasma indefinitely; temperatures as great as 10,000 K are encountered. One of the high temperature plasmas encountered is inductively coupled plasma. (Skoog, et al., 1998)

3.8.1.2 The Inductively Coupled Plasma (ICP) Source

An ICP source consists of a flowing stream of argon gas ionized by an applied radio frequency field. This field is inductively coupled to ionized gas by a water-cooled coil surrounding a quartz "torch" that supports and confines the plasma. A sample aerosol is generated in an appropriate nebulizer and spray chamber and is carried into the plasma through an injector tube located within the torch. The sample aerosol is injected directly into the ICP, subjecting the constituent atoms to temperatures of about 6,000 to 8,000 degrees Kelvin. Because this results in almost complete dissociation of molecules, significant reduction in chemical interferences is achieved. The high temperature of the plasma excites atomic emission efficiently. Ionization of a high percentage of atoms produces ionic emission spectra. The ICP provides an optically "thin" source that is not subject to self-absorption except at very high concentration. Thus linear dynamic ranges of four to six orders of magnitude are observed for many elements. The efficient excitation provided by the ICP results in low detection limits for many elements. This, coupled with the extended dynamic range, permits effective multi-element determination of metals. (Institut fuer Mineralogie, "Inductively Coupled Plasma – Atomic Emission Spectrometry", 10.10.2002)

3.9 Field Measurements: pH, Temperature, Redox Potential and Conductivity

3.9.1 pH Value

The pH is a scale based on the hydrogen ion concentration by which water and other substances are measured to determine if they are acidic, neutral, or alkaline (basic). The midpoint of the scale is pH 7.0 or neutral. Readings from 0.0 to 7.0 are acidic and the lower the pH value the more strongly acidic the material. Readings from 7.0 to 14.0 are alkaline (basic) and the higher the reading the more strongly alkaline (basic) the material. The name pH derives from the Latin word "pondus hydrogenii" which is the weight of the water ions in a watery solution.

Rapid increases in pH can cause ammonia (NH_3) concentrations to increase to concentration levels that are toxic to aquatic organisms. Figure 1 presents the pH of some common liquids.

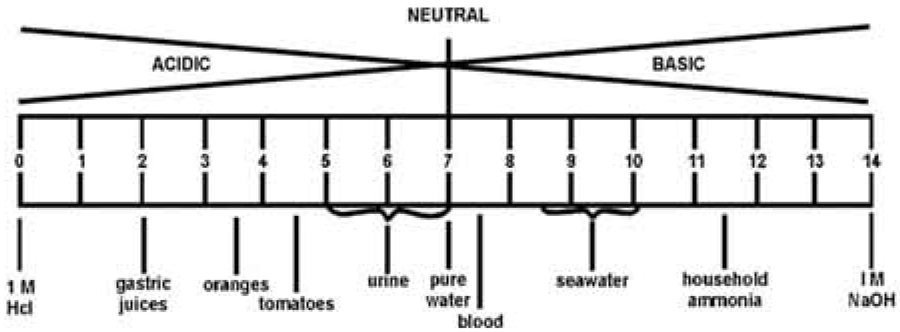


Figure 1: pH values of common liquids. (APHA. 1992)

pH affects many chemical and biological processes in the water. For example, different organisms flourish within different ranges of pH. The largest variety of aquatic animals prefer a range of 6.5-8.0. A pH outside this range reduces the diversity in the stream because it stresses the physiological systems of most organisms and can reduce reproduction. Low pH can also allow toxic elements and compounds to become mobile and "available" for uptake by aquatic plants and animals. This can produce conditions that are toxic to aquatic life, particularly to sensitive species like rainbow trout. Changes in acidity can be caused by atmospheric deposition (acid rain), surrounding rock, and certain wastewater discharges.

The pH scale measures the logarithmic concentration of hydrogen (H^+) and hydroxide (OH^-) ions, which make up water ($H^+ + OH^- = H_2O$). When both types of ions are in equal concentration, the pH is 7.0 or neutral. Below 7.0, the water is acidic (there are more hydrogen ions than hydroxide ions). When the pH is above 7.0, the water is alkaline, or basic (there are more hydroxide ions than hydrogen ions). Since the scale is logarithmic, a drop in the pH by 1.0 unit is equivalent to a 10-fold increase in acidity. So, a water sample with a pH of 5.0 is 10 times as acidic as one with a pH of 6.0, and pH 4.0 is 100 times as acidic as pH 6.0. (APHA. 1992)

3.9.1.1 Analytical and Equipment Considerations

The pH can be analyzed in the field or in the lab. If it is analyzed in the lab, you must measure the pH within 2 hours of the sample collection. This is because the pH will change due to the carbon dioxide from the air dissolving in the water, which will bring the pH toward 7. (APHA. 1992)

3.9.1.2 pH Meters

A pH meter measures the electric potential (millivolts) across an electrode when immersed in water. This electric potential is a function of the hydrogen ion activity in the sample. Therefore, pH meters can display results in either millivolts (mV) or pH units.

A pH meter consists of a potentiometer, which measures electric current; a glass electrode, which senses the electric potential where it meets the water sample; a reference electrode, which provides a constant electric potential; and a temperature compensating device, which adjusts the readings according to the temperature of the sample (since pH varies with temperature). The reference and glass electrodes are frequently combined into a single probe called a combination electrode.

There is a wide variety of meters, but the most important part of the pH meter is the electrode. Buy a good, reliable electrode and follow the manufacturer's instructions for proper maintenance. Infrequently used or improperly maintained electrodes are subject to corrosion, which makes them highly inaccurate.

Color comparators involve adding a reagent to the sample that colors the sample water. The intensity of the color is proportional to the pH of the sample. This color is then matched against a standard color chart. The color chart equates particular colors to associated pH values. The pH can be determined by matching the colors from the chart to the color of the sample. (APHA. 1992)

3.9.1.3 Collection and Analyzing Samples

The field procedures for collecting and analyzing samples for pH consist of the following tasks.

TASK 1: Prepare the sample containers. Sample containers (and all glassware used in this procedure) must be cleaned and rinsed before the first run.

TASK 2: Prepare before leaving for the sampling site. Before you leave for the sampling site, be sure to calibrate the pH meter. The pH meter should be calibrated prior to sample analysis and after every 25 samples according to the instructions that come with them. If you are using a laboratory grade meter, use two pH standard buffer solutions: 4.01 and 7.0. The buffer solutions should be at room temperature when you calibrate the meter. Do not use a buffer after its expiration date. Always cap the buffers during storage to prevent contamination. Because buffer pH values change with temperature, the meter must have a built-in temperature sensor that automatically standardizes the pH when the meter is calibrated.

TASK 3: Collect the sample.

TASK 4: Measure pH. The procedure for measuring pH is the same whether it is conducted in the field or lab. Rinse the electrode well with deionized water. Place the pH meter or electrode into the sample. Depress the dispenser button once to dispense electrolyte. Read and record the temperature and pH in the appropriate column on the data sheet. Rinse the electrode well with deionized water. Measure the pH of the 4.01 and 7.0 buffers periodically to ensure that the meter is not drifting off calibration. If it has drifted, recalibrate it. Samples for pH must be analyzed within 2 hours of collection. If the samples cannot be analyzed in the field, keep the samples on ice and take them to the lab or drop-off point as soon as possible within the 2-hour limit. (APHA. 1992)

3.9.2 Temperature

The rates of biological and chemical processes depend on temperature. Aquatic organisms from microbes to fish are dependent on certain temperature ranges for their optimal health. Optimal temperatures for fish depend on the species: some survive best in colder water, whereas others prefer warmer water. Benthic macroinvertebrates are also sensitive to temperature and will move in the stream to find their optimal temperature. If temperatures are outside this optimal range for a prolonged period of time, organisms are stressed and can die. Temperature is measured in degrees Fahrenheit (F), degrees Celsius (C), or degree Kelvin (K). Temperature affects the oxygen content of the water (oxygen levels become lower as temperature increases); the rate of photosynthesis by aquatic plants; the metabolic rates of aquatic organisms; and the sensitivity of organisms to toxic wastes, parasites, and diseases.

Causes of temperature change include weather, removal of shading streambank vegetation, impoundments (a body of water confined by a barrier, such as a dam), discharge of cooling water, urban storm water, and groundwater inflows to the stream. (APHA. 1992)

3.9.2.1 Sampling and Equipment Considerations

Temperature in a stream will vary with width and depth. It can be significantly different in the shaded portion of the water on a sunny day. In a small stream, the temperature will be relatively constant as long as the stream is uniformly in sun or shade. In a large stream, temperature can vary considerably with width and depth regardless of shade. If it is safe to do so, temperature measurements should be collected at varying depths and across the surface of the stream to obtain vertical and horizontal temperature profiles. This can be done at each site at least once to determine the necessity of collecting a profile during each sampling visit. Temperature should be measured at the same place every time.

Temperature is measured in the stream with a thermometer or a meter. Alcohol-filled thermometers are preferred over mercury-filled because they are less hazardous if broken. Armored thermometers for field use can withstand more abuse than unprotected glass thermometers and are worth the additional expense. Meters for other tests, such as pH (acidity) or dissolved oxygen, also measure temperature and can be used instead of a thermometer. (U.S. EPA 2003d) (APHA. 1992)

3.9.3 Redox Potential

Redox measurements can control the addition of reagents to treat toxic chemicals such as cyanide and render them harmless. Redox measurement is also used in cooling tower water & swimming pool water treatments. Sensors are available in many different configurations for open tanks or pipe mounting. Self-cleaning and spray wash adapters can be fitted to reduce maintenance in waste streams that may coat the sensor.

The redox potential is a measure (in volts) of the affinity of a substance for electrons - its electronegativity - compared with hydrogen (which is set at 0). Substances more strongly electronegative than (i.e., capable of oxidizing) hydrogen have positive redox potentials. Substances less electronegative than (i.e., capable of reducing) hydrogen have negative redox potentials.

Oxidations and reductions always go together. They are called redox reactions. When electrons flow "downhill" in a redox reaction, they release free energy. We indicate this with the symbol ΔG (delta G) preceded by a minus sign. It requires an input of free energy to force electrons to move "uphill" in a redox reaction. We show this with ΔG preceded by a plus sign. The electronegativity of a substance can also be expressed as a redox potential (designated E)

The standard is hydrogen, so its redox potential is expressed as $E = 0$. Any substance - atom, ion, or molecule - that is more electronegative than hydrogen is assigned a positive (+) redox potential; those less electronegative a negative (−) redox potential. The greater the difference between the redox potentials of two substances (ΔE), the greater the vigor with which electrons will flow spontaneously from the less positive to the more positive (more electronegative) substance. The difference in potential (ΔE) is, in a sense, a measure of the pressure between the two. ΔE is expressed in volts.

If we bring two substances of differing E together with a potential path for electron flow between them, we have created a battery. Although it may be in a mitochondrion, it is just as much a battery as a lead-acid storage battery in an automobile. The greater the voltage, ΔE, between the two components of a battery, the greater the energy available when electron flow occurs. (U.S. EPA 2003d)
(John W. Kimball, 2003)

3.9.4 <u>Conductivity</u>

Conductivity is a measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminum cations (ions that carry a positive charge). Organic compounds like oil, phenol, alcohol, and sugar do not conduct electrical current very well and therefore have a low conductivity when in water. Conductivity is also affected by temperature: the warmer the water, the higher the conductivity. For this reason, conductivity is reported as conductivity at 25 degrees Celsius (25 C).

Conductivity in streams and rivers is affected primarily by the geology of the area through which the water flows. Streams that run through areas with granite bedrock tend to have lower conductivity because granite is composed of more inert materials that do not ionize (dissolve into ionic components) when washed into the water. On the other hand, streams that run through areas with clay soils tend to have higher conductivity because of the presence of materials that ionize when washed into the water. Ground water inflows can have the same effects depending on the bedrock they flow through.

Discharges to streams can change the conductivity depending on their make-up. A failing sewage system would raise the conductivity because of the presence of chloride, phosphate, and nitrate; an oil spill would lower the conductivity.

The basic unit of measurement of conductivity is the mho or siemens. Conductivity is measured in micromhos per centimeter (µmhos/cm) or microsiemens per centimeter (µs/cm). Distilled water has a conductivity in the range of 0.5 to 3 µmhos/cm. The conductivity of rivers in the United States generally ranges from 50 to 1500 µmhos/cm. Studies of inland fresh waters indicate that streams supporting good mixed fisheries have a range between 150 and 500 µhos/cm. Conductivity outside this range could indicate that the water is not suitable for certain species of fish or macroinvertebrates. Industrial waters can range as high as 10,000 µmhos/cm.

3.9.4.1 Sampling and Equipment Considerations

Conductivity is useful as a general measure of stream water quality. Each stream tends to have a relatively constant range of conductivity that, once established, can be used as a baseline for comparison with regular conductivity measurements. Significant changes in conductivity could then be an indicator that a discharge or some other source of pollution has entered a stream.

Conductivity is measured with a probe and a meter. Voltage is applied between two electrodes in a probe immersed in the sample water. The drop in voltage caused by the resistance of the water is used to calculate the conductivity per centimeter. The meter converts the probe measurement to micromhos per centimeter and displays the result for the user. NOTE: Some conductivity meters can also be used to test for total dissolved solids and salinity. The total dissolved solids concentration in milligrams per liter (mg/L) can also be calculated by multiplying the conductivity result by a factor between 0.55 and 0.9, which is empirically determined (see Standard Methods #2510, APHA 1992).

Conductivity can be measured in the field or the lab. In most cases, it is probably better if the samples are collected in the field and taken to a lab for testing. In this way several teams of volunteers can collect samples simultaneously. If it is important to test in the field, meters designed for field use can be obtained for around the same cost mentioned above.

If samples will be collected in the field for later measurement, the sample bottle should be a glass or polyethylene bottle that has been washed in phosphate-free detergent and rinsed thoroughly with both tap and distilled water. (U.S. EPA 2003d) (APHA. 1992)

3.9.4.2 Conductivity and Heavy Metals

Conductivity is measured in micromhos per centimeter (umho/cm) and is used to measure the ability of a water sample to conduct an electrical current. Pure water will not conduct an electrical current. When a sample contains dissolved solids or salts, these salts are separated into positively charged (cations) and negatively charged (anions) particles. A water sample that contains ions will conduct electricity, and the concentration of dissolved ions in a sample determines conductivity. Inorganic dissolved solids such as chloride, nitrate, sulfate, phosphate, sodium, magnesium, calcium, iron, and aluminum affect conductivity levels. Geology of an area can affect conductivity levels. Streams that run through areas with granitic bedrock, such as in much of Western North Carolina, tend to have lower conductivity because granitic rock is composed of materials that do not ionize in water. Streams that receive large amounts of runoff containing clay particles generally have higher conductivity because of the presence of materials in clay that ionize more readily in water.

There is no legal standard for conductivity, but potable water has a range from 50-1500 umho/cm, while industrial wastes may have levels above 10,000 umho/cm. Because land-disturbing activities tend to elevate conductivity readings, conductivity is usually lowest in stream headwaters. Failing sewage systems can also raise conductivity levels because of the presence of chloride, phosphate, and nitrate.

Metals are found naturally occurring in surface waters in minute quantities as a result of chemical weathering and soil leaching. However, concentrations greater than those occurring naturally can be toxic to human and aquatic organisms. Elevated levels are often indicative of industrial pollution, wastewater discharge, and urban runoff, especially from areas with high concentrations of automobiles. Because metals sorb readily to many sediment types, they may easily enter streams in areas with high sediment runoff. Another source of heavy metals can be runoff from agricultural fields using sewage sludges as fertilizer, which sometimes are permitted to contain up to 1500 mg metal/1 kg fertilizer.

<u>Copper</u>: The standard of 7.0 ug/l has been established to protect aquatic life. In most areas, ambient levels are usually below 1.0 ug/l. Wear of brake linings has been

shown to contribute concentrations of copper, lead, and zinc; copper has a relatively high content in brake linings. Copper is also present in leaded, unleaded, and diesel fuel emissions.

Lead: A standard of 25 ug/l has been established to protect aquatic wildlife, while the normal ambient level is usually below 1.0 ug/l. Lead may be present in industrial wastewater and was once common in road runoff from the use of leaded gasoline. Roadside soils still generally contain high lead levels, resulting in elevated stream concentrations if these soils are subject to erosion.

Zinc: The surface water standard is 50 ug/l. Typical ambient levels of zinc are approximately 5.0 ug/l. Zinc is a major metal component of tire rubber, brake linings, and galvanized crash barriers. Studies have been conducted linking this to zinc contamination from urban runoff. Because zinc is a by-product of the auto tire vulcanization process as well as the galvanization of iron, its presence in water may also result from industrial or domestic wastewater.

(Lake James Environemtal Association, 2003) (U.S. EPA 2003d)

CHAPTER 4

METHODOLOGY

In the following section the various methods used to complete this research effort will be explained. This included the development and identification of a test site as well as the collection and analyses of highway storm water runoff samples of eleven different storm events.

4.1 Experimental Site Characteristics/Highway Runoff

In order to characterize the highway runoff water quality a broad spectrum of storm events has be sampled at the experimental site. A maximum of fifteen fully labeled samples (date, sample number and time at which it was collected) have been collected for each storm, from the time of the start of observable rainfall. Samples were collected every 2 minutes until peak flow has been reached and then every 4 minutes thereafter. All the data recorded, measurements taken and samples collected have been logged on apposite data sheets alongside the time at which they have been taken.

The initial task of the research consisted of finding the right location for the experimental site. The site was located on the intersection of the I-10 and I-610 highways direction Baton Rouge beneath the eastbound lane of the I-610. This part of the highway was ideal for the research work because of the fast and easy access by car from the University-campus even during rush hours. This was of significant importance because samples had to be taken from the very first runoff flowing out of the pipe. Because weather forecast is not always reliable and rainfall not easy to predict, the fast access of the test site by car was very important. Moreover part of the highway courses over a bridge where the drainage of the runoff can be determined easily. In this case it can be assumed that all storm water will run off each drainage-section of the bridge and can easily be collected. Therefore it is easier to determine the area drained and the amount of storm-water runoff for each section. Last but not least, the site was located in a safe neighborhood, which made the work safe even during night hours.

The sampling location was constructed beneath the Interstate-610 eastbound lane. (Figure 2). The I-610 elevated roadway has three eastbound lanes of Portland cement concrete. This highway carries an average daily traffic load of 40,000 vehicles per day. The mean annual precipitation at the experimental site is 62 in/yr (1,572 mm/yr), with the highest monthly rainfalls, 6.2 in/month (156 mm/month), during the months of July and August. The specific drainage area of the elevated roadway section drains to two storm drains on the leading edge of the outside lane (Figure 3). This specific drainage area from which the storm water runoff had to be characterized is 6,288 ft^2 large (Figure 4).

The storm water runoff is discharged without treatment directly into the 17th Street Canal. This is representative of the heavily traveled elevated sections of major arterial highways that are typical of south Louisiana's elevated infrastructure

The area beneath the elevated highway was made ready for the establishment of the experimentation station. This involved the cleaning of a sufficiently large area for the construction of the experiment station, installation of all necessary equipment for the performance of the measurements, lighting and finally making the facility secure by the installation of a fence off area. The process of site preparation also included the construction of a small concrete dam around the manhole where samples were collected from the two outflow pipes in order to prevent infiltration of surface runoff water from the surrounding environment to the runoff from the elevated highway section.

Figure 2: View of the Experimental Site and Manhole.

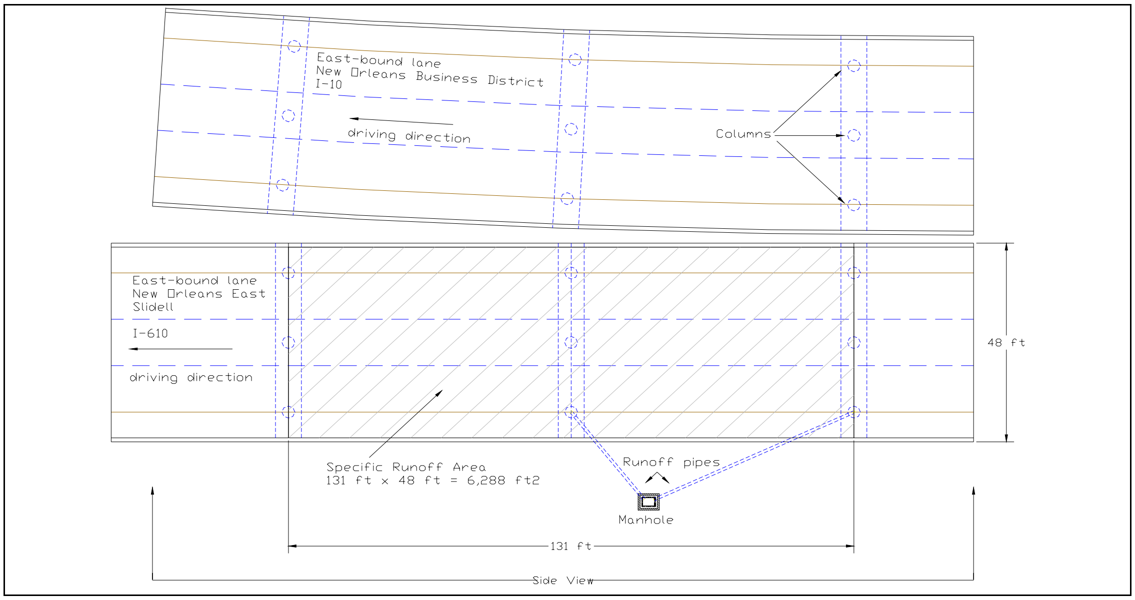


Figure 3: Plan View of the Specific Drainage Area (6,288 ft^2) of the Selected Highway Section of Interstate-610 in Orleans Parish, New Orleans, Louisiana.

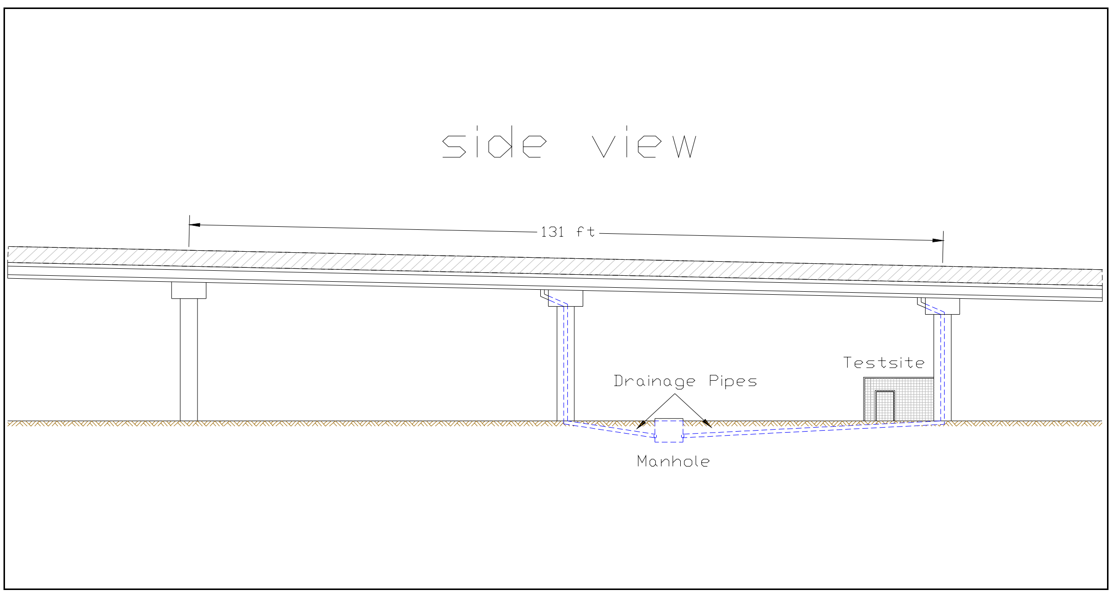


Figure 4: Side View of Section through the Selected I-610 Highway Section at the Experimental Site.

Figure 5: The Experimental Site beneath the East-Bound Lane of the Interstate-610.

Figure 6: Drainpipes in Manhole from which the Highway Runoff is Collected.

4.2 Meteorological Information and Traffic Counts

Meteorological information was a crucial component in this study in order to facilitate the collection of the highway storm water runoff samples at the very beginning of rainfall events. Vehicles potentially represent a major pollutant source in the highway storm water runoff and for that reason traffic counts were performed.

4.2.1 Sources of Meteorological Information

The sources used to gather meteorological information were local weather forecasts for long-term predictions, the local DOPPLER radar and traffic cams along the interstate I-10 to track the location and progression of the storm events. The latter two were accessible online in the World Wide Web and could be used to track the storms at any desired time with good precision.

The used links are shown below:

http://www.weather.com/weather/local/70122?whatprefs=

http://nola.com/traffic/cams/

http://www.accuweather.com

Since the first flush of every storm event was very important for the research this meteorological information was of fundamental significance.

4.2.2 Traffic Counts

Traffic flow characteristics and hydrology are two of the principle variables that significantly affect pollutant loading. Consequently, vehicular counts were performed every 15 minutes starting immediately upon arrival at the experimental site. The duration of each count was 2 to 4 minutes. In addition to these recordings another traffic count was carried out where counts where done hourly for 4 days (2 week days and 2 weekend days) in order to obtain a reasonable average value for the number of vehicles passing this specific highway section.

4.3 Storm Water Runoff Sampling and Flow Measurements

Highway storm water runoff was collected in the storm sewer manhole displayed in Figure 6. Storm water runoff from the highway section was transported to the manhole through 2 drainage pipes. Flow intensity measurements and sampling collection was performed in the above mentioned manhole for both pipes.

4.3.1 Flow Measurements

The collection of runoff samples was carried out using two 5-gallon-buckets; one for each drainpipe. Both buckets were marked with a liter scale in order to obtain the collection volume and were rinsed out with clean water before every collection. In addition, the collection time was recorded to be able to determine the runoff flow rate. Subsequently, the collected highway runoff from both drainpipes was mixed together for each sample and poured into clean polypropylene sample bottles. Fully labeled 1-liter samples (date, sample number and time at which it was collected) were collected from the time of the first flow of storm water runoff coming out of the drainpipes at the manhole (defined as time 0) to the collection of 10 to 15 runoff samples, or the end of the particular storm event, which ever came first. Depending on the intensity of the storm and the associated runoff flow samples were collected every two to five minutes.

In event periods of very low runoff flows the collection intervals were increased to obtain sufficient quantities of storm water runoff to perform all planned wet chemistry analyses.

Since flow measurements are essential to calculate mass loading contributions, recordings were carried out throughout the sampling duration of the storm, from the moment of first runoff flow generation (first runoff reaching the manhole through the drainpipes) until the completion of the particular rainfall runoff sample amount (usually between 10 – 15 samples). Volumetric flow rates were noted down with every collected sample by measuring the amount of collected water and the collection time. Storm water runoff from the elevated roadway section was sampled for eleven storm events throughout the course of the study from which hydrologic and water quality data were collected. However, only samples from 10 runoff events were analyzed for dissolved heavy metals.

4.4 Storm Water Runoff Analyses

Prior to any analytical procedure the collected samples were fully mixed because of the high particulate loadings in almost all runoff samples. This was performed to ensure that measurements taken are representative for the parent samples and to ensure sample homogeneity.

Comprehensive documentation of the recognized Standard Methods, which are referenced as the analytical techniques for each analysis performed, is not restated in this dissertation. The author has only listed any deviation from, or specific modifications to the recognized analytical procedures used. The reader is referred to the "APHA Standard

Methods for the Examination of Water and Wastewater" if further detailed review of each of these procedures is necessary. (APHA, AWWA, WEF, 1999)

4.4.1. Field Measurements

In addition to the collection of each storm water sample, field data analysis was performed immediately at the experimental site. After the storm water runoff collection the samples were transported to the environmental engineering laboratory at the University of New Orleans for further analysis. The parameters measured at the test site are listed below:

- Temperature (^oC)
- pH (s.u.) (APHA Standard Method 4500-H+B)
- Redox potential (+mv) (APHA Standard Method 2580 B)
- Conductivity (μS/cm) (APHA Standard Method 2510)

All electronic devices were calibrated before and properly cleaned with distilled water after every storm event. A portable Orion 290-A+ -meter with a silver/silver chloride (Ag/AgCl) combination electrode was used to measure oxidation/reduction potential, temperature and pH. This silver/silver chloride electrode was used instead of conventional potassium chloride probes because of the interference of heavy metals on measuring Redox potential using conventional combination electrodes.

An YSI Model 85 digital meter was used to measure conductivity and again to measure the temperature to make sure that the values of the two meters were equal in order to have an additional measurement device control.

4.4.2 Laboratory Procedures

This chapter focuses on the different analysis performed in the laboratory after collecting samples. First of all time sensitive analysis will be explained followed by the lab procedure sequence.

4.4.2.1. Time Sensitiveness and Analysis

After the cessation of the storm water runoff collection and the field analysis the samples were transported to the environmental engineering laboratory at the University of New Orleans for further analysis. Time sensitive data analyses were performed immediately or at most within 12-hours of collection. If it was not possible to perform these analyses immediately, the samples were refrigerated at 5 °C and analysed within 12 hours of initial sample collection.

All water quality parameters measured were documented in the laboratory notebook. All devices were calibrated prior to determine the samples.

Following analysis are time sensitive and were analysed as soon as possible.

- Biochemical Oxygen Demand (BOD) ,(mg/L) (APHA Standard Method 5210 B (1992))
- Chemical Oxygen Demand (total, particulate and dissolved) (mg/L) (APHA Standard Method 5220-D and Hach Method 8000 (1992))
- Acid preservation of 15-mL aliquot for heavy metal analysis

As soon as the time sensitive laboratory analyses were complete the non-time sensitive laboratory analyses proceeded. These analyses are specifically:

- Total Suspended Solids (mg/L) (APHA Standard Method 2540-D).
- Total alkalinity (APHA Standard Method 2320 B)
- Solid phase fractionation (APHA Standard Method 3030 B)
- Dissolved heavy metal analysis using an ICP-AES
- Suspended and Dissolved Solids (APHA Standard Methods 2540-D and 2540-E)
- Turbidity (APHA Standard Method 2130-B)

All data are logged in analysis specific laboratory notebooks, from which the data was than transferred to electronic files for interpretation. All analyses have been performed in triplicate for statistical verification. A blank and standard were prepared for each batch of samples. The exact number of blanks was be approximately 5% of the number of samples run as recommended with QA/QC specifications of APHA Standard. Arithmetic means and standard deviations of the triplicates were calculated.

4.4.2.2. Dissolved Heavy Metal Analysis and Sample Preservation

Metal element portioning between the dissolved and particulate-bonded phases in storm water runoff is a dynamic process. The dissolved phase is defined as metal elements that pass through a 0.45-μm cellulose acetate membrane filter. The dissolved heavy metal analysis were performed partly at the Louisiana State University (LSU) in Baton Rouge and partly at the University on New Orleans (UNO).

The first step consisted in pre-washing all filters to insure freedom from contamination. The filter device was pre-conditioned by rinsing it with de-ionized water.

The dissolved phase filtrate was acid preserved in 15-ml polystyrene flasks to less then pH 2 with trace metal grade HNO_3 in accordance with APHA Standard Methods 3010-B. (APHA, AWWA, WEF, 1999)

Dissolved heavy metal analyses performed in the chemistry department at the University of New Orleans were carried out using an Inductively Coupled Plasma-Optical Emission Spectrometer (ICP-OES) - Varian Vista MPX, in accordance with APHA Standard Method 3120-B. (APHA, AWWA, WEF, 1999),

Before starting heavy metal analysis it was necessary to prepare the computer program and to select the elements that had to be analyzed. The task here was to find a wavelength location where elements had a high energy-intensity and possibly low interference with other elements. Every element was found at a certain wavelength and with certain intensity (Figure 7). Wavelengths for the analyzed heavy metals are shown in Table 4.

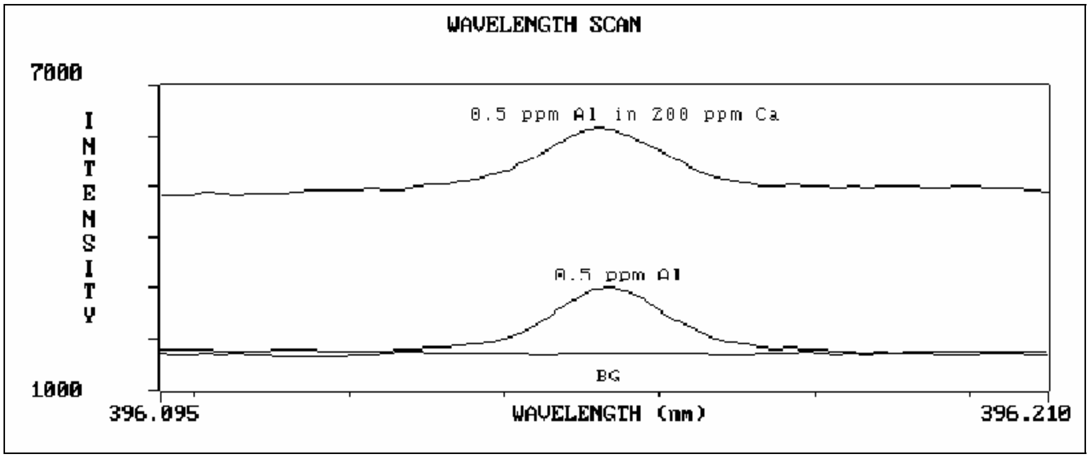


Figure 7: Example Diagram with Wavelength and Intensity of Al. (Varian Inc, 2002)

Element	Wavelength [nm]	Instrument Detection Limit [mg/L]
Al	396.152	1
As	188.98	3
Cd	226.502	1
Cr	267.716	2
Cu	324.754	1
Fe	259.94	1
Mn	257.61	0.4
Ni	231.604	1
Pb	283.305	2
Zn	213.857	1

Table 4: Wavelengths used for each Dissolved Heavy Metal Element

Subsequently, the instrument had to be calibrated using multi-element standard solutions and a blank to give the device reference conditions. The blank and the standardized concentration were then used to generate a calibration line with energy intensity of the element as a function of its concentration.

After the ICP-OES was calibrated and the elements were selected the argon gas supply and the cooling system were activated. One hour later the test analysis was performed analyzing samples with known concentrations to verify measuring precision. Furthermore, this test analysis was carried out after every 10 samples to guarantee accuracy of the analyses.

At that point the instrument was ready for use and samples were analyzed for 10 different metal elements (Al, As, Cu, Cd, Cr, Fe, Mn, Ni, Pb, Zn). For the dissolved heavy metal analyses three analyses were performed for every sample and the mean was used as sample concentration to minimize statistical errors. Furthermore, the sample supply tube was rinsed with distilled water after every analysis and a control sample with known concentration was analyzed after every 10 samples. (Gschnitzer Armin, May 2003)

4.5 Statistical Data Analysis

The enormous amount of data collected from the analyzed storm water runoff events was transferred to an Excel spread sheet where it could be further examined. The database was comprised of 126 data samples. For each of these samples a total of 27 analyses and 40 values based on the field and laboratory measurements were calculated. Mean values and total mass loadings were calculated from the obtained field and lab measurements. A list of the measured variables, their dimensional units and description is shown in Table 5. It is also very important to understand and observe the ranges of values for each of the parameters collected and calculated. Table 6 lists the basic descriptive statistics for each of the parameters in the database, including mean, standard deviation, minimum and maximum values.

Analysis of the data was performed in order to identify the parameters which had the most influence on dissolved heavy metal concentrations. This was done using scatter plots, basic statistical calculations and correlations. Moreover the data was spit into high-flow and low-flow data. This became necessary because of the significant differences in concentrations and correlation-behavior between those two data sets.

Descriptive Statistics

	Definition	Unit
AL	Aluminium	µg/l
CR	Cromium	µg/l
MN	Manganese	µg/l
FE	Iron	µg/l
NI	Nickel	µg/l
CU	Copper	µg/l
ZN	Zinc	µg/l
AS	Arsenic	µg/l
CD	Cadmium	µg/l
PB	Led	µg/l
DRY_H	Dry hours between rainfall	h
RAIN_T	Time until beginning of rainfall	min
FLOW	Runoff flow from the elevated highway section	l/min
RUNOFFT	Runoff-time starting at t=0 for the first observed pipe-outflow	min
QT	Cumulative total Runoff since first pipe-outflow	l
TSS	Total Suspended Solids	mg/l
VDS	Volatile Dissolced Solids	mg/l
TDS	Total Dissolved Solids	mg/l
VSS	Volatile Suspended Solids	mg/l
COD	Chemical Oxigene Demand	mg/l
PH	pH	pH
RED	Redox potential	+mv
BOD	Biochemical Oxigene Demand	mg/l
TURB	Turbidity	NTU
TEMP	Temperature	°C
ALCAL	Alcalinity	meq/l
COND	Conductivity	µS/cm
AL mean	mean Aluminium concentration	µg/l
CR mean	mean Cromium concentration	µg/l
MN mean	mean Manganese concentration	µg/l
FE mean	mean Iron concentration	µg/l
NI mean	mean Nickel concentration	µg/l
CU mean	mean Copper conentration	µg/l
ZN mean	mean Zinc concentration	µg/l
AS mean	mean Arsenic concentration	µg/l
CD mean	mean Cadmium concentration	µg/l
PB mean	mean Lead concentration	µg/l
FLOW mean	mean runoff flow	l/min
TSS mean	mean TSS concentration	mg/l
VDS mean	mean CDS concentration	mg/l
TDS mean	mean TDS concentration	mg/l
VSS mean	mean VDS concentration	mg/l

Table 5: Descriptive Statistics: List of Variables and Units

COD mean	mean COD concentration		mg/l
PH mean	mean pH value		pH
RED mean	mean redox potential		+mv
BOD mean	mean BOD		mg/l
TURB mean	mean Turbidity		NTU
TEMP mean	mean Temperature		°C
ALCAL mean	mean Alcalinity		meq/l
COND mean	mean Conductivity		µS/cm
AL tot m.l.	total mass load	Al	µg
CR tot m.l.	total mass load	Cr	µg
MN tot m.l.	total mass load	Mn	µg
FE tot m.l.	total mass load	Fe	µg
NI tot m.l.	total mass load	Ni	µg
CU tot m.l.	total mass load	Cu	µg
ZN tot m.l.	total mass load	Zn	µg
AS tot m.l.	total mass load	As	µg
CD tot m.l.	total mass load	Cd	µg
PB tot m.l.	total mass load	Pb	µg
QT tot	total runoff volume		l
TSS tot m.l.	total mass load	TSS	mg
VDS tot m.l.	total mass load	VDS	mg
TDS tot m.l.	total mass load	TDS	mg
VSS tot m.l.	total mass load	VSS	mg
COD tot m.l.	total mass load	COD	mg
BOD tot m.l.	total mass load	BOD	mg

Table 5 continued: Descriptive Statistics: List of Variables and Units

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
AL	109	3.2	4223.9	309.795	514.106
CR	109	2.40	460.20	23.3408	57.9143
MN	109	3	671	63.76	112.95
FE	109	27	3097	448.53	525.82
NI	109	.00	205.30	23.2240	34.6973
CU	109	2.0	273.7	36.691	57.341
ZN	109	17	3832	375.62	599.70
AS	109	.000	18.300	2.60642	4.35079
CD	109	.000	10.900	.62238	1.64311
PB	109	.000	108.100	9.51018	20.36398
DRY_H	109	42	1032	304.60	316.11
FLOW	109	0	900	126.47	218.27
QT	109	0	14240	1401.66	2633.46
TSS	109	4	1200	109.94	159.43
VDS	109	4	720	128.03	117.17
TDS	109	10	1350	300.25	267.44
VSS	109	2	397	48.49	62.61
COD	109	30	1195	316.99	228.89
PH	109	6.30	8.30	7.7523	.2984
RED	108	-63.0	37.5	-43.952	17.039
BOD	77	2	236	42.33	43.91
TURB	109	3	80	27.22	13.88
TEMP	109	11.1	30.2	19.589	5.693
ALCAL	109	12	166	49.21	30.15
COND	95	45	2935	516.45	625.99

Table 6. Basic Descriptive Statistics of Database

Once a set of parameters were identified, a model or a series of models could be developed to describe the concentrations of dissolved heavy metals in storm water runoff from elevated highways. These models were calculated based on the high-flow data only.

The approach for the analysis of the high-flow data proceeded in four steps which are discussed in the following chapters.

4.5.1 Statistical Model Data Preparation

The first step consisted in developing correlation matrixes for each of the ten dissolved heavy metals. This was done observing the original data first. The data set was then transformed. For the data set of this research the author applied a logarithmic transformation. Moreover, for certain variables a constant was applied. This became necessary because some variables had negative or zero values. Such values were not able to be transformed without adding a constant. The redox potential was calibrated to Zobell's solution prior to all calculations. The measured redox potential of Zobell's solution against the standard hydrogen electrode is 428mV at 25°C. The Ag-AgCl electrode has a potential of 199mV versus the standard hydrogen electrode. The device used for this research to measure the redox potential was calibrated with the Zobell's solution. The obtained correction value (271.8mV) was then added to all measured readings in order to bring them up to be relative to the standard hydrogen electrode.

A correlation matrix for the transformed data was then developed. The values for the new correlation matrix were then compared to the previously obtained values from the non transformed data. It could be seen that for some dissolved heavy metals the non transformed data gave better results, while for others the transformed data set gave better results.

The following tables (Table 7-9) illustrate the logarithmic transformation used to transform the raw data and the correlation matrix for the untransformed and transformed data set for high flow storm events.

ORIGINAL UNTRANSFORMED VARIABLES	Initial	Mathematical Calculation	Final	OBTAINED TRANSFORMED VARIABLES
	AL	natural logaritm = LN (AL)	Ln(Al)	
	CR	LN (Cr)	Ln(Cr)	
	MN	LN (Mn)	Ln(Mn)	
	FE	LN (Fe)	Ln(Fe)	
	NI	LN (Ni+10)	Ln(Ni)	
	CU	LN (Cu)	Ln(Cu)	
	ZN	LN (Zn)	Ln(Zn)	
	AS	LN (As+10)	Ln(As)	
	CD	LN (Cd+10)	Ln(Cd)	
	PB	LN (Pb+10)	Ln(Pb)	
	DRY_H	LN (Dry_h)	Ln(Dry_h)	
	RAIN_T	LN (Rain_t)	Ln(rain_t)	
	FLOW	LN (Flow)	Ln(flow)	
	RUNOFFT	LN (Runofft+10)	Ln(runofft)	
	QT	LN (Qt+10)	Ln(Qt)	
	TSS	LN (TSS)	Ln(TSS)	
	VDS	LN (VDS)	Ln(VDS)	
	TDS	LN (TDS)	Ln(TDS)	
	VSS	LN (VSS)	Ln(VSS)	
	COD	LN (COD)	Ln(COD)	
	PH	LN (Ph)	Ln(pH)	
	RED	LN (Red+64)	Ln(red)	
	BOD	LN (BOD)	Ln(BOD)	
	TURB	LN (Turb)	Ln(Turb)	
	TEMP	LN (Temp)	Ln(Temp)	
	ALCAL	LN (Alcal)	Ln(Alcal)	
	COND	LN (Cond)	Ln(Cond)	

Table 7: Mathematical Procedure for Transformation of Variables

	Al	Cr	Mn	Fe	Ni	Cu	Zn	As	Cd	Pb	Dry h	FLOW	Runofft	Qt	TSS	VDS	TDS	VSS	COD	PH	Red	BOD	Turb	Temp	Cond I	Alcal
Al	1.00																									
Cr	0.94	1.00																								
Mn	0.40	0.41	1.00																							
Fe	0.91	0.86	0.59	1.00																						
Ni	0.78	0.81	0.74	0.90	1.00																					
Cu	0.82	0.83	0.79	0.86	0.88	1.00																				
Zn	0.82	0.75	0.77	0.85	0.84	0.88	1.00																			
As	0.88	0.81	0.55	0.81	0.71	0.87	0.79	1.00																		
Cd	0.89	0.86	0.60	0.83	0.77	0.90	0.82	0.98	1.00																	
Pb	0.80	0.67	0.37	0.69	0.56	0.71	0.71	0.84	0.82	1.00																
Dry h	-0.13	-0.12	0.33	-0.07	0.07	0.16	-0.05	0.02	0.08	0.00	1.00															
FLOW	-0.22	-0.21	-0.08	-0.09	-0.13	-0.16	-0.29	-0.17	-0.15	-0.13	0.44	1.00														
Runofft	-0.39	-0.35	-0.35	-0.53	-0.59	-0.39	-0.43	-0.25	-0.28	-0.21	0.10	0.16	1.00													
Qt	-0.30	-0.29	-0.22	-0.33	-0.41	-0.27	-0.39	-0.19	-0.18	-0.11	0.52	0.60	0.70	1.00												
TSS	0.72	0.64	0.83	0.81	0.84	0.89	0.89	0.78	0.81	0.69	0.23	-0.12	-0.52	-0.33	1.00											
VDS	0.73	0.69	0.45	0.73	0.68	0.73	0.70	0.72	0.73	0.65	-0.31	-0.37	-0.59	-0.52	0.70	1.00										
TDS	0.70	0.72	0.72	0.74	0.77	0.89	0.79	0.80	0.81	0.61	-0.15	-0.38	-0.41	-0.47	0.78	0.85	1.00									
VSS	0.50	0.46	0.85	0.64	0.74	0.77	0.78	0.60	0.65	0.48	0.26	-0.11	-0.51	-0.34	0.93	0.65	0.73	1.00								
COD	0.43	0.45	0.84	0.70	0.83	0.68	0.69	0.40	0.47	0.27	0.17	0.07	-0.55	-0.30	0.73	0.42	0.57	0.73	1.00							
PH	-0.68	-0.81	-0.62	-0.77	-0.84	-0.82	-0.62	-0.66	-0.73	-0.45	-0.22	-0.14	0.37	0.14	-0.66	-0.49	-0.66	-0.56	-0.71	1.00						
Red	0.65	0.79	0.61	0.74	0.81	0.82	0.58	0.65	0.72	0.43	0.22	0.14	-0.39	-0.15	0.64	0.53	0.68	0.58	0.69	-0.98	1.00					
BOD	0.79	0.79	0.85	0.87	0.92	0.97	0.94	0.86	0.89	0.66	0.08	-0.35	-0.55	-0.43	0.92	0.82	0.96	0.84	0.75	-0.80	0.78	1.00				
Turb	0.19	0.12	0.57	0.44	0.57	0.33	0.45	0.06	0.12	0.06	0.25	-0.07	-0.65	-0.37	0.55	0.23	0.22	0.59	0.77	-0.30	0.27	0.43	1.00			
Temp	0.13	-0.01	-0.14	0.03	-0.05	-0.18	0.22	-0.14	-0.14	0.02	-0.26	-0.32	-0.06	-0.21	-0.03	-0.10	-0.24	-0.06	-0.05	0.31	-0.43	-0.20	0.28	1.00		
Cond I	0.81	0.81	0.81	0.87	0.91	0.96	0.91	0.83	0.86	0.66	0.07	-0.30	-0.48	-0.40	0.90	0.76	0.90	0.81	0.74	-0.78	0.76	0.98	0.48	-0.04	1.00	
Alcal	0.69	0.66	0.38	0.67	0.64	0.60	0.64	0.52	0.55	0.45	-0.16	-0.55	-0.49	-0.58	0.54	0.59	0.59	0.46	0.46	-0.44	0.42	0.66	0.50	0.31	0.73	1.00

Table 8: Correlation Matrix for all Variables: Untransformed Raw Data Set

	Al_log	Cr_log	Mn_log	Fe_log	Ni_log	Cu_log	Zn_log	As_log	Cd_log	Pb_log	Dry h_log	FLOW_log	Runofft_log	Qt_log	TSS_log	VDS_log	TDS_log	VSS_log	COD_log	PH_log	Red_log	BOD_log	Turb_log	Temp_log	Cond l_log	Alcal_log
Al_log	1.00																									
Cr_log	0.79	1.00																								
Mn_log	0.17	0.28	1.00																							
Fe_log	0.68	0.76	0.61	1.00																						
Ni_log	0.57	0.72	0.75	0.86	1.00																					
Cu_log	0.15	0.36	0.94	0.61	0.77	1.00																				
Zn_log	0.79	0.81	0.30	0.70	0.65	0.30	1.00																			
As_log	0.23	0.45	0.58	0.47	0.56	0.64	0.38	1.00																		
Cd_log	0.33	0.53	0.65	0.53	0.64	0.70	0.45	0.97	1.00																	
Pb_log	0.28	0.34	0.36	0.36	0.40	0.39	0.34	0.75	0.73	1.00																
Dry h_log	0.16	-0.14	0.47	0.07	0.23	0.34	-0.13	0.11	0.20	0.06	1.00															
FLOW_log	0.33	-0.03	0.15	0.08	0.01	-0.02	0.00	-0.18	-0.09	-0.13	0.53	1.00														
Runofft_log	-0.39	-0.45	-0.59	-0.70	-0.74	-0.58	-0.54	-0.34	-0.37	-0.27	0.01	0.00	1.00													
Qt_log	-0.37	-0.54	-0.46	-0.68	-0.72	-0.54	-0.61	-0.46	-0.46	-0.39	0.29	0.39	0.83	1.00												
TSS_log	0.63	0.47	0.72	0.72	0.76	0.65	0.63	0.39	0.50	0.37	0.40	0.35	-0.79	-0.61	1.00											
VDS_log	0.17	0.52	0.38	0.56	0.53	0.46	0.53	0.40	0.40	0.28	-0.55	-0.33	-0.68	-0.76	0.35	1.00										
TDS_log	0.00	0.45	0.43	0.44	0.50	0.52	0.44	0.47	0.45	0.25	-0.52	-0.44	-0.49	-0.66	0.19	0.91	1.00									
VSS_log	0.55	0.45	0.75	0.66	0.73	0.69	0.64	0.43	0.53	0.36	0.30	0.24	-0.77	-0.65	0.95	0.45	0.33	1.00								
COD_log	0.55	0.60	0.68	0.87	0.83	0.60	0.55	0.33	0.39	0.23	0.23	0.17	-0.69	-0.56	0.73	0.43	0.33	0.68	1.00							
PH_log	-0.43	-0.64	-0.78	-0.68	-0.79	-0.78	-0.42	-0.69	-0.77	-0.43	-0.39	-0.16	0.40	0.33	-0.54	-0.35	-0.41	-0.52	-0.67	1.00						
Red_log	0.12	0.32	0.72	0.47	0.58	0.68	0.07	0.44	0.49	0.18	0.42	0.21	-0.36	-0.15	0.40	0.26	0.31	0.40	0.63	-0.83	1.00					
BOD_log	0.60	0.61	0.85	0.73	0.86	0.91	0.68	0.62	0.68	0.40	0.13	-0.45	-0.85	-0.77	0.86	0.68	0.73	0.87	0.73	-0.73	0.57	1.00				
Turb_log	0.60	0.36	0.51	0.66	0.64	0.44	0.53	0.07	0.16	0.11	0.37	0.27	-0.68	-0.51	0.84	0.18	0.02	0.76	0.74	-0.32	0.26	0.68	1.00			
Temp_log	0.68	0.37	-0.35	0.16	0.02	-0.38	0.61	-0.16	-0.14	0.05	-0.20	0.01	-0.08	-0.21	0.21	0.00	-0.14	0.18	0.03	0.26	-0.54	-0.11	0.34	1.00		
Cond l_log	0.35	0.59	0.72	0.66	0.81	0.79	0.63	0.61	0.65	0.42	-0.01	-0.37	-0.69	-0.82	0.63	0.67	0.71	0.71	0.62	-0.63	0.44	0.92	0.50	0.08	1.00	
Alcal_log	0.41	0.55	0.39	0.53	0.56	0.49	0.58	0.42	0.44	0.34	-0.13	-0.49	-0.53	-0.70	0.46	0.50	0.50	0.51	0.44	-0.35	0.15	0.76	0.46	0.35	0.83	1.00

Table 8: Correlation Matrix for all Variables: Transformed Raw Data Set

4.5.2 Independent Variables Selection

The second step corresponded to the selection of independent variables associated with the concentration of dissolved heavy metals from the storm water runoffs. These independent variables were obtained on the basis of three different statistical methods: forward selection, backward elimination and stepwise procedure. The level of significance for the two-tailed test (α) was set at 0.05. A two-tailed test allowed the author to evaluate deviations from a statistical hypothesis in two directions. In other words, a value of the statistic that is sufficiently small or sufficiently large will lead to rejection of the hypothesis tested.

The forward procedure begins with no variables in the model. After each calculation step the software enters one variable. For each of the variables entered the forward procedure calculates the F-statistic which reflects the contribution of the test variable to the model. Variables are entered one by one into the model until none of the remaining variables produce a significant F-statistic. The limitation of this procedure is as followed: once a variable is entered into the model it will not be removed, even when it becomes insignificant in the presence of new variables entered into the model at a later time.

To overcome the limitation of the forward selection models were developed using the backward elimination procedure. This method is exactly the opposite of the forward selection procedure. This method begins by calculating F-statistics for each variable. After that the variables are deleted from the model one by one, starting with the variable showing the least contribution. This procedure is repeated until all the variables remaining in the model produce a F-statistics significant to five percent. The backward elimination procedure has similar limitations as the forward selection procedure. Once the variable is excluded from the model it cannot be re-entered again even if it becomes significant after deleting other variables from the model. For this reason it is recommended to select the variables on basis of combination of different procedures.

The stepwise method was used as well to select the variables that significantly correlate to the concentration of dissolved heavy metals. The stepwise procedure is a modification of the forward selection procedure. The different is that the variables which are already included in a model do not necessarily remain in the model. After a variable is added the stepwise procedure examines all the variables already in the model and deletes these variables which are not significant at five percent due to adding the new variable. This means that a variable in a model can be significant at five percent for a certain combination of variables. After adding more and more variables, previous added and from the model excepted variables can become insignificant in combination with other variables. Therefore this procedure eliminates these variables. The stepwise procedure continues until none of the remaining variables outside the model are significant.

The following tables (Tables 10-16) show the significant variables for each dissolved heavy metal according to all three selection-procedures.

Selection of Variables Significantly Associated with Al			
Variable	Forward	Backward	Stepwise
dry_h	x	x	x
flow			
runofft			
qt	x	x	x
ph			
red		x	
temp		x	
cond_i	x	x	x
Ln(dry_h)	x	x	x
Ln(flow)			
Ln(runofft)			
Ln(Qt)	x	x	x
Ln(pH)			
Ln(red)	x	x	x
Ln(temp)	x	x	x
Ln(cond)	x	x	x

Table 10: Selection of Variables Significantly Associated with Al

Selection of Variables Significantly Associated with Cr			
Variable	Forward	Backward	Stepwise
dry_h	x	x	x
flow		x	
runofft			
qt		x	
ph	x		x
red		x	
Temp		x	
cond_i	x	x	x
Ln(dry_h)	x	x	x
Ln(flow)		x	
Ln(runofft)			
Ln(Qt)		x	
Ln(pH)	x		x
Ln(red)		x	
Ln(temp)	x	x	x
Ln(cond)		x	

Table 11: Selection of Variables Significantly Associated with Cr

Selection of Variables Significantly Associated with Mn			
Variable	Forward	Backward	Stepwise
dry_h	x	x	x
flow			
runofft			
qt			
ph			
red			
temp			
cond_i	x	x	x
Ln(dry_h)	x	x	x
Ln(flow)	x	x	x
Ln(Runofft)			
Ln(Qt)			
Ln(pH)			
Ln(red)	x	x	
Ln(Temp)	x	x	x
Ln(cond)	x	x	x

Table 12: Selection of Variables Significantly Associated with Mn

Selection of Variables Significantly Associated with Fe			
Variable	Forward	Backward	Stepwise
dry_h	x	x	x
flow	x	x	x
runofft		x	
qt		x	
ph		x	
red			
temp		x	
cond_i	x	x	x
Ln(dry_h)			
Ln(Flow)			
Ln(runofft)	x		x
Ln(Qt)		x	
Ln(pH)	x		x
Ln(red)		x	
Ln(Temp)	x	x	x
Ln(cond)		x	

Table 13: Selection of Variables Significantly Associated with Fe

Selection of Variables Significantly Associated with Ni			
Variable	Forward	Backward	Stepwise
dry_h			
flow			
runofft			
qt	x	x	x
ph	x	x	x
red			
temp			
cond_i	x	x	x
Ln(dry_h)		x	x
Ln(Flow)			
Ln(runofft)	x		
Ln(Qt)		x	x
Ln(pH)	x		x
Ln(red)		x	
Ln(Temp)	x	x	
Ln(Cond)	x		

Table 14: Selection of Variables Significantly Associated with Ni

Selection of Variables Significantly Associated with Cu			
Variable	Forward	Backward	Stepwise
dry_h			
flow		x	
runofft		x	
qt	x		x
ph			
red			
temp	x	x	x
cond_i	x	x	x
Ln(dry_h)	x	x	x
Ln(Flow)	x	x	x
Ln(runofft)		x	
Ln(Qt)		x	
Ln(pH)			
Ln(red)	x		
Ln(Temp)	x	x	x
Ln(Cond)	x	x	x

Table 15: Selection of Variables Significantly Associated with Cu

Selection of Variables Significantly Associated with Zn			
Variable	Forward	Backward	Stepwise
dry_h		x	
flow		x	
runofft			
qt			
ph		x	
red			
temp	x	x	x
cond_i	x	x	x
Ln(dry_h)	x	x	x
Ln(Flow)		x	
Ln(runofft)			
Ln(Qt)			
Ln(pH)			
Ln(red)	x	x	x
Ln(Temp)	x	x	x
Ln(Cond)	x	x	x

Table 16: Selection of Variables Significantly Associated with Zn

4.5.3 <u>Model Developing</u>

The third step was to develop models for the concentration of dissolved heavy metals. The information obtained from the first two steps was used to carry out these calculations. First, models were developed using all data available from the high flow data, and combining the information of the first two steps.

Then step two and three were repeated taking into consideration only the dissolved heavy metal concentrations and the field measurements performed during this research. The field measurements proved a good correlation to the metal concentrations and were moreover easy to perform with low technical expenditure in a short period of time. As the number of independent parameters was reduced, the change in correlation coefficient was observed. The second set of models was then compared to the first set and the results were evaluated and discussed.

The coefficient of determination (R^2) and Mallow's Cp-Statistics criteria were used for the selection of the appropriated model.

The R^2 value can be interpreted as the proportion of the variance in Y attributable to the variation in X. The R^2 value, also known as the Coefficient of Determination, is an indicator that ranges in value from 0 to 1. This coefficient reveals how closely the estimated values for the regression correspond to the actual data. A regression is most reliable when its R^2 value is at or near 1. Moreover the Pearson Product Moment Correlation Coefficient R was calculated, a dimensionless index that ranges from -1.0 to 1.0 inclusive and reflects the extent of a linear relationship between two data sets where 0 represents no correlation and 1 represents an excellent correlation. A value of –1 shows a perfect reciprocal correlation. The value for R^2 was calculated using following formula:

$$R^2 = 1 - \frac{SSE}{SST}$$

where $SSE = \sum (Y_j - \hat{Y}_j)^2$

and $SST = (\sum Y_j^{\ 2}) - \frac{(\sum Y_j)^2}{h}$

The Correlation Factor R for linear regression-functions can also be calculated directly using following formula: (Devore, 1991)

$$R = \frac{n(\sum XY) - (\sum X) * (\sum Y)}{\sqrt{\left[n\sum X^2 - (\sum X)^2\right] * \left[n\sum Y^2 - (\sum Y)^2\right]}}$$

Mallow's Cp-Statistics criteria is a measure of total squared errors for a subset model containing p regressors. The total squared error is a measure of the error variance plus the bias introduced when non including important regressors in a model. This procedure can be helpful detecting if too many regressors have included or deleted from the regression model.

For the statistical evaluation the software packages "Statistical Analysis System" (SAS) and "Statistical Package for the Social Sciences" (SPSS) were used.

The software package SAS was used for the Cp-Statistics. The procedure begins with one variable in the model. After calculating the R^2 and Cp value for all models including only one variable, the same procedure is repeated for all possible two-variable models. This means that the software calculates all combinations of a two-variable model and computes the R^2 and Cp value for each of them. The procedure continues until all possible models resulting from adding all variables are considered. The theory of the Cp-statistic suggests that the best-fitting model is the model which has a Cp value close to the number of parameters (p) included in the model. A Cp value greater than p indicates a biased model, while a Cp smaller than p indicates sampling error.

A low absolute value of the correlation coefficient (R) can indicate a weak degree of linear correlation among the examined variables. On the other hand, a large R value does not necessarily guarantee that two variables are related. The value calculated for the correlation coefficient will tend to be inflated if there are only a few data pairs available. Moreover, there could be a third variable causing the simultaneous change in the first two variables. The magnitude of the correlation coefficient is very sensitive to the presence of nonlinear trends which would cause the relationship to be underestimated or overestimated. Nonlinear trends and outliers can usually be detected in scatter-plots described above (section 4.5). Regardless of the magnitude of the correlation coefficient the value R may or may not be significant. Therefore a significance test must be performed in order to determine if the observed correlation coefficient is significantly different from zero. If no correlation between two variables can be obtained it is still possible that a high (positive or negative) sample correlation value may occur. For a true correlation of zero it can be shown that

$$t^{*} = R\frac{\sqrt{n-2}}{\sqrt{1-R^{2}}}$$

where R = correlation coefficient

n = number of samples

has a t-distribution with n-2 degrees of freedom and that both variables are normally distributed.

4.5.4 Model Verification

The fourth and last step consisted of verification of the model. Here a series of statistical analyse were conducted in order to determine the reliability and accuracy of the predicted values versus the observed values.

First the "Coefficient of Variation Test for Normality" (COV) was computed for the predicted and observed data. The COV was obtained by dividing the standard deviation (S) by the mean of the variable ($\bar{x}$).

(Edward, H. Isaaks, et al., 1989) (Vera, Oscar, 2003)

$$COV = \frac{S}{\bar{x}}$$

A normal distributed data set is fundamental for any further statistical analysis. A COV value less than one shows that the data set is normal distributed while a COV value higher than one indicates a non normal distribution. If the COV exceeds 1.0, there is a strong evidence that the data is not normally distributed. In the latter case a transformation of the data set is necessary before further statistical analyses. For this research the author had to apply a logarithmic transformation for some data sets in order to obtain a normal distribution. (Edward, H. Isaaks, et al., 1989) (Vera, Oscar, 2003)

The Student's t-Test was used for comparing two samples for significance of difference. Previous to the use of the t-test it was, however, necessary to analyze both sets of data for significance difference between samples variances. This was done using the F-test. This test determines if two samples have a statistically different variance or not. This is important in order to see which t-test to use. The F-distribution is the sampling distribution of the ratio of two independent, unbiased estimates of the variance of a normal distribution. The variance ratio is defined as followed:

$$F = \frac{S_1^2}{S_2^2}$$

where, S1 is greater than S2 and represents the variance of both samples being compared. Should the F-ratio be lesser than the F-test then there is not a statistically significant difference between the variances and the t-test for equal variances can be utilized. Otherwise the t-test for unequal variances has to be used.

Finally, the t-test was performed for comparing the set for significance of difference in the mean. If the predicted and the observed data set showed a statistically equal mean, the model was declared reliable on the 95% confidence interval which corresponds to the 5% significance level.

CHAPTER 5

DISCUSSION OF RESULTS

The fundamental goal of this study was to characterize and predict dissolved heavy metals in storm water runoff from elevated roadways. In the following chapter the methods used to develop the prediction models will be explained. This includes the development and verification of all generated models as well as the comparison of the obtained results. For this research a total of eleven different storm events was collected and analyzed as described in the Methodology.

The quality of highway storm water runoff is difficult to characterize, because it is affected by many factors, such as rainfall intensity, antecedent dry days, traffic conditions, climatic effects etc. For this study a total of 27 measured variables were used in order to characterize the factors affecting storm water runoff from elevated roadways. The high variations and fluctuations of these factors between rainfall events or during a single event made it difficult to find significant correlations.

5.1. High-Flow and Low-Flow Storm Events

During this research effort it became evident that the data from the analyzed storm events did not show uniform behavior or correlation. A total of eleven storm events were analyzed over a period of more than one year. The type of rainfall event, however, depends on the actual season. In general, in southeastern Louisiana there are two types of rainfall events. During the fall and winter rainfalls are generally stratiform with a low rainfall intensity and generally without thunderstorms but with a quite long duration. During the spring- and summer months rainfall is usually convective which is a torrential rainfall accompanied by thunder, high rainfall intensities and short duration.

Six of the analyzed storms occurred within spring and summer months (between March 20 and September 23) and five of them occurred during fall and winter months (between September 23 and March 20).

While evaluating the data of all storm events an important observation could be made: all analyzed storm events could mainly be divided into two major categories which than showed uniform behavior in the concentration of pollutants. One category of storm events included all events with high runoff flow intensity while the other category contained all events with low runoff flow intensity (Figure 8-10). The high flow rainfalls were due to convective storm events while the low flow rain events were due to stratiform storm events.

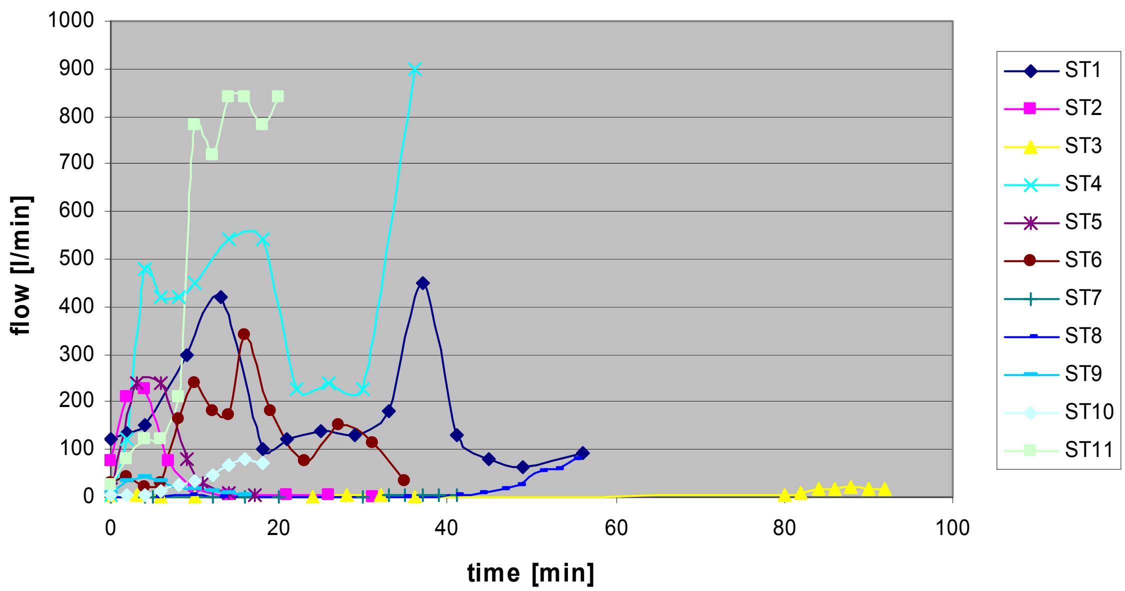


Figure 8: Flow-Intensity Diagram for all Storm Events

Figure 8 shows the difference in intensity between high flow data and low flow data. The huge difference in runoff intensity has an enormous impact on the rate at which contaminants are washed off the roadways. When dividing the data set into these two categories and evaluating the performed analysis, better correlation between the single storm events can be observed. Therefore all collected storm events were split into high flow data and low flow data and further examined. Figure 9 and 10 illustrate the different categories.

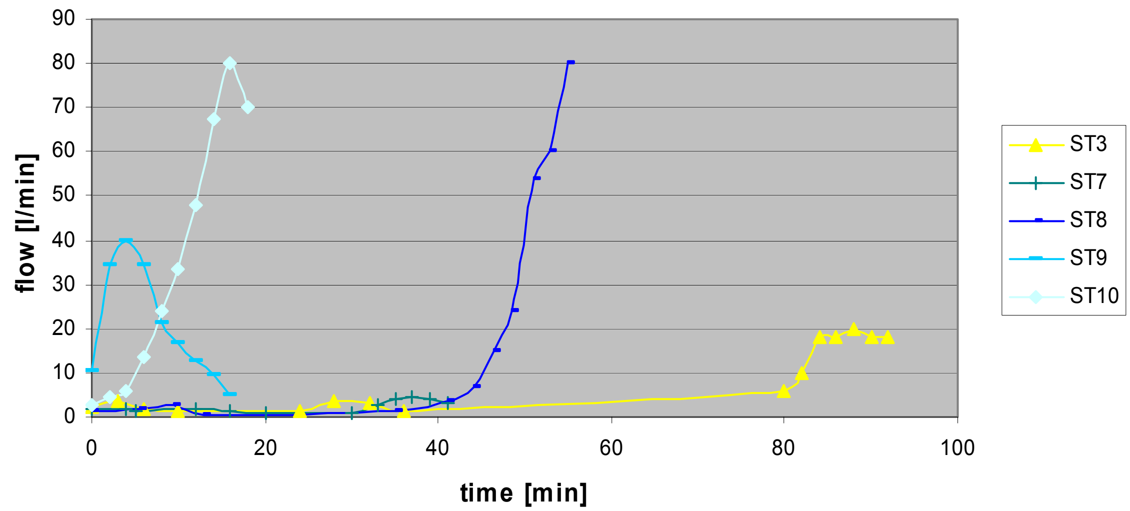


Figure 9: Low Flow Intensity Diagram

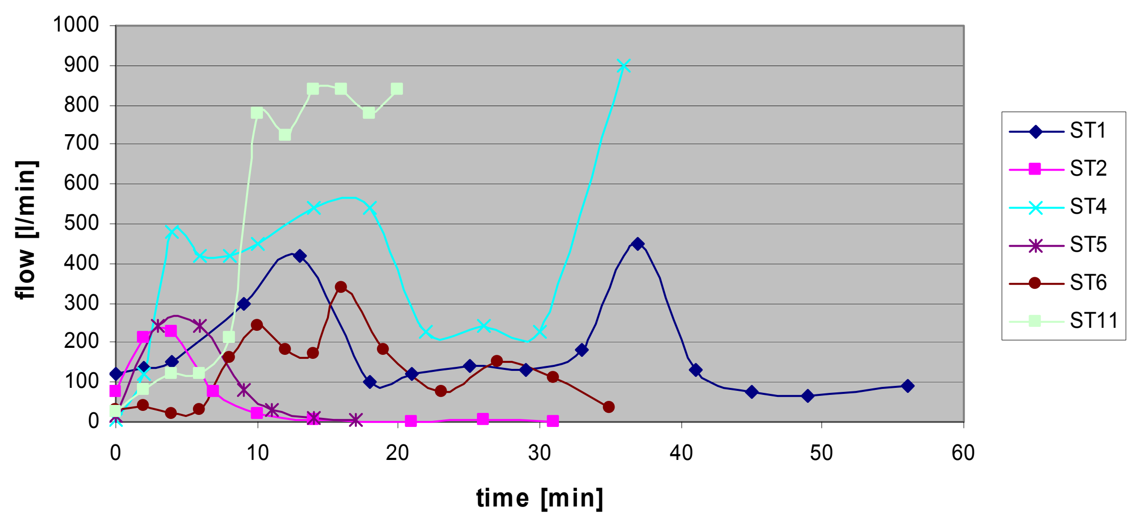


Figure 10: High Flow Intensity Diagram

The category for low flow intensity includes the storm events: ST3, ST7, ST8, ST9, ST10, while ST1, ST2, ST4, ST5, ST6, ST11 are considered as high flow intensity storm events. From Figure 9 and 10 it can be observed that the low flow intensity storm events have maximal runoff intensities below 100 l/min. The storm events included in the high flow category show a runoff intensity which is most of the time significantly above 100 l/min. In this research the threshold level between the two runoff intensity categories was set to 100 l/min.

Not only the flow intensity but also the accumulative runoff volume differs significantly between the two storm event categories as it can be observed in Figures 11-13.

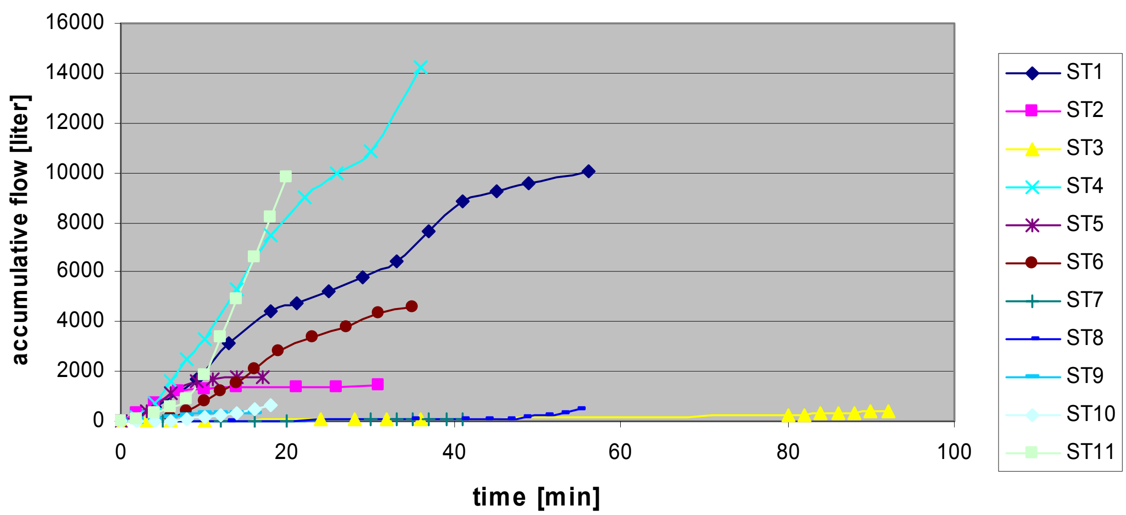


Figure 11: Accumulative Runoff Flow Diagram for all Storm Events

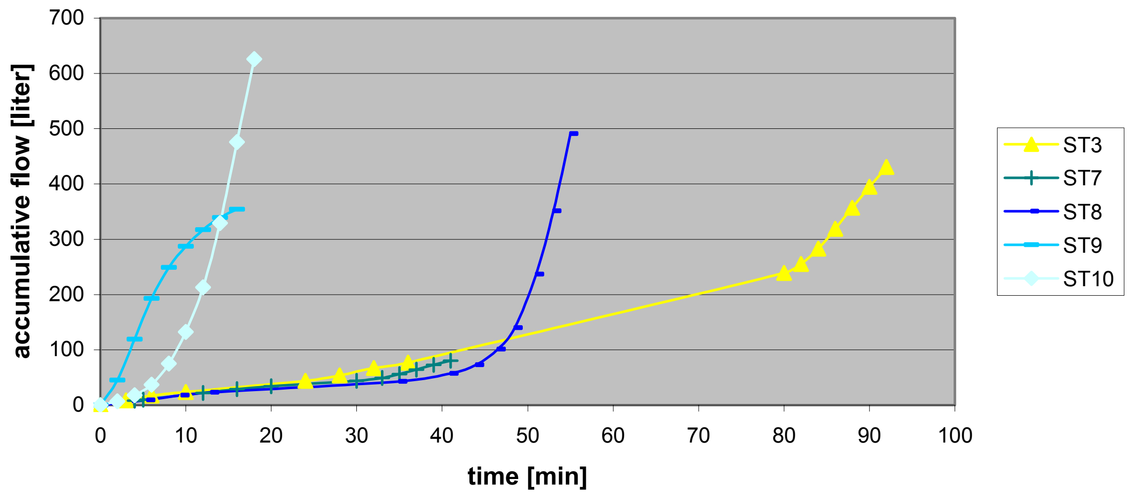


Figure 12: Accumulative Runoff Flow Diagram for Low Flow Storm Events

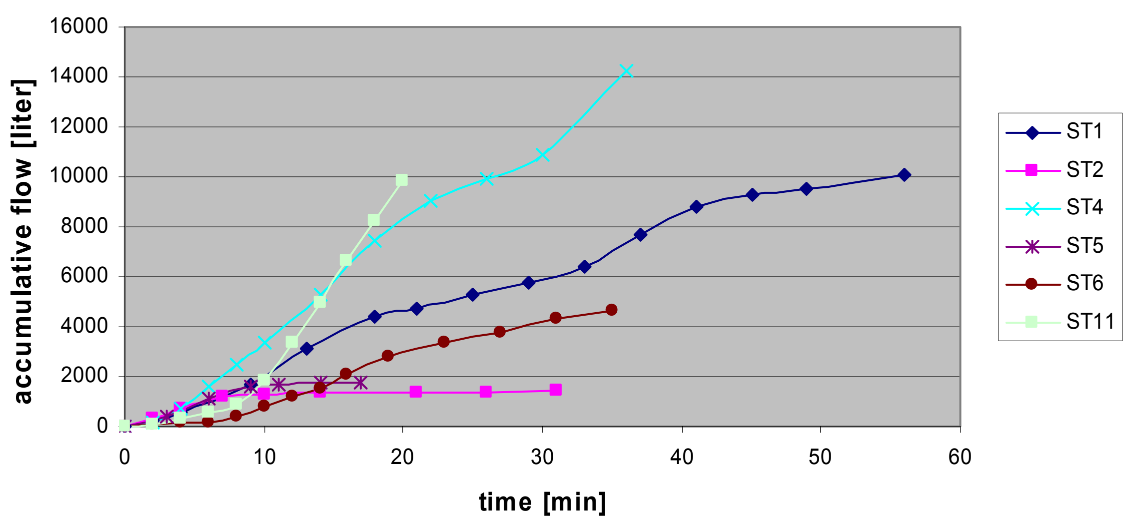


Figure 13: Accumulative Runoff Flow Diagram for High Flow Storm Events

The low flow storm events also have a low total runoff volume discharged from the highway at the end of the storm event. As it can be observed (Figures 11-13), the total runoff volume is lower than 1,000 l for the entire storm event. The total volume ranges from 350 to 620 l for this category. On the other hand the high flow data has a total runoff volume significantly higher than 1,000 l. The total runoff volume ranges from 1,400 to 14,200 l. Therefore, not only the runoff flow intensity but also the total runoff volume can be used to assign a single storm event to the two categories.

For this research the entire data set was observed and regression analysis were performed for all storm events as well as for the two categories individually (high flow and low flow storm events).

5.2. Dissolved Heavy Metal Concentrations

The analysis of dissolved heavy metals using an ICP-AES, showed detection limit problems with the elements arsenic (detection limit: 3 microgram per liter), cadmium (detection limit: 1 microgram per liter) and lead (detection limit: 2 microgram per liter). Since more than 70 % of all analyzed samples had As, Cd and Pb concentrations lower than the detection limits, no prediction model could be developed for these three dissolved heavy metals. Hence, all statistical calculations in this research exclude As, Cd and Pb.

After dividing the storm events into the two major categories, as described in the previous chapter, the concentrations of dissolved heavy metals for each storm event were observed. The minimal, maximal and average percentage of the total mass loading for each heavy metal is shown in Table 17.

all values in %	Metal	All data			High flow			Low flow		
		min	mean	max	min	mean	max	min	mean	max
	Al	3	29	40	5	30	40	3	23	32
	Cr	0	2	6	1	1	2	0	4	6
	Mn	1	3	12	1	3	7	1	4	12
	Fe	5	49	63	36	50	63	5	41	54
	Ni	1	1	5	1	1	2	1	3	5
	Cu	0	1	8	0	1	3	1	3	8
	Zn	3	15	64	9	14	21	3	22	64

Table 17: Basic Statistical Values for the Mass Loading of Dissolved Heavy Metals

Table 17 is based on the runoff volume. It was important to include the runoff volume together with the dissolved heavy metal concentrations in order to adjust each single analyzed sample concentrations to the impact to the environment. A big runoff volume in a certain amount of time with a certain dissolve heavy metal concentration has a bigger impact to the environment than a small runoff volume in the same amount of time with the same concentration. Therefore high runoff storm events have a significant higher impact on the calculated values in the above printed table when including all data.

The Figures 14-16 illustrate the percentile average total mass load concentrations of dissolved heavy metals in the storm water runoff. Figure 15 and 16 indicate the differences in the mass load concentrations for low flow and high flow data, the latter having a higher runoff flow intensity and a higher total runoff volume.

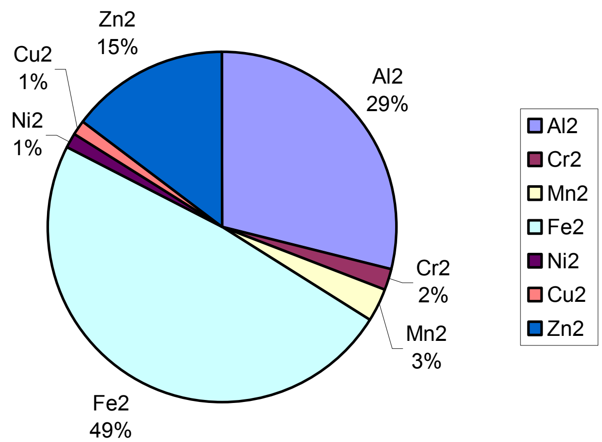


Figure 14: Average Percentile Concentration of Total Mass Load for Dissolved Heavy Metal: all Storm Events

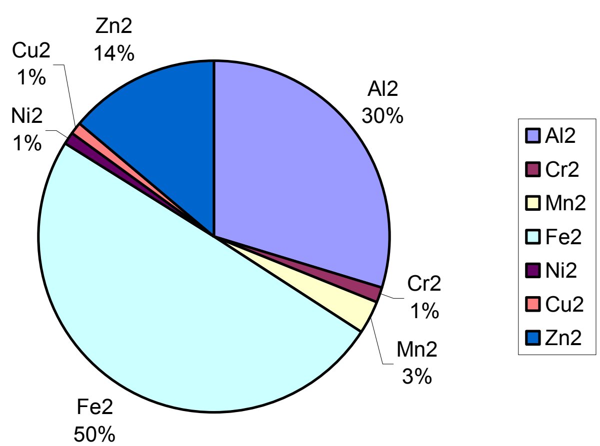


Figure 15: Average Percentile Concentration of Total Mass Load for Dissolved Heavy Metal: High Flow Storm Events

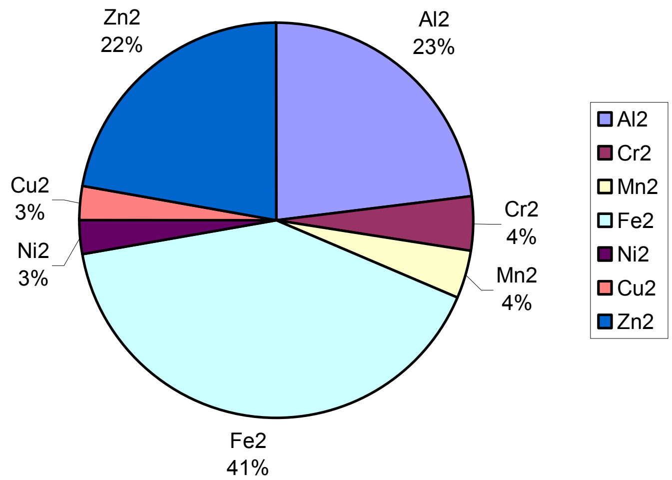


Figure 16: Average Percentile Concentration of Total Mass Load for Dissolved Heavy Metal: Low Flow Storm Events

As it can be observed in Figure 15 and Figure 16 the percentile distribution of the total mass loading for dissolved heavy metals varies between high flow data and low flow data. The dissolved heavy metals Al, Fe and Zn can be used to distinguish the high flow data from the low flow data. A higher Fe concentration is characteristic for high flow data. Also the Al concentration is higher for high runoff storm events than for low runoff storm events. A lower Fe concentration and a significantly higher Zn concentration are characteristic for the low flow data.

Summarizing it can be said that the runoff flow intensity, the total discharged runoff and the dissolved heavy metal concentrations can be used in order to assign a single storm to the two categories of high flow (mainly spring- and summer months, rainfall is usually convective)and low flow storm events (mainly fall and winter, rainfalls are generally stratiform). Table 18 illustrates the different characteristics for the high flow and low flow data.

Category	flow intensity [liter/min]	total runoff volume [liter]	Fe % [% of total mass load]	Al % [% of total mass load]	Zn % [% of total mass load]
Low Flow	< 100	<1000	~41	~23	~22
High Flow	>100	>1000	~50	~30	~14

Table 18: Characterization of Low Flow and High Flow Storm Events

As described in the previous chapters, different parameters can be used to characterize and categorize a single storm event. Table 18 summarizes these parameters. The low flow storm events have a maximal flow intensity below 100 l/min and a total runoff volume of less than 1000 liter. The percentage of the total mass loading of iron is approximately 41% while the percentage for aluminum is 23%. The total mass loading of zinc is 22% for this category.

The high flow storm events show a maximal flow intensity of more than 100 l/min and a total runoff volume of more than 1000 l. For this category the percentage of total mass loading of iron is 50%, for aluminum approximately 30% and for zinc around 14%.

5.3. <u>Percentile Mass Loading of Dissolved Heavy Metal in High Flow Storm Events</u>

Because of the quite different statistical behaviors of the high flow and low flow storm events, this research focused mainly on the high flow data because of there bigger impact on the environment due to the observed higher wash off of contaminants and higher runoff volume.

The primary sources of common highway storm water runoff heavy metal pollutants are illustrated in the following table.

Constituents	***Primary Sources***
Aluminum	Moving engine parts
Chromium	Metal plating, moving engine parts, brake lining wear
Manganese	Moving engine parts
Iron	Auto body rust, steel highway structures (guardrails, bridges, etc.), moving engine parts
Nickel	Diesel fuel gasoline (exhaust) and lubricating oil, metal plating, bushing wear, brake lining , wear, asphalt paving
Copper	Metal plating, bearing and bushing wear; moving engine parts; brake lining wear; fungicides and insecticides (roadside maintenance operations)
Zinc	Tire wear (filler material), motor oil (stabilizing additive), grease, metal plating
Arsenic	Erosion of natural deposits, glass and electronic products
Cadmium	Tire wear (filler material), insecticides
Lead	Leaded gasoline (auto exhaust), tire wear (lead oxidi filler material), lubricating oil and grease, bearing wear

Table 19: Primary Sources of Heavy Metal Contamination (Gschnitzer Armin, 2003)

Initially for this research the cumulative percentage of mass loadings for every dissolved heavy metal element was plotted versus the cumulative percentage of discharged runoff volume. As it can be observed from the obtained figures (Figure 17 to 24), the cumulative percentage of each dissolved heavy metal fluctuates significantly over the cumulative percentage of discharged runoff volume for the high flow data. Figures 17-23 show the mean cumulative percentage of mass loadings for each dissolved heavy metal versus the cumulative percentage of discharged runoff volume. Also the minimal and maximal percentages measured for all storm events are illustrated together with the standard deviation over the cumulative percentage of discharged runoff volume.

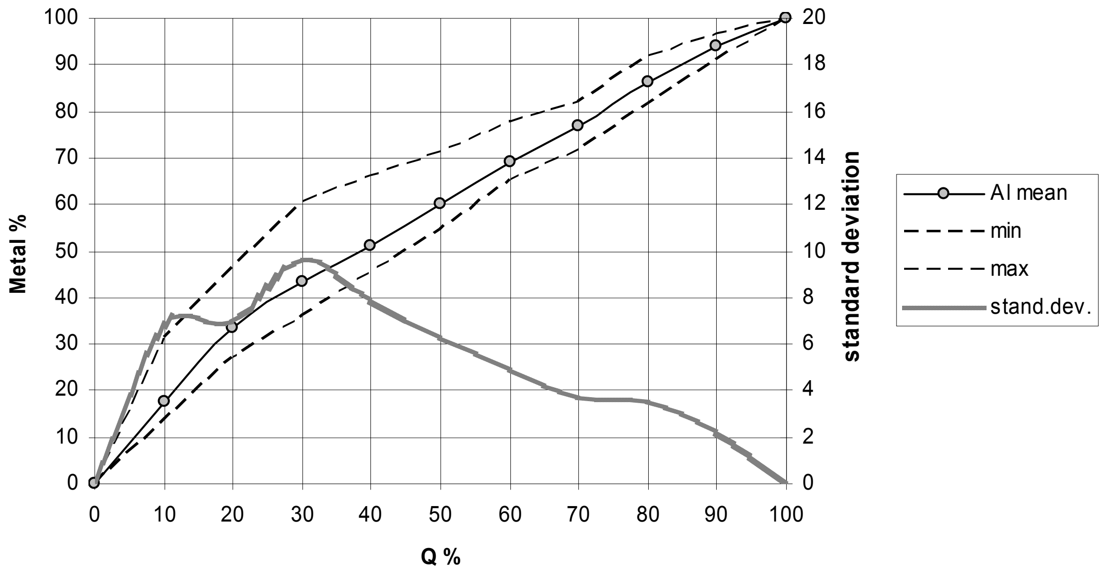


Figure 17: Cumulative Percentage of Al Mass Loading versus Cumulative Percentage of Discharged Runoff Volume

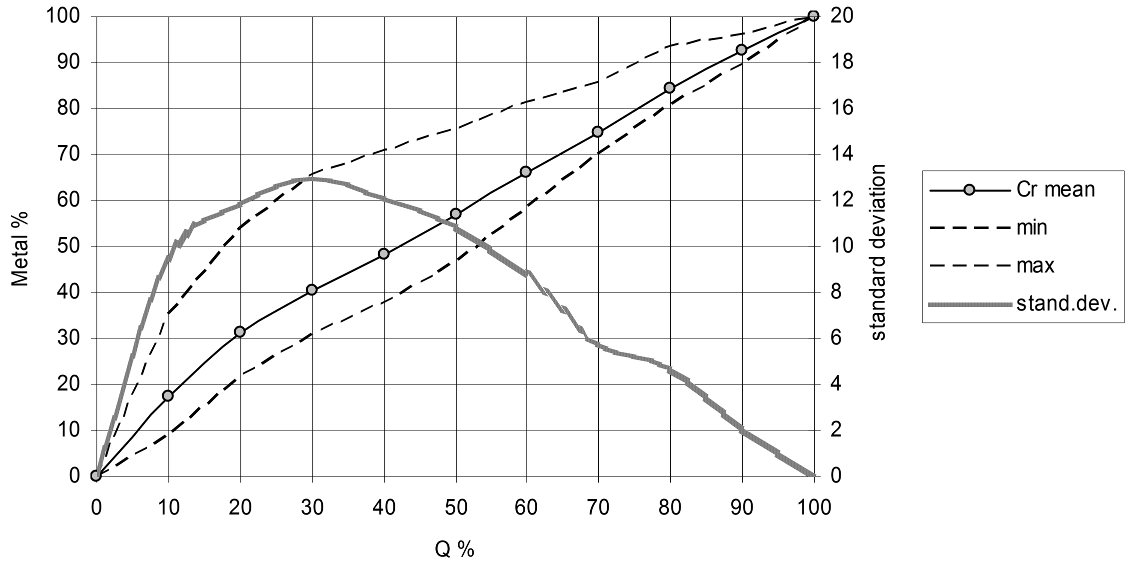


Figure 18: Cumulative Percentage of Cr Mass Loading versus Cumulative Percentage of Discharged Runoff Volume

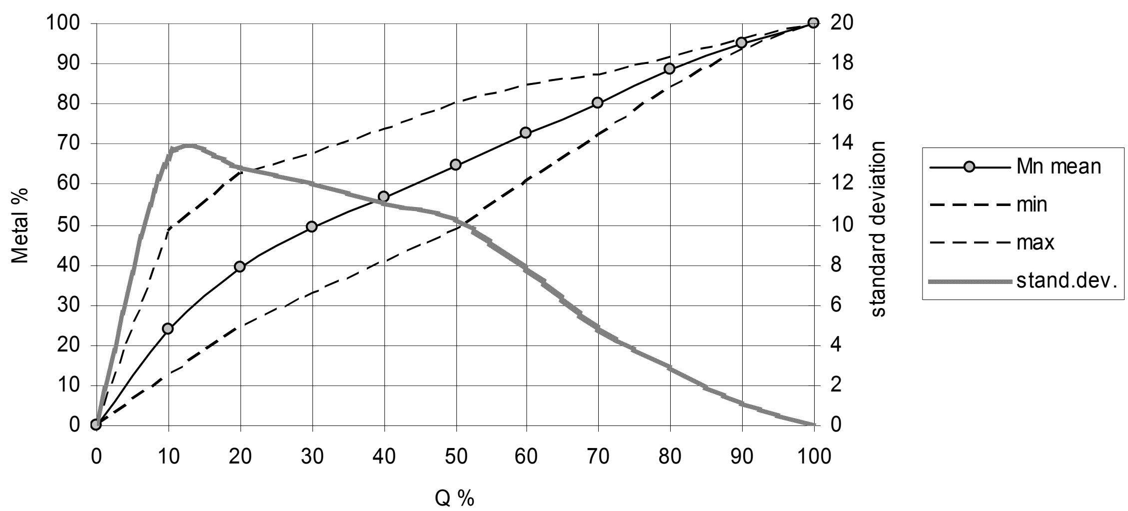


Figure 19: Cumulative Percentage of Mn Mass Loading versus Cumulative Percentage of Discharged Runoff Volume

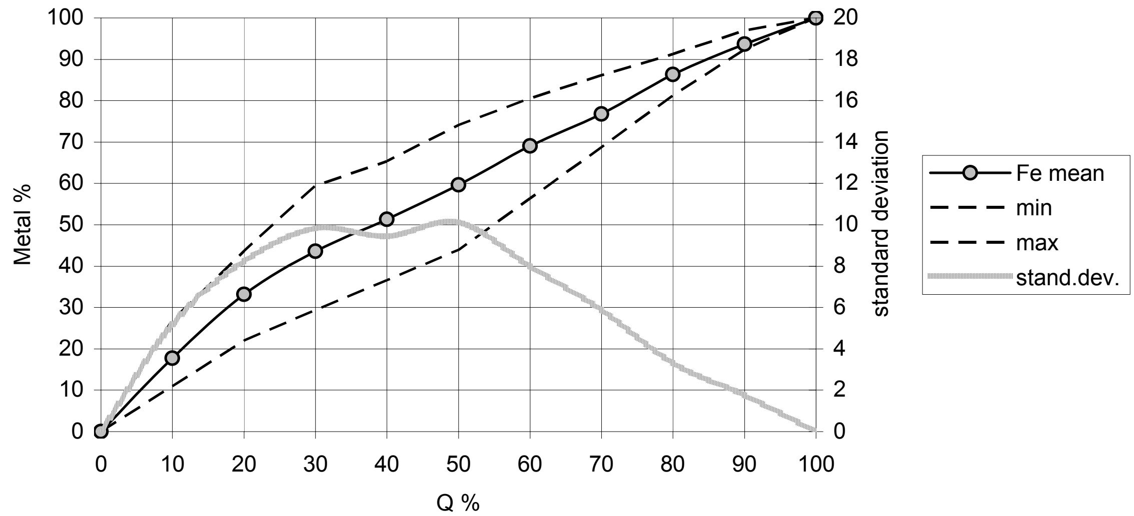


Figure 20: Cumulative Percentage of Fe Mass Loading versus Cumulative Percentage of Discharged

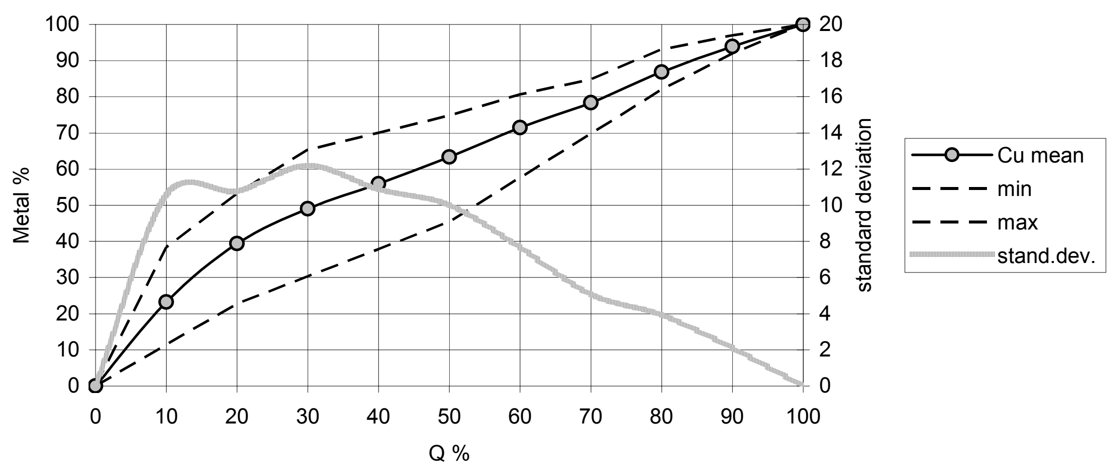


Figure 21: Cumulative Percentage of Cu Mass Loading versus Cumulative Percentage of Discharged Runoff Volume

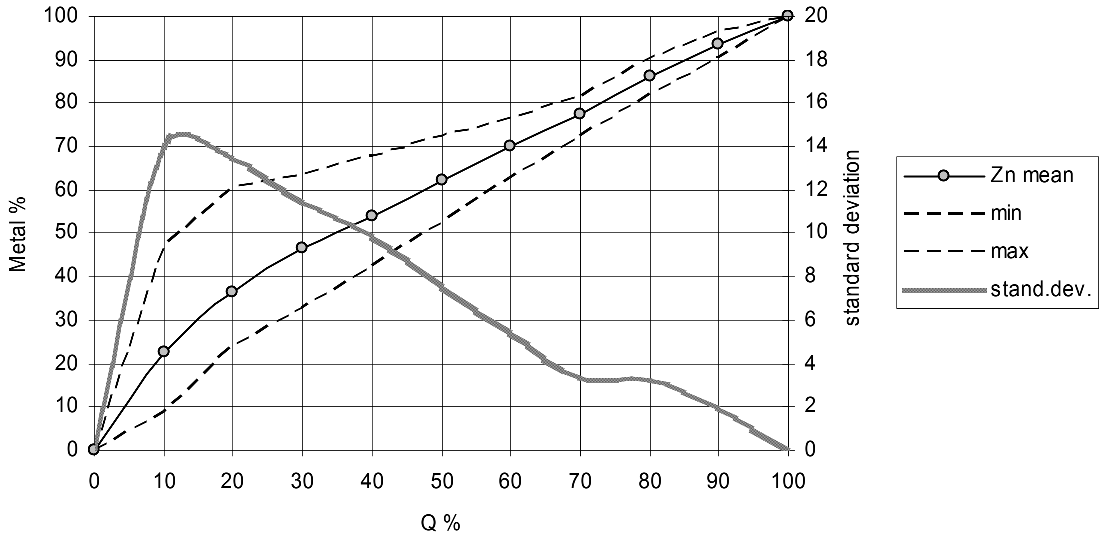


Figure 22: Cumulative Percentage of Zn Mass Loading versus Cumulative Percentage of Discharged Runoff Volume

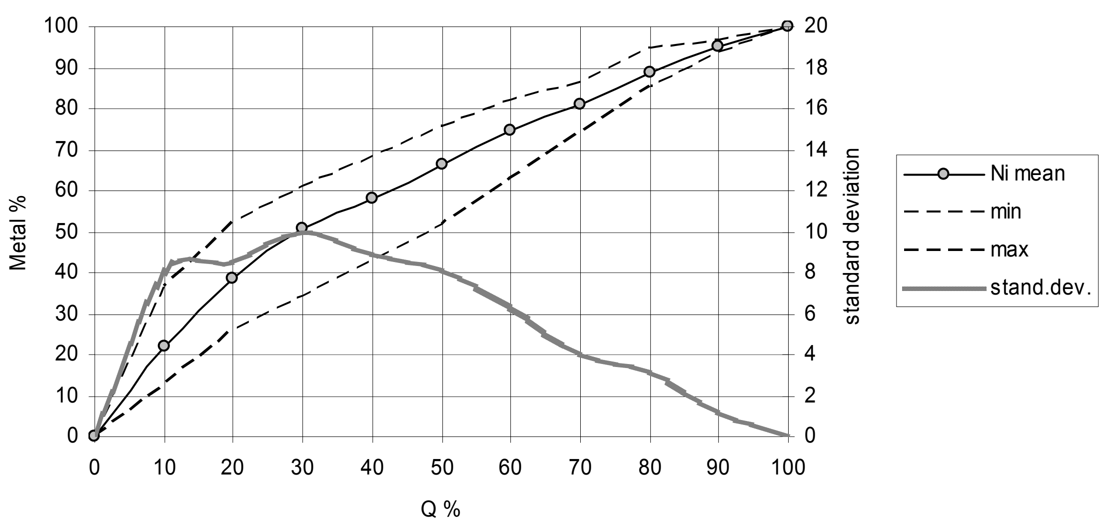


Figure 23: Cumulative Percentage of Ni Mass Loading versus Cumulative Percentage of Discharged Runoff Volume

All curves in the Figures 17 to 23 show a steep slope during the first fraction of the curve followed by a slighter flattening. The distributions of these curves illustrated the high wash-out and wash-off of pollutants during the first part of the storm event. The first portion of storm water runoff discharged from highways had the highest mass loadings followed by a clear decline with increasing discharge of storm water runoff. The cumulative percentage of dissolved heavy metals, however, fluctuates especially over the first 50% of the cumulative percentage of discharged runoff volume. This can be seen when observing the difference between the minimal and maximal measured cumulative percentages. Also the standard deviation has its highest values during the first 50% of the discharged runoff volume.

Figure 24 contains only the mean values for all mass loadings versus the cumulative runoff volume. Examining the charts it became evident that 50 percent of the total mass loadings washed off the roadway during a storm event are contained in the first 30 to 40 percent of the discharged runoff volume.

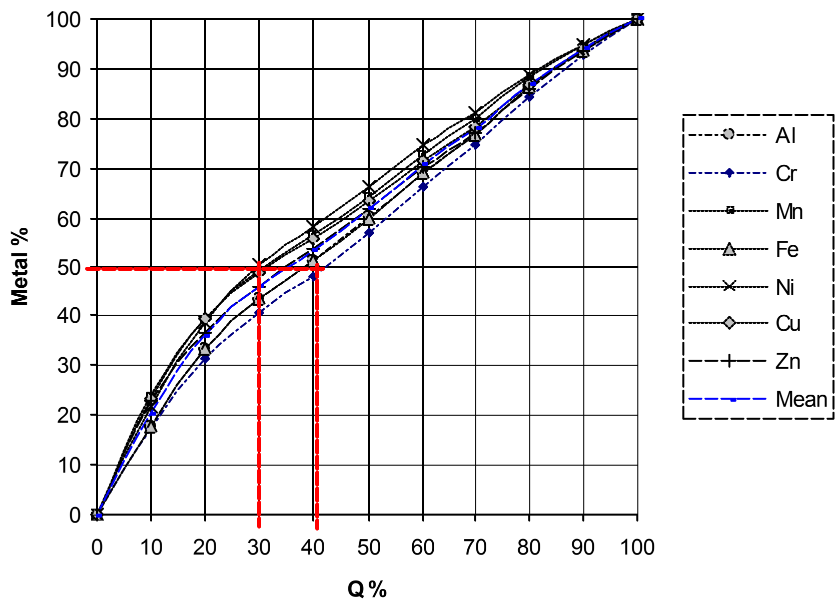


Table 36: Mean Cumulative Percentage of Dissolved Heavy Metal Mass Loading versus Cumulative Percentage of Discharged Runoff Volume

5.4. Regression Model for Dissolved Heavy Metals

The development of regression models was performed for all dissolved heavy metals excluding As, Cd and Pb because of the above explained detection limit problems. The development of these models was performed according to the procedures and explanations in the Methodology. All model equations were developed following statistical analyses which minimize the sampling error and the bias introduced into the model by some of the variables selection methods used (forward, backward and stepwise). Also the Mallows´s Cp-Statistic procedure was used in order to achieve this goal.

Using the software packages SAS and SPSS the best possible statistical models for the prediction of dissolved heavy metals were derived. This was done for three different data categories.

The first data category included all storm events and all analyzed variables including field and laboratory measurements.

The second data category included the high flow data only. For this second category models were developed using both, field and laboratory measurements.

The last category of models was developed using only variables obtained from the field measurements. These models were developed for high flow storm events.

Moreover, models were developed for each described category using the untransformed and the transformed data. The results of this statistical effort are illustrated in Table 20.

	Metal	all flow/all analysis		high flow/all analysis		high flow/field analysis	
		R	R^2	R	R^2	R	R^2
no transformation	**Al**	**0.88**	**0.78**	**0.99**	**0.98**	0.86	0.74
	Cr	0.46	0.21	**0.96**	**0.92**	0.89	0.80
	Mn	**0.95**	**0.91**	**0.99**	**0.97**	0.85	0.73
	Fe	**0.85**	**0.72**	**0.97**	**0.94**	**0.93**	**0.86**
	Ni	0.66	0.44	**0.96**	**0.92**	**0.94**	**0.90**
	Cu	**0.99**	**0.99**	0.99	0.98	**0.98**	**0.96**
	Zn	**0.90**	**0.81**	0.99	0.98	**0.95**	**0.89**

	Metal	all flow/all analysis		high flow/all analysis		high flow/field analysis	
		R	R^2	R	R^2	R	R^2
LN transformation	**Al**	0.78	0.61	0.98	0.93	**0.98**	**0.96**
	Cr	**0.76**	**0.57**	0.94	0.88	**0.93**	**0.86**
	Mn	0.92	0.84	0.97	0.93	**0.97**	**0.94**
	Fe	0.82	0.67	0.95	0.91	0.88	0.77
	Ni	**0.80**	**0.64**	0.96	0.91	0.94	0.88
	Cu	0.98	0.96	**0.98**	**0.95**	0.97	0.94
	Zn	0.82	0.68	**0.93**	**0.86**	0.91	0.82

Table 20: R and R^2 values for the Model Development for Dissolved Heavy Metals

As it can be observed from Table 20, for certain dissolved heavy metals better regression models could be derived with the transformed data set while for others the untransformed data set was better suited.

In summary the best fitting models, their R and R^2 values as well as the used data set (transformed or untransformed) are listed in Table 21. Numbers in bold represent models derived from transformed data while all other models were derived using untransformed data.

	Metal	all flow/all analysis		high flow/all analysis		high flow/field analysis	
		R	R²	R	R²	R	R²
BEST MODEL	Al	0.88	0.78	0.99	0.98	**0.98**	**0.96**
	Cr	**0.76**	**0.57**	0.96	0.92	**0.93**	**0.86**
	Mn	0.95	0.91	0.99	0.97	**0.97**	**0.94**
	Fe	0.85	0.72	0.97	0.94	0.93	0.86
	Ni	**0.80**	**0.64**	0.96	0.92	0.94	0.90
	Cu	0.99	0.99	**0.98**	**0.95**	0.98	0.96
	Zn	0.90	0.81	**0.93**	**0.86**	0.95	0.89

Table 21: R and R^2 values for the Best possible Model for Dissolved Heavy Metals

The goal of this research effort was to obtain prediction models for each dissolved heavy metal which are easy to use. Therefore the main objective was to exclude as many variables as possible while still obtaining high reliable prediction models. The differences in the R and R^2 values for the best possible models for each dissolved heavy metal are illustrated in the Figure 39-40.

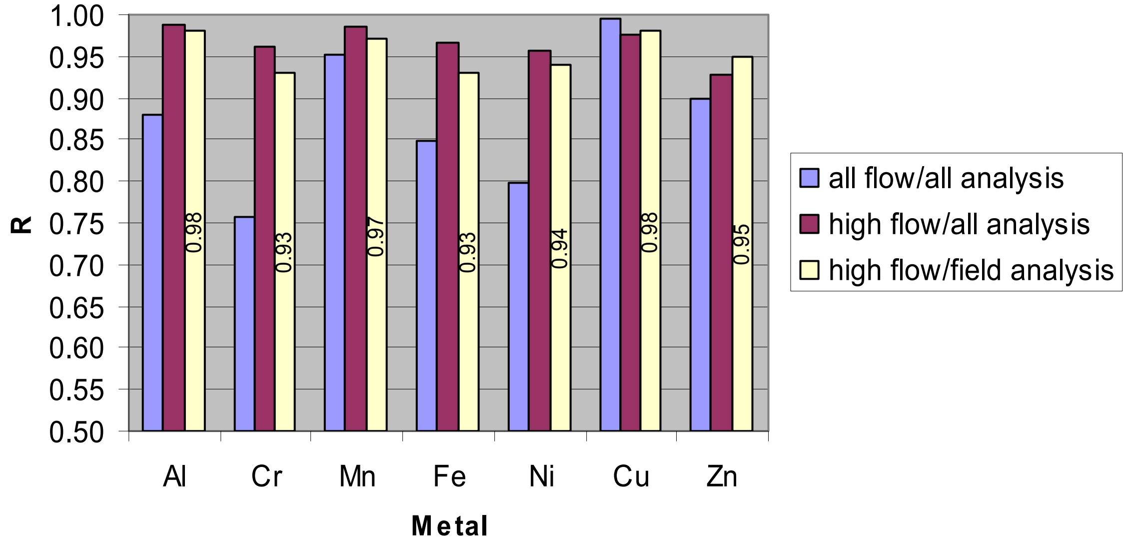


Figure 25: Differences in the R Values for the Different Categories

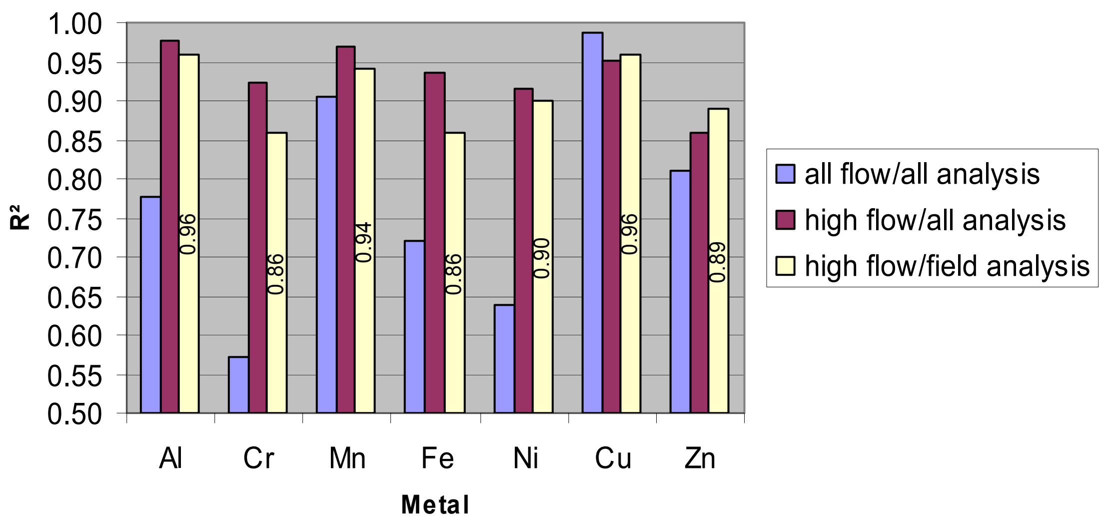


Figure 26: Differences in the R^2 Values for the Different Categories

The difference in the R and R^2 values between the first two categories (all flow/all analysis and high flow/all analysis) makes it evident that it is necessary to divide the data set into high flow data and low flow data. The models developed for high flow data show a higher correlation than the models developed using high and low flow data together. As explained above, this research focused mainly on the development of reliable prediction models for the high flow storm events due to their higher impact to the environment.

In order to simplify the final models for dissolved heavy metals in high flow storm events only variables were included which were obtained in the field measurements. The preformed field measurements are described in the Methodology. Figure 25 and 26 illustrate that by including only field obtained variables and excluding all lab variables, the statistical correlation of the model slightly decreases. This decrease was determined to be tolerable when considering the huge simplification of the models by including only field measurements. The latter proved a good correlation to the metal concentrations and were moreover easy to perform with low technical expenditure in a short period of time. The obtained prediction models can be used to roughly assess the concentration of dissolved heavy metals in storm water runoff from roadways during high flow storm events including field measurements only. This means that first estimates of pollutant concentration of the occurring runoff can be obtained in the field during a storm event. The developed equations can be useful for the treatment of storm water runoff when expensive treatment technologies can be better put into action in order to obtain optimal results. Also the advantage to obtain estimative results already in the field can reduce time and money and increase flexibility and efficiency of treatment technologies.

The statistical calculations obtained from SPSS and SAS are listed in the Appendix A. The obtained prediction models are considered linear when untransformed variables are used and exponential when transformed variables are used. In the latter case, the obtained predicted values have to be transformed back into untransformed predicted values by calculating the exponential value of the obtained results.

The following paragraph describes the prediction models for each dissolved heavy metal for high flow storm events, their equation and the regression line of the predicted versus the observed values.

5.4.1. Regression Model for Al

For the dissolved heavy metal aluminum the best regression model was obtained using the transformed dataset. As shown in the selection of variables significantly associated with Al (Table 10), the selected variables were

- Temperature
- Redox potential
- Conductivity
- Cumulative total runoff
- Dry hours

The model was developed using the software SPSS, as described in the methodology. The obtained result was as followed:

$$Ln(Al)=-100.176+7.563*Ln(Temp)+16.629*Ln(Redox)-1.296*Ln(Cond)$$
$$-0.411*Ln(Qt+10)+0.140*Ln(Dry\_h)$$

This equation with an R^2 value of 0.96 was then verified and examined. Before this model can be applied it is important to understand the significance of all included parameters ad their logical effect on the concentration of aluminum in the runoff.

In the equation above the temperature is directly correlated to the concentration of dissolved aluminum. This means that with increasing temperature also the aluminum concentration in the runoff is increasing. This is plausible because of the influence of temperature on the reaction of different processes. Higher temperatures often increase the reaction rate of many processes.

The redox potential is also proportional to the concentration of aluminum in the runoff. The redox potential is a measure (in volts) of the affinity of a substance for electrons, its electronegativity, compared with hydrogen (which is set at 0). Substances more strongly electronegative than hydrogen (i.e., capable of oxidizing) have positive redox potentials. Dissolved heavy metals are capable of oxidizing and can be the reason for a higher redox potential. In the soil, a decreased redox potential, as is often seen under oxygen deficient conditions, will change the composition of metal complexes and release the metal ions into the overlying water. In our case the runoff is discharged directly into the manhole and no such influence could be noted.

The dry hours affect the concentration of pollutants. An extended dry period between two storm events will increase the pollution load on the surface of the roadway. Therefore the positive factor which correlates the dry hours to the concentration of aluminium in the storm water runoff is reasonable.

The cumulative total runoff is correlated negatively to the concentration of aluminium. Also this is plausible, because with progressing storm the accumulated total runoff volume is increasing and the concentration of dissolved heavy metals is decreasing. The biggest pollution and the highest concentration of contaminants are normally observed in the first part of the storm event.

The conductivity is also correlated with a negative sign to the concentration of aluminium in the runoff. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminum cations (ions that carry a positive charge). Inorganic compounds usually dissociate into ions when dissolved and solutions of those are good conductors. In contrast, organic molecules generally do not form ions when being dissolved, and hence do not contribute to the electrical conductivity. The negative correlation of conductivity to the aluminum concentration, which can be observed in our case, is not reasonable. Therefore this initially included variable was excluded. The regression model was then redeveloped.

The recalculated prediction model was:

$$Ln(Al)=-79.715+6.883*Ln(Temp)+11.537*Ln(Redox)+0.164*Ln(Flow)$$

As explained above and discussed in detail all used variables are reasonable linked to the concentration of aluminum in the storm water runoff. The variable “runoff flow from the elevated highway section” (variable: Flow) represents the runoff intensity over time. A positive sign indicates that with increasing runoff intensity (liters/min) also the concentration of aluminum increases. This can be explained due to the wash-off and washout of contaminants with high runoff intensities. The coefficient of determination R^2 was 0.91 and is slightly lower than in the initial equation. Nevertheless, the obtained coefficient of determination was high enough and the obtained prediction model was reasonable even in the water-chemistry aspect. Figure 27 was developed to show the relationship of aluminium as predicted by the model to the observed values.

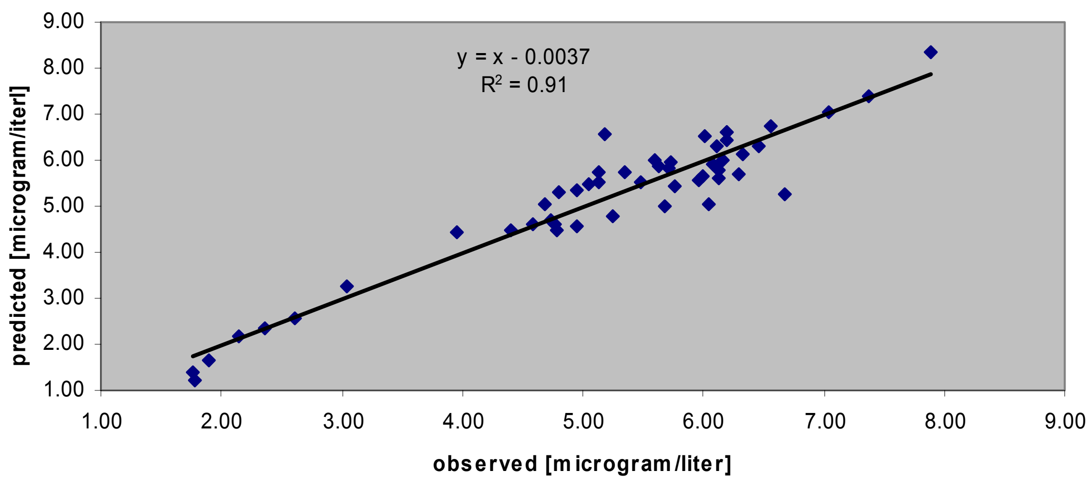


Figure 27: Ln of Predicted vs. Observed Values: Multiple Regression for Ln(Al)

The obtained regression line is illustrated in Figure 27. Although the R^2 value is high, the obtained correlation between observed and predicted data has to be further examined. It is necessary to understand the effects and significance of such a correlation plot. The equation of the regression line is $y=1*x-0.0037$. In this equation 1 represents the slope of the correlation while -0.0037 is the y-segment where the regression line intersects the y-axis. Under ideal conditions the slope is 1.00 and the regression line would intersect the y-axis at 0 so that the y-segment would be 0.00. If the slope is less than 1.00 the predicted values are underestimated. On the other hand, if the slope of a multiple regression line is higher than 1.00 the model is overestimating the values. The y-segment, where the regression line is intersecting the y-axis, has an influence on the application of such a model. A y-segment value above 0.00 indicates that the model is not ideal. For an observed value of 0.00 the regression model would give a predicted value above 0.00. This would decrease the reliability of the model drastically. A y-segment value below 0.00 could be lead back to certain detection limits.

In our case the slope is exactly 1.00 and the value for the y-segment is very close to 0.00. Therefore the model is reliable and applicable also from this point of view.

5.4.2. Regression Model for Cr

For the dissolved heavy metal chromium the best regression model was obtained using the transformed dataset, as used for aluminum. Table 11 illustrated the selected variables which were as followed:

- Temperature
- pH
- Dry hours

The derived formula was as followed:

$$Ln(Cr)=32.407-17.509*Ln(pH)+2.381*Ln(Temp)-0.376*Ln(Dry\_H)$$

This equation with an R^2 value of 0.86 was further verified and examined. In this equation the temperature is directly related to the concentration of chromium. The temperature can indicate exothermic reactions. Also solubilities and reaction rates are dependent on temperature. Temperature values are needed to correct the values for electrical conductivity, pH, and redox potential. The plus sign of the correlation is therefore reasonable. The minimal and maximal temperature measured over the entire observation period and for all storm events was 16.1°C and 30.2°C.

The pH influences the solubility of numerous substances (especially heavy metals) and thus their mobility. Metals may be desorbed from the sediment if the water experiences increases in salinity, decreases in redox potential, or decreases in pH. A lower pH increases the competition between metal and hydrogen ions for binding sites. A decrease in pH may also dissolve metal-carbonate complexes, releasing free metal ions into the water column. Therefore the negative correlation of the pH to the chromium concentration is reasonable.

The dry hours are negatively correlated to the concentration of chromium. This would mean, that with increasing dry period between two storm events, the concentration of pollutants would decrease. This is not a behavior which can be observed in the real world. With increasing time more constituencies of concern can be deposited on the pavement of the roadways. Therefore this variable was excluded from the regression analysis and the prediction model was recalculated.

The obtained regression equation of the second calculation was:

$$Ln(Cr)=23.033-13.407*Ln(pH)+2.353*Ln(Temp)-0.104*Ln(Qt+10)$$

This equation had an R^2 value of 0.75. No better correlation model could be found which also showed reasonable correlation of the variables to the concentration of chromium in the storm water runoff. Figure 42 illustrates the relationship of chromium as predicted by the model to the observed values.

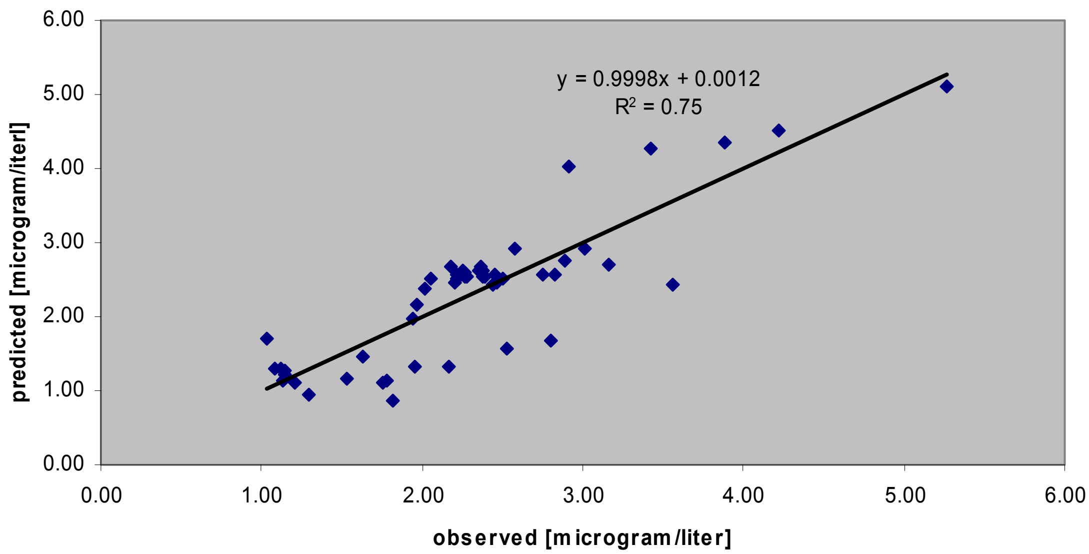


Figure 28: Ln of Predicted vs. Observed Values: Multiple Regression for Ln(Cr)

The equation of the multiple regression line is y=0.9998*x+0.0012. As discussed in section 5.4.2, the slope is almost 1.00 and the y-segment close to 0.00. Therefore the model is applicable in every case.

5.4.3. Regression Model for Mn

Also for the heavy metal manganese the best regression model was obtained using the transformed dataset. The selected variables obtained and described in the methodology (Table 12) were as followed:

- Temperature
- Conductivity
- Runoff intensity
- Dry hours

The derived formula with these variables was as followed:

$$Ln(Mn)=1.143+1.070*Ln(Cond)+0.180*Ln(Dry\_H)-1.738*Ln(Temp)+0.213*Ln(Flow)$$

This equation had an R^2 value of 0.94. The variables conductivity and dry hours as well as runoff intensity are correlated with a plus sign to the manganese concentration of the runoff. As explained above, this behavior is reasonable.

The temperature was correlated negatively to the concentration in the runoff. This indicates that manganese concentrations were higher at lower temperatures. As stated before, the minimal and maximal temperatures observed for all storm events were 16.1°C and 30.2°C. The higher temperature were observed in storm events occurring over the summer period of the year, while the lower temperature were measured in the winter months. The average temperature for the high flow storm events, occurring in spring and summer, was 22.4°C. The mean temperature for the low flow storms, occurring in the fall and winter months, was 16.5°C. When observing the difference in the average concentration of dissolved heavy metals between high flow storm events (spring and summer period) and low flow storm events (fall and winter period) we can observe that the manganese concentration in the low flow storm events is almost three times as high as for the high flow storm events (Figure 29).

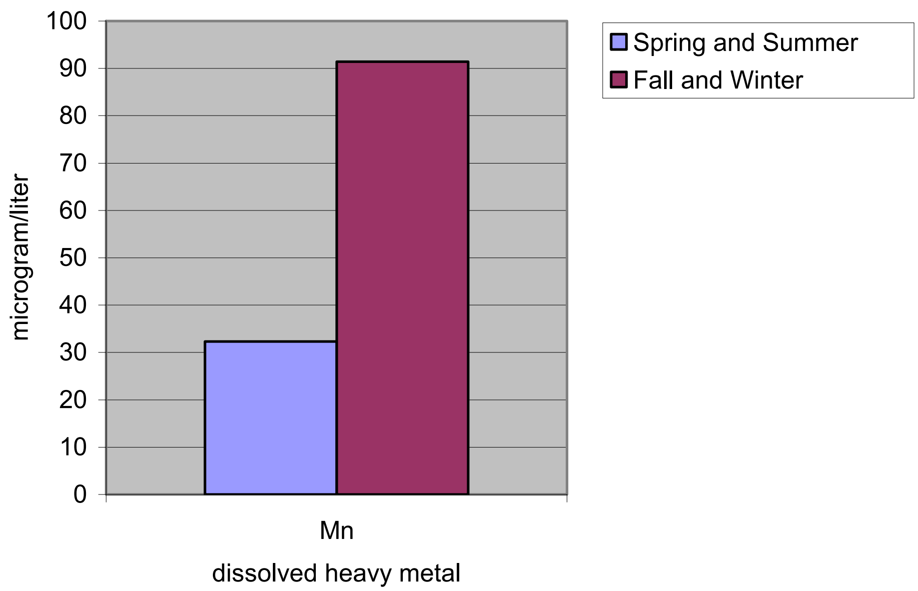


Figure 29: Mean Dissolved Heavy Metal Concentrations for Manganese

During the fall and winter period, where the average temperature of the runoff was lower, the manganese concentration in the storm water runoff is significantly higher than over the spring and summer months. Therefore the negative correlation of the variable "temperature of the runoff" in the regression model is reasonable. Figure 30 shows the relationship of manganese as predicted by the model to the observed values.

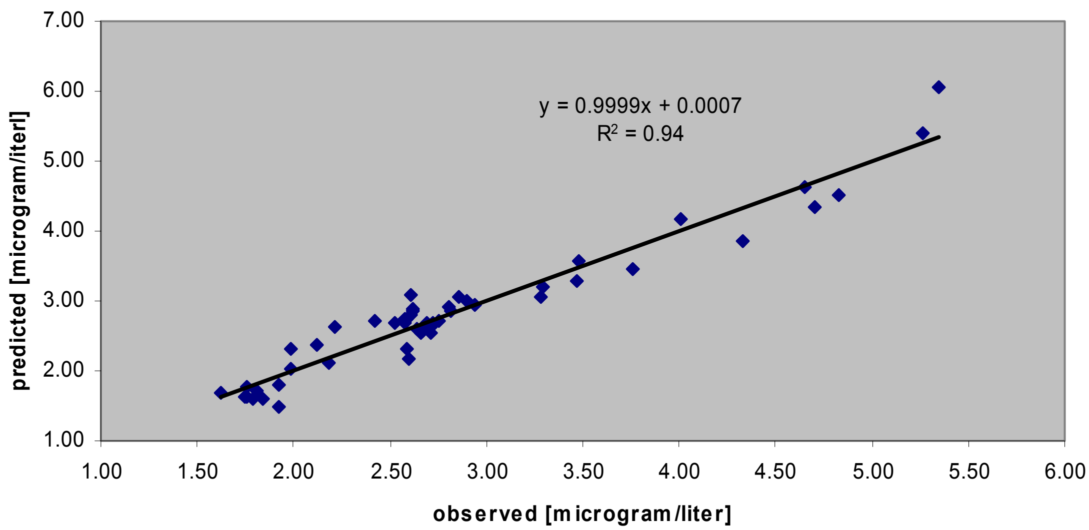


Figure 30: Ln of Predicted vs. Observed Values: Multiple Regression for Ln(Mn)

The slope and the y-segment correspond very well to the expected values and the model is very well suitable over the entire range.

5.4.4. Regression Model for Fe

For the heavy metal iron the best regression model was obtained using the untransformed dataset. The selection of variables significantly associated with Fe was illustrated in Table 13. The model developed was as followed:

Fe=102.362+1.931*Cond+0.601*Flow-0.621*Dry_H

This equation with an R^2 value of 0.86 was then verified and examined. It is important to understand the significance of each parameter and the logical effect of it on the concentration of iron in the storm water runoff. The runoff intensity (Flow) and the conductivity are positively correlated to the concentration of iron in the storm water runoff. This is realistic as discussed above.

The dry hours are negatively correlated to the concentration of iron. This would mean, that the concentration of pollutants in the storm water would decrease with increasing dry period between two individual storm events. This is not realistic because such behavior can not be observed in the real world. With increasing time more contaminants are deposited on the pavement of the roadways. Therefore this variable was excluded from the regression analysis and the prediction model was recalculated.

$$Fe=1841.838-1.56E-02*Qt-271.907*pH+17.565*Temp+1.447*Cond+0.404*Flow$$

The coefficient of determination R^2 for this equation was 0.83 and is slightly lower than the R^2 of the initial equation. All variables are reasonable correlated to the concentration of iron in the runoff from elevated roadways during storm events.

Figure 31 was developed to show the relationship of iron between the predicted and observed values. The slope is close to 1.00 while the y-segment is almost 0.00

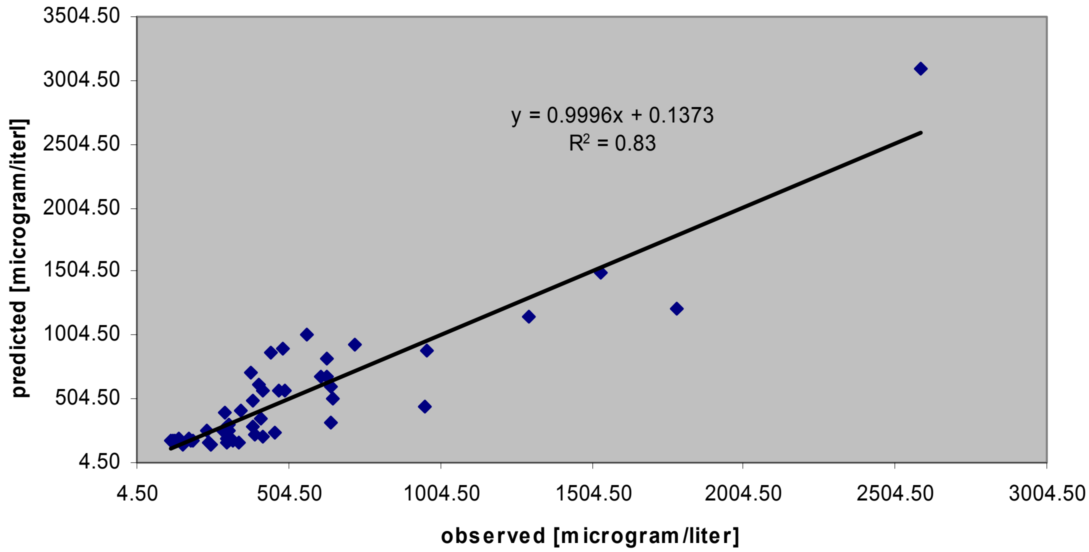


Figure 31: Predicted vs. Observed Values: Multiple Regression for Fe

5.4.5. **Regression Model for Ni**

For the dissolved heavy metal nickel the best regression model was obtained using the untransformed dataset as well. Table 14 illustrats the selected variables which were as followed:

- Cumulative total runoff
- pH
- Conductivity

The derived formula was as followed:

Ni=106.216+0.02868*Cond-12.802*pH-5.18E-04*Qt

This equation had an R^2 value of 0.90. In this equation the pH value is negatively linked to the nickel concentration in the runoff. The pH influences the solubility of numerous substances (especially heavy metals) and their mobility. As stated earlier, a lower pH increases the competition between metal and hydrogen ions for binding sites. A decrease in pH may also dissolve metal-carbonate complexes, releasing free metal ions into the water column. Therefore the negative correlation of the pH to the nickel concentration is realistic.

The variable “cumulative total runoff” (Qt) is correlated with a minus sign to the concentration of nickel. With progressing storm the accumulated total runoff volume is increasing and the concentration of dissolved heavy metals is decreasing. The biggest pollution and the highest concentration of contaminants in the stormwater runoff are normally observed in the first part of the storm event. Therefore it is reasonable that this variable is correlated negatively with the concentration of nickel in the storm water runoff.

Figure 32, illustrating the relationship of nickel as predicted by the model to the observed values, shows a slope of the regression line of 1.00 and a value for the y-segment of almost 0.00.

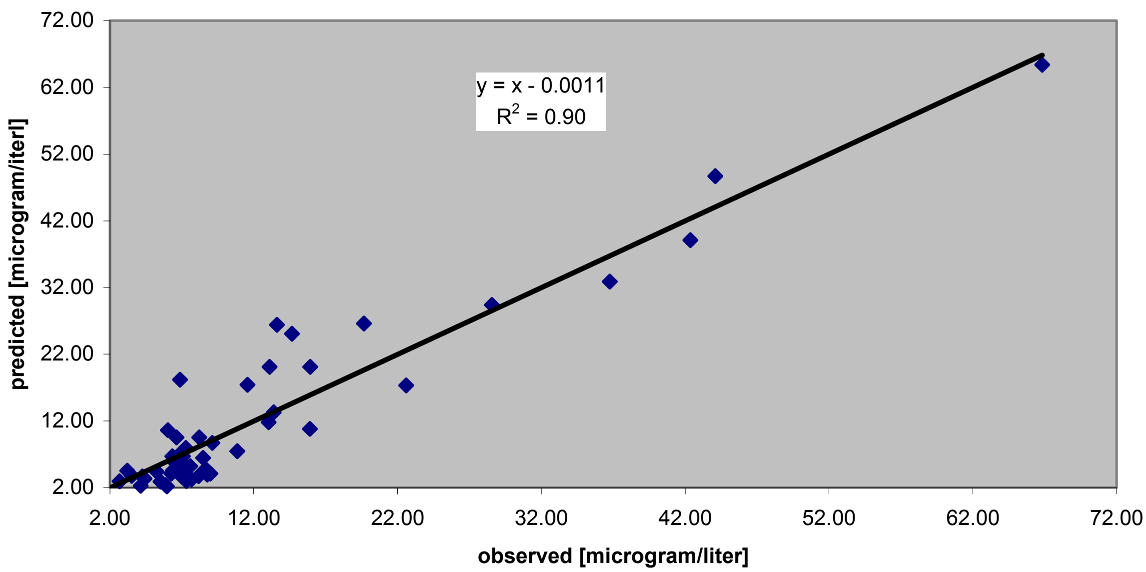


Figure 32: Predicted vs. Observed Values: Multiple Regression for Ni

5.4.6. Regression Model for Cu

For the dissolved heavy metal copper the best regression model was obtained using the untransformed dataset, as used for nickel. The derived formula was as followed:

Cu=8.023+9.658E-02*Cond-0.622*Temp+8.917E-03*Flow

This equation has an R^2 value of 0.95. The initially included variable Qt (cumulative runoff volume) was excluded after it became obvious that the correlation coefficient and its sign were unreasonable for this variable.

The temperature was correlated negatively to the concentration in the runoff. This indicates that copper concentrations were higher at lower temperatures, as noticed for manganese as well. The higher temperature were observed in storm events occurring over the summer period of the year, while the lower temperature were measured in the winter months. The average temperature were 16.5°C for the storm events occurring in fall and winter and 22.4°C for the storms analyzed in the spring and summer.

When observing the difference in the average concentration of dissolved heavy metals between high flow storm events (spring and summer period) and low flow storm events (fall and winter period) we can see that the copper concentration in the low flow storm events is higher than for the high flow storm events (Figure 33). This behavior can be observed for manganese, nickel and copper. When examining the regression models for this metals, the temperature is negatively correlated to the concentration of each metal for all of them.

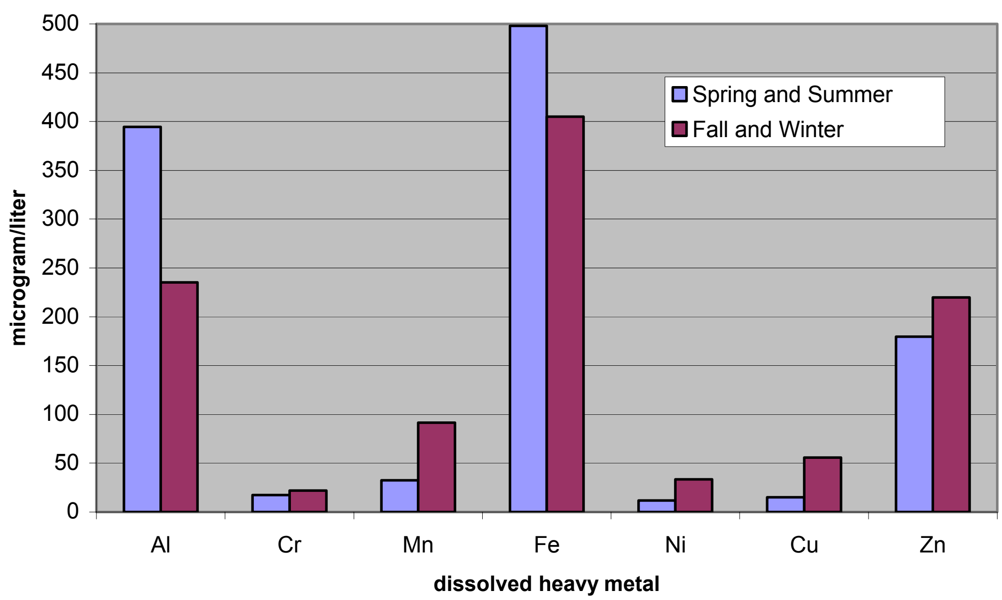


Figure 33: Mean Dissolved Heavy Metal Concentrations: Summer and Winter

During the fall and winter period, where the average temperature of the runoff was lower, the manganese, nickel and copper concentration in the storm water runoff are significantly higher than over the spring and summer months (Figure 33). Therefore the negative correlation of this variable in the regression model is reasonable. For aluminum and iron higher concentrations could be observed in the spring and summer period. Also the developed regression models for these dissolved heavy metals indicated a positive correlation of the temperature to the concentration of the single contaminants. Chromium and zinc showed similar concentrations of dissolved metals over the entire year.

Figure 34 proves a good correlation of the observed and predicted values. The slope and the y-section of the regression line are as desired.

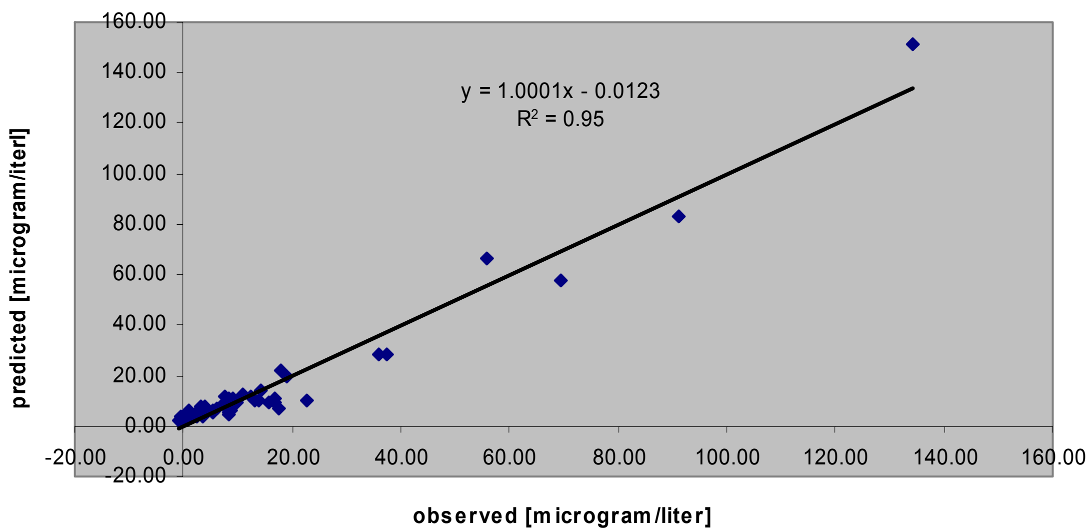


Figure 34: Predicted vs. Observed Values: Multiple Regression for Cu

5.4.7. <u>Regression Model for Zn</u>

For the heavy metal zinc the best regression model was obtained using the untransformed dataset. The selection of variables significantly associated with zinc was illustrated in Table 16 and are listed below:

- Temperature
- Conductivity

The model developed was as followed:

Zn=-213.572+0.743*Cond+10.665*Temp

Both variables used in this regression model are correlated with reasonable sign to the concentration of zinc in the storm water runoff. The coefficient of determination R^2 for this equation was 0.89. Figure 35 confirms the good correlation because the slope and the y-segment are close to 1.00 and 0.00.

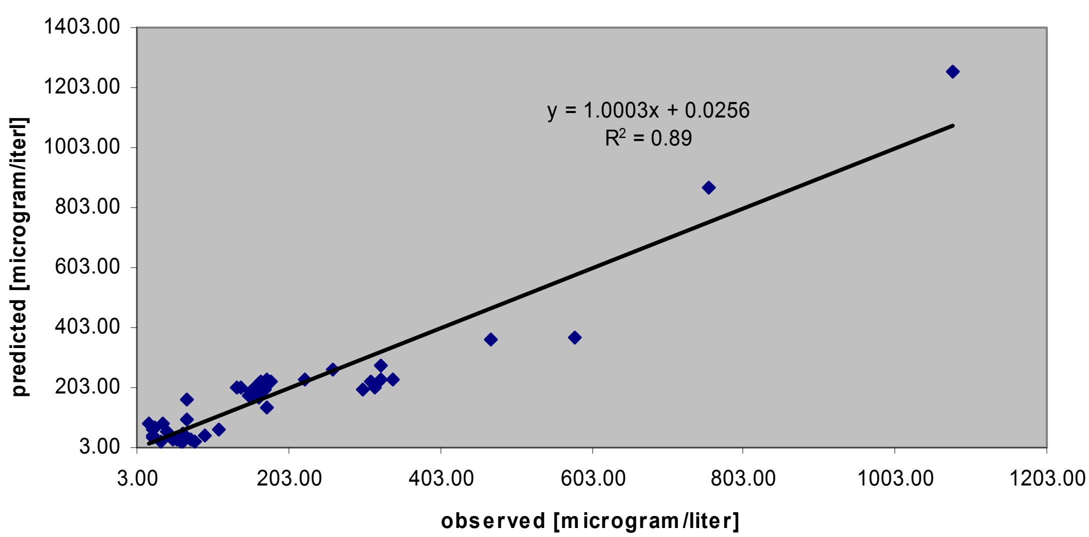


Figure 35: Predicted vs. Observed Values: Multiple Regression for Zn

5.5. Model Verification

The developed models were verified for their reliability by carrying out a significant-difference test on the predicted and observed data set. For this purpose a Student's t-Test was used to compare whether both sets of data have significance of difference. In order to validate the accuracy of the t-test a normal distributed data set has to be available. Therefore the predicted and observed values were tested for normal distribution and equal variances. This was done using the F-test. This test determines if two samples have a statistically different variance or not. This is important in order to see which t-test to use. The F-distribution is the sampling distribution of the ratio of two independent, unbiased estimates of the variance of a normal distribution.

Should the F-ratio be lesser than the F-test, then there is not a statistically significant difference between the variances, and the t-test for equal variances can be utilized. Otherwise the t-test for unequal variances has to be used.

Finally, the t-test was performed for comparing the set for significance of difference in the mean. If the predicted and the observed data set showed a statistically equal mean, the model was declared reliable on the 95% confidence interval which corresponds to the 5% significance level.

The following tables (Tables 24-26) illustrate the summary of the verification results obtained by comparing observed and predicted values for all developed models.

Parameter	Transformed Data Set					
	Al		Cr		Mn	
	Observed	Predicted	Observed	Predicted	Observed	Predicted
Mean	5.211	5.215	2.305	2.305	2.826	2.826
Standard Deviation	1.498	1.426	0.953	0.824	0.949	0.918
COV	0.298	0.273	0.416	0.358	0.336	0.325
Variance	2.291	2.075	0.926	0.794	0.918	0.86
F-ratio	1.104		1.337		1.067	
F-test	1.607		1.607		1.607	
t*	-0.0134		0.004		0.003	
tc	1.984		1.984		1.984	

Table 24: Model Verification for the Entire Dataset (A)

Parameter	Untransformed Data Set							
	Fe		Ni		Cu		Zn	
	Observed	Predicted	Observed	Predicted	Observed	Predicted	Observed	Predicted
Mean	504.74	504.79	11.914	11.912	15.142	15.153	182.56	182.474
Standard Deviation	494.856	449.707	12.871	12.126	24.967	24.379	204.839	193.614
COV	0.98	0.891	1.08	1.018	1.649	1.609	1.122	1.061
Variance	249880	206363	169.045	150.043	636.078	606.444	42815.48	38251.39
F-ratio	1.211		1.127		1.049		1.119	
F-test	1.607		1.607		1.607		1.607	
t*	-0.0005		0.00065		-0.0023		0.002	
tc	1.984		1.984		1.984		1.984	

Table 25: Model Verification for the Entire Dataset (B)

The elements nickel, copper and zinc had a COV value greater than 1.0 (Table 25). Therefore the observed and predicted values had to be transformed prior to any further statistical analysis. In this research a lognormal transformation was used as described in the methodology.

Parameter	Untransformed Data Set							
	Fe		Ni		Cu		Zn	
	Observed	Predicted	Observed	Predicted	Observed	Predicted	Observed	Predicted
Mean	504.74	504.79	2.055	2.219	2.16	1.912	4.781	4.773
Standard Deviation	494.856	449.707	0.872	0.679	0.902	1.315	0.947	0.951
COV	0.98	0.891	0.424	0.306	0.418	0.688	0.198	0.199
Variance	249880	206363	0.775	0.47	0.83	1.503	0.916	0.921
F-ratio	1.211		1.648		0.553		0.994	
F-test	1.607		1.612		0.616		0.662	
t*	-0.0005		-1.035		1.088		0.0395	
tc	1.984		1.986		1.984		1.984	

Table 26: Model Verification for the Entire Dataset: recalculated

In Table 26 and Table 50 all COV values are less than 1.0. This means that the data set is normal distributed. For the elements nickel and zinc the F-ratio is higher than the F-test. Therefore for these elements the t-test for unequal variances had to be used. For all other data sets the t-test for equal variances was used.

The two values t* and tc can now be compared. If the t* is less than tc, the test indicates an insufficient evidence for a statistically significant difference between the means of both sets of the analyzed data. By inspecting the above illustrated tables, it is also possible to observe, that all models passed the F-test with a 95% confidence limit. This means that there is no statistical evidence of difference among the variances estimated and those observed in the raw data.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

The fundamental goal of this study was to characterize and predict dissolved heavy metals in storm water runoff from elevated roadways.

The quality of highway storm water runoff is difficult to characterize, because it is affected by many factors, such as rainfall intensity, antecedent dry days, traffic conditions, climatic effects etc. The high variations and fluctuations between rainfall events or during each single event made it difficult to find significant correlations.

As described in the previous chapters, different parameters can be used to characterize and categorize a single storm event. Table 27 summarizes these parameters. The low flow storm events have a maximal flow intensity below 100 l/min and a total runoff volume of less than 1000 liter. The percentage of the total mass loading of iron is around 41%, while the percentage for aluminum is about 23%. The total mass loading of zinc is about 22% for this category.

The high flow storm events show a maximal flow intensity of more than 100 l/min and a total runoff volume of more than 1000 l. For this category the percentage of total mass loading of iron is around 50%, for aluminum about 30% and for zinc around 14%.

Category	flow intensity [liter/min]	total runoff volume [liter]	Fe % [% of total mass load]	Al % [% of total mass load]	Zn % [% of total mass load]
Low Flow	< 100	<1000	~41	~23	~22
High Flow	>100	>1000	~50	~30	~14

Table 27: Characterization of Low Flow and High Flow Storm Events

Moreover it became evident, that 50 percent of the total mass loadings, washed off the roadway during a storm event, are contained in the first approximately 30 to 40 percent of the discharged runoff volume (Figure 36).

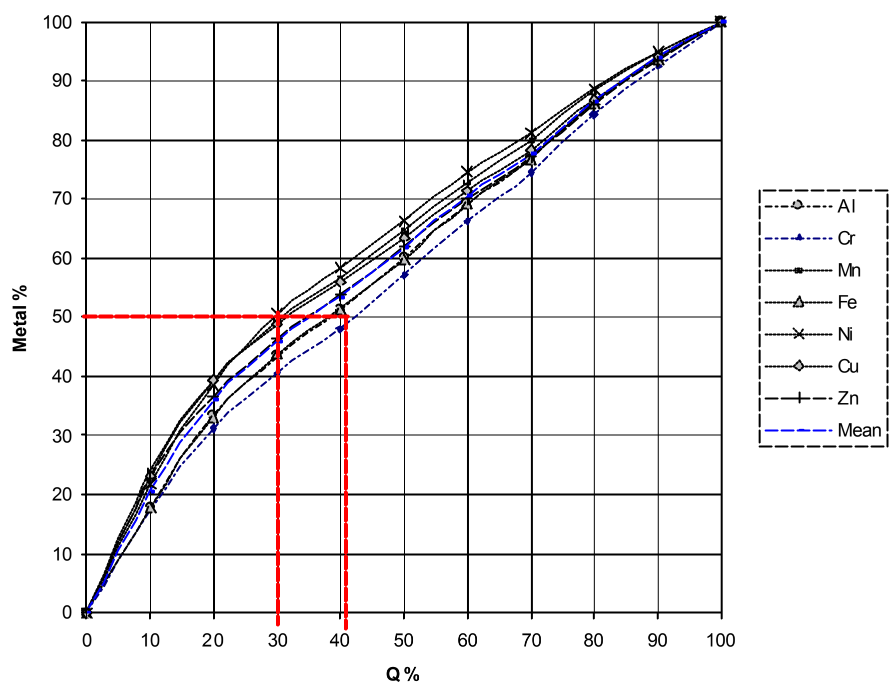


Figure 36: Mean Cumulative Percentage of Dissolved Heavy Metal Mass Loading versus Cumulative Percentage of Discharged Runoff Volume

The development of regression models was performed for all dissolved heavy metals excluding As, Cd and Pb because of detection limit problems. The developed models were as followed:

Ln(Al)=-79.715+6.883*Ln(Temp)+11.537*Ln(Redox)+0.164*Ln(Flow)

R^2=0.91

Ln(Cr)=23.033-13.407*Ln(pH)+2.353*Ln(Temp)-0.104*Ln(Qt+10)

R^2=0.75

Ln(Mn)=1.143+1.070*Ln(Cond)+0.180*Ln(Dry_H)-1.738*Ln(Temp)+

+0.213*Ln(Flow)

R^2=0.94.

Fe=1841.838-1.56E-02*Qt-271.907*pH+17.565*Temp+1.447*Cond+0.404*Flow

R^2=0.83

Ni=106.216+0.02868*Cond-12.802*pH-5.18E-04*Qt

R^2=0.90

Cu=8.023+9.658E-02*Cond-0.622*Temp+8.917E-03*Flow

R^2=0.95

Zn=-213.572+0.743*Cond+10.665*Temp

R^2=0.89.

A linear regression model was chosen for zinc, copper, nickel and iron. A exponential model was developed for the elements aluminum, chromium and manganese. All models were then verified. For the elements nickel, copper and zinc the COV value was greater than 1.0. Therefore the observed and predicted values had to be transformed prior to any further statistical analysis. After transforming these values all further test were performed. All models passed the F-test with a 95% confidence limit. This means, that there is no statistical evidence of difference among the variances estimated and those observed in the raw data.

The obtained regression models can be used to roughly predict the concentration of dissolved heavy metals in storm water runoff from roadways during high flow storm events. The advantage is that only field measurements are needed in order to obtain the necessary variables used for all models. This means, that first estimates of pollutant concentration of the occurring runoff can be obtained already in the field during a storm event. The developed equations can be useful for the treatment of storm water runoff. Expensive treatment technologies can be better brought into action in order to obtain optimal results. Also the advantage to obtain estimative results already in the field can reduce time and money and increase flexibility and efficiency of treatment technologies.

The U.S. EPA issued a policy memorandum on October 1, 1993, which was titled "Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Metals Policy" and stated:

"It is now the policy of the Office of Water that the use of dissolved metal to set and measure compliance with water quality standards is the recommended approach, because dissolved metal more closely approximates the bio-available fraction of metal in the water column than does total recoverable metal". Therefore this research can be useful, especially for non point sources, to assess and predict dissolved metals in runoff from roadways and similar. (U.S. EPA, Office of Water, June 1996)

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APPENDIX A

Regression for Al (2)

Descriptive Statistics

	Mean	Std. Deviation	N
AL	5.21107496037245	1.51344206660380	50
DRY_H	4.86177472968490	1.04069718768750	50
FLOW	4.74231979617219	1.58493791080735	50
QT	7.0538708695629	1.7511923750221	50
PH	2.0396464105274	5.213327473445E-02	50
REDOX	5.43046382930972	9.1231051324984E-02	50
TEMP	3.12378406380180	.21070002533544	50

Correlations

		AL	DRY_H	FLOW	QT	PH	REDOX	TEMP
Pearson Correlation	AL	1.000	.120	.231	-.385	-.434	.335	.660
	DRY_H	.120	1.000	.520	.297	-.387	.414	-.242
	FLOW	.231	.520	1.000	.426	-.139	.189	-.075
	QT	-.385	.297	.426	1.000	.334	-.276	-.215
	PH	-.434	-.387	-.139	.334	1.000	-.977	.287
	REDOX	.335	.414	.189	-.276	-.977	1.000	-.410
	TEMP	.660	-.242	-.075	-.215	.287	-.410	1.000
Sig. (1-tailed)	AL	.	.202	.053	.003	.001	.009	.000
	DRY_H	.202	.	.000	.018	.003	.001	.045
	FLOW	.053	.000	.	.001	.167	.095	.301
	QT	.003	.018	.001	.	.009	.026	.067
	PH	.001	.003	.167	.009	.	.000	.022
	REDOX	.009	.001	.095	.026	.000	.	.002
	TEMP	.000	.045	.301	.067	.022	.002	.
N	AL	50	50	50	50	50	50	50
	DRY_H	50	50	50	50	50	50	50
	FLOW	50	50	50	50	50	50	50
	QT	50	50	50	50	50	50	50
	PH	50	50	50	50	50	50	50
	REDOX	50	50	50	50	50	50	50
	TEMP	50	50	50	50	50	50	50

Model Summary

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.660[a]	.436	.424	***********	.436	37.127	1	48	.000
2	.937[b]	.877	.872	***********	.441	168.850	1	47	.000
3	.952[c]	.906	.900	***********	.028	13.867	1	46	.001

a. Predictors: (Constant), TEMP

b. Predictors: (Constant), TEMP, REDOX

c. Predictors: (Constant), TEMP, REDOX, FLOW

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48.950	1	48.950	37.127	.000[a]
	Residual	63.285	48	1.318		
	Total	112.235	49			
2	Regression	98.455	2	49.227	167.902	.000[b]
	Residual	13.780	47	.293		
	Total	112.235	49			
3	Regression	101.647	3	33.882	147.202	.000[c]
	Residual	10.588	46	.230		
	Total	112.235	49			

a. Predictors: (Constant), TEMP

b. Predictors: (Constant), TEMP, REDOX

c. Predictors: (Constant), TEMP, REDOX, FLOW

d. Dependent Variable: AL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Correlations		
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	-9.607	2.437		-3.942	.000	-14.508	-4.706			
	TEMP	4.744	.779	.660	6.093	.000	3.178	6.309	.660	.660	.660
2	(Constant)	-81.883	5.680		-14.417	.000	-93.309	-70.457			
	TEMP	6.886	.402	.959	17.110	.000	6.076	7.695	.660	.928	.875
	REDOX	12.077	.929	.728	12.994	.000	10.207	13.947	.335	.884	.664
3	(Constant)	-79.715	5.066		-15.735	.000	-89.913	-69.518			
	TEMP	6.883	.357	.958	19.302	.000	6.165	7.600	.660	.943	.874
	REDOX	11.537	.836	.695	13.796	.000	9.853	13.220	.335	.897	.625
	FLOW	.164	.044	.172	3.724	.001	.075	.253	.231	.481	.169

Coefficients[a]

Model		Collinearity Statistics Tolerance	VIF
1	(Constant)		
	TEMP	1.000	1.000
2	(Constant)		
	TEMP	.832	1.202
	REDOX	.832	1.202
3	(Constant)		
	TEMP	.832	1.202
	REDOX	.807	1.239
	FLOW	.964	1.037

a. Dependent Variable: AL

Excluded Variables[d]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance	VIF	Minimum Tolerance
1	DRY_H	.298[a]	2.857	.006	.385	.941	1.062	.941
	FLOW	.282[a]	2.771	.008	.375	.994	1.006	.994
	QT	-.254[a]	-2.404	.020	-.331	.954	1.049	.954
	PH	-.680[a]	-11.945	.000	-.867	.918	1.090	.918
	REDOX	.728[a]	12.994	.000	.884	.832	1.202	.832
2	DRY_H	.062[b]	1.104	.275	.161	.822	1.216	.727
	FLOW	.172[b]	3.724	.001	.481	.964	1.037	.807
	QT	.028[b]	.484	.631	.071	.795	1.258	.693
	PH	.050[b]	.170	.866	.025	3.087E-02	32.394	2.800E-02
3	DRY_H	-.040[c]	-.694	.491	-.103	.619	1.614	.619
	QT	-.108[c]	-1.818	.076	-.262	.557	1.795	.557
	PH	-.217[c]	-.811	.422	-.120	2.874E-02	34.798	2.567E-02

a. Predictors in the Model: (Constant), TEMP

b. Predictors in the Model: (Constant), TEMP, REDOX

c. Predictors in the Model: (Constant), TEMP, REDOX, FLOW

d. Dependent Variable: AL

Coefficient Correlations[a]

Model			TEMP	REDOX	FLOW
1	Correlations	TEMP	1.000		
	Covariances	TEMP	.606		
2	Correlations	TEMP	1.000	.410	
		REDOX	.410	1.000	
	Covariances	TEMP	.162	.153	
		REDOX	.153	.864	
3	Correlations	TEMP	1.000	.404	-.002
		REDOX	.404	1.000	-.174
		FLOW	-.002	-.174	1.000
	Covariances	TEMP	.127	.120	-3.456E-05
		REDOX	.120	.699	-6.394E-03
		FLOW	-3.456E-05	-6.394E-03	1.939E-03

a. Dependent Variable: AL

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	TEMP	REDOX	FLOW
1	1	1.998	1.000	.00	.00		
	2	2.222E-03	29.986	1.00	1.00		
2	1	2.997	1.000	.00	.00	.00	
	2	3.347E-03	29.922	.01	.73	.02	
	3	1.018E-04	171.527	.99	.27	.98	
3	1	3.921	1.000	.00	.00	.00	.01
	2	7.607E-02	7.179	.00	.00	.00	.95
	3	3.264E-03	34.657	.01	.73	.02	.03
	4	9.983E-05	198.172	.99	.27	.98	.02

a. Dependent Variable: AL

Regression for Al

Descriptive Statistics

	Mean	Std. Deviation	N
AL	5.21107496037245	1.51344206660380	50
DRY_H	4.86177472968490	1.04069718768750	50
FLOW	4.74231979617219	1.58493791080735	50
QT	7.0538708695629	1.7511923750221	50
PH	2.0396464105274	5.213327473445E-02	50
REDOX	5.43046382930972	9.1231051324984E-02	50
TEMP	3.12378406380180	.21070002533544	50
COND	4.88455781766913	.80472615766296	50

Correlations

		AL	DRY_H	FLOW	QT	PH	REDOX
Pearson Correlation	AL	1.000	.120	.231	-.385	-.434	.335
	DRY_H	.120	1.000	.520	.297	-.387	.414
	FLOW	.231	.520	1.000	.426	-.139	.189
	QT	-.385	.297	.426	1.000	.334	-.276
	PH	-.434	-.387	-.139	.334	1.000	-.977
	REDOX	.335	.414	.189	-.276	-.977	1.000
	TEMP	.660	-.242	-.075	-.215	.287	-.410
	COND	.385	-.007	-.385	-.820	-.633	.590
Sig. (1-tailed)	AL	.	.202	.053	.003	.001	.009
	DRY_H	.202	.	.000	.018	.003	.001
	FLOW	.053	.000	.	.001	.167	.095
	QT	.003	.018	.001	.	.009	.026
	PH	.001	.003	.167	.009	.	.000
	REDOX	.009	.001	.095	.026	.000	.
	TEMP	.000	.045	.301	.067	.022	.002
	COND	.003	.481	.003	.000	.000	.000
N	AL	50	50	50	50	50	50
	DRY_H	50	50	50	50	50	50
	FLOW	50	50	50	50	50	50
	QT	50	50	50	50	50	50
	PH	50	50	50	50	50	50
	REDOX	50	50	50	50	50	50
	TEMP	50	50	50	50	50	50
	COND	50	50	50	50	50	50

Correlations

		TEMP	COND
Pearson Correlation	AL	.660	.385
	DRY_H	-.242	-.007
	FLOW	-.075	-.385
	QT	-.215	-.820
	PH	.287	-.633
	REDOX	-.410	.590
	TEMP	1.000	.088
	COND	.088	1.000
Sig. (1-tailed)	AL	.000	.003
	DRY_H	.045	.481
	FLOW	.301	.003
	QT	.067	.000
	PH	.022	.000
	REDOX	.002	.000
	TEMP	.	.271
	COND	.271	.
N	AL	50	50
	DRY_H	50	50
	FLOW	50	50
	QT	50	50
	PH	50	50
	REDOX	50	50
	TEMP	50	50
	COND	50	50

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.660[a]	.436	.424	1.148235386243
2	.937[b]	.877	.872	.54147110743307
3	.954[c]	.910	.904	.46985888356499
4	.977[d]	.955	.951	.33489873690119
5	.980[e]	.961	.956	.31578733588695

Model Summary

Model	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change
1	.436	37.127	1	48	.000
2	.441	168.850	1	47	.000
3	.032	16.419	1	46	.000
4	.046	45.545	1	45	.000
5	.006	6.612	1	44	.014

a. Predictors: (Constant), TEMP

b. Predictors: (Constant), TEMP, REDOX

c. Predictors: (Constant), TEMP, REDOX, COND

d. Predictors: (Constant), TEMP, REDOX, COND, QT

e. Predictors: (Constant), TEMP, REDOX, COND, QT, DRY_H

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48.950	1	48.950	37.127	.000[a]
	Residual	63.285	48	1.318		
	Total	112.235	49			
2	Regression	98.455	2	49.227	167.902	.000[b]
	Residual	13.780	47	.293		
	Total	112.235	49			
3	Regression	102.080	3	34.027	154.128	.000[c]
	Residual	10.155	46	.221		
	Total	112.235	49			
4	Regression	107.188	4	26.797	238.923	.000[d]
	Residual	5.047	45	.112		
	Total	112.235	49			
5	Regression	107.847	5	21.569	216.296	.000[e]
	Residual	4.388	44	9.972E-02		
	Total	112.235	49			

a. Predictors: (Constant), TEMP

b. Predictors: (Constant), TEMP, REDOX

c. Predictors: (Constant), TEMP, REDOX, COND

d. Predictors: (Constant), TEMP, REDOX, COND, QT

e. Predictors: (Constant), TEMP, REDOX, COND, QT, DRY_H

f. Dependent Variable: AL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-9.607	2.437		-3.942	.000
	TEMP	4.744	.779	.660	6.093	.000
2	(Constant)	-81.883	5.680		-14.417	.000
	TEMP	6.886	.402	.959	17.110	.000
	REDOX	12.077	.929	.728	12.994	.000
3	(Constant)	-98.703	6.444		-15.318	.000
	TEMP	7.595	.391	1.057	19.442	.000
	REDOX	15.188	1.113	.916	13.640	.000
	COND	-.468	.116	-.249	-4.052	.000
4	(Constant)	-104.562	4.674		-22.370	.000
	TEMP	7.617	.278	1.060	27.354	.000
	REDOX	17.437	.861	1.051	20.258	.000
	COND	-1.263	.144	-.672	-8.789	.000
	QT	-.361	.053	-.417	-6.749	.000
5	(Constant)	-100.176	4.726		-21.197	.000
	TEMP	7.563	.263	1.053	28.711	.000
	REDOX	16.629	.870	1.002	19.107	.000
	COND	-1.296	.136	-.689	-9.519	.000
	QT	-.411	.054	-.475	-7.603	.000
	DRY_H	.140	.054	.096	2.571	.014

Coefficients[a]

Model		95% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	-14.508	-4.706
	TEMP	3.178	6.309
2	(Constant)	-93.309	-70.457
	TEMP	6.076	7.695
	REDOX	10.207	13.947
3	(Constant)	-111.674	-85.732
	TEMP	6.809	8.382
	REDOX	12.946	17.429
	COND	-.701	-.236
4	(Constant)	-113.976	-95.147
	TEMP	7.056	8.178
	REDOX	15.704	19.171
	COND	-1.553	-.974
	QT	-.468	-.253
5	(Constant)	-109.700	-90.651
	TEMP	7.032	8.094
	REDOX	14.875	18.383
	COND	-1.570	-1.021
	QT	-.520	-.302
	DRY_H	.030	.250

Coefficients[a]

Model		Correlations			Collinearity Statistics	
		Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)					
	TEMP	.660	.660	.660	1.000	1.000
2	(Constant)					
	TEMP	.660	.928	.875	.832	1.202
	REDOX	.335	.884	.664	.832	1.202
3	(Constant)					
	TEMP	.660	.944	.862	.665	1.504
	REDOX	.335	.895	.605	.437	2.290
	COND	.385	-.513	-.180	.521	1.921
4	(Constant)					
	TEMP	.660	.971	.865	.665	1.504
	REDOX	.335	.949	.640	.371	2.694
	COND	.385	-.795	-.278	.171	5.844
	QT	-.385	-.709	-.213	.261	3.828
5	(Constant)					
	TEMP	.660	.974	.856	.661	1.514
	REDOX	.335	.945	.570	.323	3.098
	COND	.385	-.820	-.284	.170	5.895
	QT	-.385	-.754	-.227	.227	4.396
	DRY_H	.120	.361	.077	.633	1.580

a. Dependent Variable: AL

Excluded Variables[f]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance	VIF	Minimum Tolerance
1	DRY_H	.298[a]	2.857	.006	.385	.941	1.062	.941
	FLOW	.282[a]	2.771	.008	.375	.994	1.006	.994
	QT	-.254[a]	-2.404	.020	-.331	.954	1.049	.954
	PH	-.680[a]	-11.945	.000	-.867	.918	1.090	.918
	REDOX	.728[a]	12.994	.000	.884	.832	1.202	.832
	COND	.329[a]	3.325	.002	.436	.992	1.008	.992
2	DRY_H	.062[b]	1.104	.275	.161	.822	1.216	.727
	FLOW	.172[b]	3.724	.001	.481	.964	1.037	.807
	QT	.028[b]	.484	.631	.071	.795	1.258	.693
	PH	.050[b]	.170	.866	.025	3.087E-02	32.394	2.800E-02
	COND	-.249[b]	-4.052	.000	-.513	.521	1.921	.437
3	DRY_H	-.006[c]	-.115	.909	-.017	.727	1.375	.337
	FLOW	.085[c]	1.358	.181	.198	.489	2.044	.251
	QT	-.417[c]	-6.749	.000	-.709	.261	3.828	.171
	PH	-.042[c]	-.166	.869	-.025	3.062E-02	32.658	2.779E-02
4	DRY_H	.096[d]	2.571	.014	.361	.633	1.580	.170
	FLOW	.064[d]	1.440	.157	.212	.487	2.054	.123
	PH	.074[d]	.405	.687	.061	3.034E-02	32.956	2.673E-02
5	FLOW	.020[e]	.416	.680	.063	.393	2.548	.110
	PH	.083[e]	.483	.631	.073	3.033E-02	32.971	2.654E-02

a. Predictors in the Model: (Constant), TEMP

b. Predictors in the Model: (Constant), TEMP, REDOX

c. Predictors in the Model: (Constant), TEMP, REDOX, COND

d. Predictors in the Model: (Constant), TEMP, REDOX, COND, QT

e. Predictors in the Model: (Constant), TEMP, REDOX, COND, QT, DRY_H

f. Dependent Variable: AL

Coefficient Correlations[a]

Model			TEMP	REDOX	COND	QT	DRY_H
1		TEMP	1.000				
	Covariances	TEMP	.606				
2	Correlations	TEMP	1.000	.410			
		REDOX	.410	1.000			
	Covariances	TEMP	.162	.153			
		REDOX	.153	.864			
3	Correlations	TEMP	1.000	.574	-.448		
		REDOX	.574	1.000	-.689		
		COND	-.448	-.689	1.000		
	Covariances	TEMP	.153	.250	-2.025E-02		
		REDOX	.250	1.240	-8.874E-02		
		COND	-2.025E-02	-8.874E-02	1.336E-02		
4	Correlations	TEMP	1.000	.534	-.267	-.012	
		REDOX	.534	1.000	-.682	-.387	
		COND	-.267	-.682	1.000	.819	
		QT	-.012	-.387	.819	1.000	
	Covariances	TEMP	7.755E-02	.128	-1.067E-02	-1.748E-04	
		REDOX	.128	.741	-8.434E-02	-1.782E-02	
		COND	-1.067E-02	-8.434E-02	2.066E-02	6.294E-03	
		QT	-1.748E-04	-1.782E-02	6.294E-03	2.857E-03	
5	Correlations	TEMP	1.000	.525	-.257	.018	-.080
		REDOX	.525	1.000	-.599	-.207	-.361
		COND	-.257	-.599	1.000	.795	-.093
		QT	.018	-.207	.795	1.000	-.360
		DRY_H	-.080	-.361	-.093	-.360	1.000
	Covariances	TEMP	6.939E-02	.120	-9.222E-03	2.534E-04	-1.147E-03
		REDOX	.120	.758	-7.102E-02	-9.741E-03	-1.712E-02
		COND	-9.222E-03	-7.102E-02	1.852E-02	5.842E-03	-6.882E-04
		QT	2.534E-04	-9.741E-03	5.842E-03	2.918E-03	-1.058E-03
		DRY_H	-1.147E-03	-1.712E-02	-6.882E-04	-1.058E-03	2.968E-03

a. Dependent Variable: AL

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index
1	1	1.998	1.000
	2	2.222E-03	29.986
2	1	2.997	1.000
	2	3.347E-03	29.922
	3	1.018E-04	171.527
3	1	3.978	1.000
	2	1.868E-02	14.594
	3	3.290E-03	34.772
	4	5.636E-05	265.660
4	1	4.916	1.000
	2	7.592E-02	8.047
	3	6.063E-03	28.476
	4	1.754E-03	52.935
	5	5.163E-05	308.563
5	1	5.884	1.000
	2	7.733E-02	8.723
	3	3.230E-02	13.497
	4	4.839E-03	34.871
	5	1.746E-03	58.052
	6	4.492E-05	361.912

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions (Constant)	TEMP	REDOX	COND	QT	DRY_H
1	1	.00	.00				
	2	1.00	1.00				
2	1	.00	.00	.00			
	2	.01	.73	.02			
	3	.99	.27	.98			
3	1	.00	.00	.00	.00		
	2	.00	.02	.00	.54		
	3	.00	.57	.01	.01		
	4	1.00	.42	.99	.45		
4	1	.00	.00	.00	.00	.00	
	2	.00	.00	.00	.02	.13	
	3	.00	.28	.00	.23	.23	
	4	.02	.33	.02	.39	.56	
	5	.98	.38	.98	.37	.09	
5	1	.00	.00	.00	.00	.00	.00
	2	.00	.00	.00	.02	.10	.01
	3	.00	.01	.00	.00	.02	.65
	4	.00	.32	.00	.28	.32	.20
	5	.01	.31	.02	.42	.54	.01
	6	.99	.36	.98	.28	.02	.13

a. Dependent Variable: AL

Regression for Cr (2)

Descriptive Statistics

	Mean	Std. Deviation	N
CR	2.3048648937386	.96219906569489	50
FLOW	4.7423197961722	1.58493791080735	50
QT	7.0538708695629	1.7511923750221	50
PH	2.0396464105274	5.213327473E-02	50
REDOX	5.4304638293097	9.123105132E-02	50
TEMP	3.1237840638018	.21070002533544	50
COND	4.8845578176691	.80472615766296	50

Correlations

		CR	FLOW	QT	PH	REDOX
Pearson Correlation	CR	1.000	-.092	-.542	-.642	.562
	FLOW	-.092	1.000	.426	-.139	.189
	QT	-.542	.426	1.000	.334	-.276
	PH	-.642	-.139	.334	1.000	-.977
	REDOX	.562	.189	-.276	-.977	1.000
	TEMP	.347	-.075	-.215	.287	-.410
	COND	.599	-.385	-.820	-.633	.590
Sig. (1-tailed)	CR	.	.262	.000	.000	.000
	FLOW	.262	.	.001	.167	.095
	QT	.000	.001	.	.009	.026
	PH	.000	.167	.009	.	.000
	REDOX	.000	.095	.026	.000	.
	TEMP	.007	.301	.067	.022	.002
	COND	.000	.003	.000	.000	.000
N	CR	50	50	50	50	50
	FLOW	50	50	50	50	50
	QT	50	50	50	50	50
	PH	50	50	50	50	50
	REDOX	50	50	50	50	50
	TEMP	50	50	50	50	50
	COND	50	50	50	50	50

Correlations

		TEMP	COND
Pearson Correlation	CR	.347	.599
	FLOW	-.075	-.385
	QT	-.215	-.820
	PH	.287	-.633
	REDOX	-.410	.590
	TEMP	1.000	.088
	COND	.088	1.000
Sig. (1-tailed)	CR	.007	.000
	FLOW	.301	.003
	QT	.067	.000
	PH	.022	.000
	REDOX	.002	.000
	TEMP	.	.271
	COND	.271	.
N	CR	50	50
	FLOW	50	50
	QT	50	50
	PH	50	50
	REDOX	50	50
	TEMP	50	50
	COND	50	50

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.642[a]	.412	.399	***********
2	.848[b]	.720	.708	***********
3	.865[c]	.748	.731	***********

Model Summary

Model	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change
1	.412	33.595	1	48	.000
2	.308	51.636	1	47	.000
3	.028	5.096	1	46	.029

a. Predictors: (Constant), PH

b. Predictors: (Constant), PH, TEMP

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18.678	1	18.678	33.595	.000[a]
	Residual	26.687	48	.556		
	Total	45.366	49			
2	Regression	32.649	2	16.325	60.336	.000[b]
	Residual	12.716	47	.271		
	Total	45.366	49			
3	Regression	33.917	3	11.306	45.428	.000[c]
	Residual	11.448	46	.249		
	Total	45.366	49			

a. Predictors: (Constant), PH

b. Predictors: (Constant), PH, TEMP

c. Predictors: (Constant), PH, TEMP, QT

d. Dependent Variable: CR

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	26.460	4.169		6.347	.000
	PH	-11.843	2.043	-.642	-5.796	.000
2	(Constant)	24.454	2.922		8.370	.000
	PH	-14.911	1.488	-.808	-10.021	.000
	TEMP	2.645	.368	.579	7.186	.000
3	(Constant)	23.033	2.872		8.020	.000
	PH	-13.407	1.575	-.726	-8.514	.000
	TEMP	2.353	.376	.515	6.257	.000
	QT	-.104	.046	-.189	-2.257	.029

Coefficients[a]

Model		95% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	18.078	34.842
	PH	-15.951	-7.735
2	(Constant)	18.576	30.331
	PH	-17.904	-11.917
	TEMP	1.905	3.386
3	(Constant)	17.252	28.813
	PH	-16.577	-10.238
	TEMP	1.596	3.110
	QT	-.196	-.011

Coefficients[a]

Model		Correlations			Collinearity Statistics	
		Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)					
	PH	-.642	-.642	-.642	1.000	1.000
2	(Constant)					
	PH	-.642	-.825	-.774	.918	1.090
	TEMP	.347	.724	.555	.918	1.090
3	(Constant)					
	PH	-.642	-.782	-.631	.754	1.327
	TEMP	.347	.678	.463	.809	1.236
	QT	-.542	-.316	-.167	.783	1.277

a. Dependent Variable: CR

Excluded Variables[d]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	FLOW	-.185[a]	-1.690	.098	-.239	.981	1.020	.981
	QT	-.369[a]	-3.491	.001	-.454	.888	1.125	.888
	REDOX	-1.399[a]	-2.923	.005	-.392	4.624E-02	21.627	4.624E-02
	TEMP	.579[a]	7.186	.000	.724	.918	1.090	.918
	COND	.323[a]	2.361	.022	.326	.600	1.668	.600
2	FLOW	-.165[b]	-2.195	.033	-.308	.979	1.021	.904
	QT	-.189[b]	-2.257	.029	-.316	.783	1.277	.754
	REDOX	.367[b]	.791	.433	.116	2.800E-02	35.720	2.800E-02
	COND	.071[b]	.662	.512	.097	.520	1.922	.481
3	FLOW	-.105[c]	-1.198	.237	-.176	.709	1.411	.567
	REDOX	.412[c]	.928	.359	.137	2.794E-02	35.789	2.794E-02
	COND	-.339[c]	-1.998	.052	-.286	.179	5.594	.179

a. Predictors in the Model: (Constant), PH

b. Predictors in the Model: (Constant), PH, TEMP

c. Predictors in the Model: (Constant), PH, TEMP, QT

d. Dependent Variable: CR

Coefficient Correlations[a]

Model			PH	TEMP	QT
1	Correlations	PH	1.000		
	Covariances	PH	4.175		
2	Correlations	PH	1.000	-.287	
		TEMP	-.287	1.000	
	Covariances	PH	2.214	-.157	
		TEMP	-.157	.136	
3	Correlations	PH	1.000	-.390	-.423
		TEMP	-.390	1.000	.344
		QT	-.423	.344	1.000
	Covariances	PH	2.480	-.231	-3.063E-02
		TEMP	-.231	.141	5.954E-03
		QT	-3.063E-02	5.954E-03	2.115E-03

a. Dependent Variable: CR

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	PH	TEMP	QT
1	1	2.000	1.000	.00	.00		
	2	3.200E-04	79.054	1.00	1.00		
2	1	2.997	1.000	.00	.00	.00	
	2	2.750E-03	33.014	.04	.03	.99	
	3	3.163E-04	97.345	.96	.97	.01	
3	1	3.953	1.000	.00	.00	.00	.00
	2	4.479E-02	9.394	.00	.00	.01	.74
	3	2.354E-03	40.976	.06	.03	.93	.13
	4	2.790E-04	119.030	.94	.97	.06	.12

a. Dependent Variable: CR

Regression for Cr

Descriptive Statistics

	Mean	Std. Deviation	N
CR	2.30486489373856	.96219906569489	50
DRY_H	4.86177472968490	1.0406971876875	50
FLOW	4.74231979617219	1.5849379108074	50
QT	7.0538708695629	1.7511923750221	50
PH	2.0396464105274	5.21332747E-02	50
REDOX	5.43046382930972	9.12310513E-02	50
TEMP	3.12378406380180	.21070002533544	50
COND	4.88455781766913	.80472615766296	50

Correlations

		CR	DRY_H	FLOW	QT	PH	REDOX
Pearson Correlation	CR	1.000	-.165	-.092	-.542	-.642	.562
	DRY_H	-.165	1.000	.520	.297	-.387	.414
	FLOW	-.092	.520	1.000	.426	-.139	.189
	QT	-.542	.297	.426	1.000	.334	-.276
	PH	-.642	-.387	-.139	.334	1.000	-.977
	REDOX	.562	.414	.189	-.276	-.977	1.000
	TEMP	.347	-.242	-.075	-.215	.287	-.410
	COND	.599	-.007	-.385	-.820	-.633	.590
Sig. (1-tailed)	CR	.	.126	.262	.000	.000	.000
	DRY_H	.126	.	.000	.018	.003	.001
	FLOW	.262	.000	.	.001	.167	.095
	QT	.000	.018	.001	.	.009	.026
	PH	.000	.003	.167	.009	.	.000
	REDOX	.000	.001	.095	.026	.000	.
	TEMP	.007	.045	.301	.067	.022	.002
	COND	.000	.481	.003	.000	.000	.000
N	CR	50	50	50	50	50	50
	DRY_H	50	50	50	50	50	50
	FLOW	50	50	50	50	50	50
	QT	50	50	50	50	50	50
	PH	50	50	50	50	50	50
	REDOX	50	50	50	50	50	50
	TEMP	50	50	50	50	50	50
	COND	50	50	50	50	50	50

Correlations

		TEMP	COND
Pearson Correlation	CR	.347	.599
	DRY_H	-.242	-.007
	FLOW	-.075	-.385
	QT	-.215	-.820
	PH	.287	-.633
	REDOX	-.410	.590
	TEMP	1.000	.088
	COND	.088	1.000
Sig. (1-tailed)	CR	.007	.000
	DRY_H	.045	.481
	FLOW	.301	.003
	QT	.067	.000
	PH	.022	.000
	REDOX	.002	.000
	TEMP	.	.271
	COND	.271	.
N	CR	50	50
	DRY_H	50	50
	FLOW	50	50
	QT	50	50
	PH	50	50
	REDOX	50	50
	TEMP	50	50
	COND	50	50

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.642[a]	.412	.399	***********
2	.848[b]	.720	.708	***********
3	.926[c]	.857	.848	***********

Model Summary

Model	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change
1	.412	33.595	1	48	.000
2	.308	51.636	1	47	.000
3	.137	44.162	1	46	.000

a. Predictors: (Constant), PH

b. Predictors: (Constant), PH, TEMP

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18.678	1	18.678	33.595	.000[a]
	Residual	26.687	48	.556		
	Total	45.366	49			
2	Regression	32.649	2	16.325	60.336	.000[b]
	Residual	12.716	47	.271		
	Total	45.366	49			
3	Regression	38.878	3	12.959	91.884	.000[c]
	Residual	6.488	46	.141		
	Total	45.366	49			

a. Predictors: (Constant), PH

b. Predictors: (Constant), PH, TEMP

c. Predictors: (Constant), PH, TEMP, DRY_H

d. Dependent Variable: CR

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	26.460	4.169		6.347	.000
	PH	-11.843	2.043	-.642	-5.796	.000
2	(Constant)	24.454	2.922		8.370	.000
	PH	-14.911	1.488	-.808	-10.021	.000
	TEMP	2.645	.368	.579	7.186	.000
3	(Constant)	32.407	2.425		13.363	.000
	PH	-17.509	1.143	-.949	-15.316	.000
	TEMP	2.381	.269	.521	8.858	.000
	DRY_H	-.376	.057	-.406	-6.645	.000

Coefficients[a]

Model		95% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	18.078	34.842
	PH	-15.951	-7.735
2	(Constant)	18.576	30.331
	PH	-17.904	-11.917
	TEMP	1.905	3.386
3	(Constant)	27.525	37.289
	PH	-19.810	-15.208
	TEMP	1.840	2.922
	DRY_H	-.490	-.262

Coefficients[a]

Model		Correlations			Collinearity Statistics	
		Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)					
	PH	-.642	-.642	-.642	1.000	1.000
2	(Constant)					
	PH	-.642	-.825	-.774	.918	1.090
	TEMP	.347	.724	.555	.918	1.090
3	(Constant)					
	PH	-.642	-.914	-.854	.810	1.234
	TEMP	.347	.794	.494	.898	1.114
	DRY_H	-.165	-.700	-.371	.831	1.203

a. Dependent Variable: CR

Excluded Variables[d]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	DRY_H	-.487[a]	-4.945	.000	-.585	.850	1.177	.850
	FLOW	-.185[a]	-1.690	.098	-.239	.981	1.020	.981
	QT	-.369[a]	-3.491	.001	-.454	.888	1.125	.888
	REDOX	-1.399[a]	-2.923	.005	-.392	4.624E-02	21.627	4.624E-02
	TEMP	.579[a]	7.186	.000	.724	.918	1.090	.918
	COND	.323[a]	2.361	.022	.326	.600	1.668	.600
2	DRY_H	-.406[b]	-6.645	.000	-.700	.831	1.203	.810
	FLOW	-.165[b]	-2.195	.033	-.308	.979	1.021	.904
	QT	-.189[b]	-2.257	.029	-.316	.783	1.277	.754
	REDOX	.367[b]	.791	.433	.116	2.800E-02	35.720	2.800E-02
	COND	.071[b]	.662	.512	.097	.520	1.922	.481
3	FLOW	.036[c]	.547	.587	.081	.723	1.383	.614
	QT	.012[c]	.161	.873	.024	.608	1.645	.553
	REDOX	.625[c]	1.917	.062	.275	2.764E-02	36.182	2.764E-02
	COND	-.107[c]	-1.319	.194	-.193	.465	2.149	.380

a. Predictors in the Model: (Constant), PH

b. Predictors in the Model: (Constant), PH, TEMP

c. Predictors in the Model: (Constant), PH, TEMP, DRY_H

d. Dependent Variable: CR

Coefficient Correlations[a]

Model			PH	TEMP	DRY_H
1	Correlations	PH	1.000		
	Covariances	PH	4.175		
2	Correlations	PH	1.000	-.287	
		TEMP	-.287	1.000	
	Covariances	PH	2.214	-.157	
		TEMP	-.157	.136	
3	Correlations	PH	1.000	-.216	.342
		TEMP	-.216	1.000	.148
		DRY_H	.342	.148	1.000
	Covariances	PH	1.307	-6.636E-02	2.211E-02
		TEMP	-6.636E-02	7.224E-02	2.252E-03
		DRY_H	2.211E-02	2.252E-03	3.197E-03

a. Dependent Variable: CR

Collinearity Diagnostics[a]

				Variance Proportions			
Model	Dimension	Eigenvalue	Condition Index	(Constant)	PH	TEMP	DRY_H
1	1	2.000	1.000	.00	.00		
	2	3.200E-04	79.054	1.00	1.00		
2	1	2.997	1.000	.00	.00	.00	
	2	2.750E-03	33.014	.04	.03	.99	
	3	3.163E-04	97.345	.96	.97	.01	
3	1	3.961	1.000	.00	.00	.00	.00
	2	3.592E-02	10.501	.00	.00	.01	.74
	3	2.532E-03	39.553	.03	.04	.99	.07
	4	2.584E-04	123.812	.97	.96	.00	.19

a. Dependent Variable: CR

Regression for Cu (2)

Descriptive Statistics

	Mean	Std. Deviation	N
CU	15.141	25.221	50
FLOW	256.84	269.13	50
TEMP	23.224	4.781	50
COND	199.63	257.11	50

Correlations

		CU	FLOW	TEMP	COND
Pearson Correlation	CU	1.000	-.162	-.195	.961
	FLOW	-.162	1.000	-.360	-.304
	TEMP	-.195	-.360	1.000	-.043
	COND	.961	-.304	-.043	1.000
Sig. (1-tailed)	CU	.	.130	.087	.000
	FLOW	.130	.	.005	.016
	TEMP	.087	.005	.	.382
	COND	.000	.016	.382	.
N	CU	50	50	50	50
	FLOW	50	50	50	50
	TEMP	50	50	50	50
	COND	50	50	50	50

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	COND, TEMP, FLOW[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: CU

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.976[a]	.954	.950	5.612

Model Summary

Model	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change
1	.954	314.577	3	46	.000

a. Predictors: (Constant), COND, TEMP, FLOW

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29719.055	3	9906.352	314.577	.000[a]
	Residual	1448.587	46	31.491		
	Total	31167.642	49			

a. Predictors: (Constant), COND, TEMP, FLOW

b. Dependent Variable: CU

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.023	4.906		1.635	.109
	FLOW	8.917E-03	.003	.095	2.622	.012
	TEMP	-.622	.183	-.118	-3.410	.001
	COND	9.658E-02	.003	.985	29.063	.000

Coefficients[a]

Model		95% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	-1.853	17.898
	FLOW	.002	.016
	TEMP	-.990	-.255
	COND	.090	.103

Coefficients[a]

Model		Correlations			Collinearity Statistics	
		Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)					
	FLOW	-.162	.361	.083	.767	1.303
	TEMP	-.195	-.449	-.108	.844	1.184
	COND	.961	.974	.924	.880	1.136

a. Dependent Variable: CU

Coefficient Correlations[a]

Model			COND	TEMP	FLOW
1	Correlations	COND	1.000	.172	.343
		TEMP	.172	1.000	.393
		FLOW	.343	.393	1.000
	Covariances	COND	1.104E-05	1.045E-04	3.881E-06
		TEMP	1.045E-04	3.331E-02	2.436E-04
		FLOW	3.881E-06	2.436E-04	1.156E-05

a. Dependent Variable: CU

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	FLOW	TEMP	COND
1	1	2.938	1.000	.00	.03	.00	.03
	2	.746	1.984	.00	.23	.00	.41
	3	.301	3.126	.01	.48	.03	.47
	4	1.487E-02	14.059	.99	.26	.97	.08

a. Dependent Variable: CU

Regression for Fe (2)

Descriptive Statistics

	Mean	Std. Deviation	N
FE	504.75	499.95	50
QT	2859.47	3349.42	50
PH	7.6978	.3820	50
TEMP	23.224	4.781	50
COND	199.63	257.11	50
FLOW	256.84	269.13	50

Correlations

		FE	QT	PH	TEMP	COND	FLOW
Pearson Correlation	FE	1.000	-.340	-.773	.010	.874	-.105
	QT	-.340	1.000	.143	-.223	-.400	.595
	PH	-.773	.143	1.000	.338	-.777	-.131
	TEMP	.010	-.223	.338	1.000	-.043	-.360
	COND	.874	-.400	-.777	-.043	1.000	-.304
	FLOW	-.105	.595	-.131	-.360	-.304	1.000
Sig. (1-tailed)	FE	.	.008	.000	.472	.000	.235
	QT	.008	.	.161	.060	.002	.000
	PH	.000	.161	.	.008	.000	.183
	TEMP	.472	.060	.008	.	.382	.005
	COND	.000	.002	.000	.382	.	.016
	FLOW	.235	.000	.183	.005	.016	.
N	FE	50	50	50	50	50	50
	QT	50	50	50	50	50	50
	PH	50	50	50	50	50	50
	TEMP	50	50	50	50	50	50
	COND	50	50	50	50	50	50
	FLOW	50	50	50	50	50	50

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	FLOW, PH, TEMP, QT, COND[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: FE

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.908[a]	.825	.805	220.53

Model Summary

Model	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change
1	.825	41.567	5	44	.000

a. Predictors: (Constant), FLOW, PH, TEMP, QT, COND

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10107600	5	2021520.013	41.567	.000[a]
	Residual	2139837.7	44	48632.676		
	Total	12247438	49			

a. Predictors: (Constant), FLOW, PH, TEMP, QT, COND

b. Dependent Variable: FE

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1841.838	1380.678		1.334	.189
	QT	-1.556E-02	.012	-.104	-1.266	.212
	PH	-271.907	176.964	-.208	-1.537	.132
	TEMP	17.565	7.643	.168	2.298	.026
	COND	1.447	.263	.744	5.493	.000
	FLOW	.404	.178	.217	2.267	.028

Coefficients[a]

Model		95% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	-940.736	4624.411
	QT	-.040	.009
	PH	-628.555	84.741
	TEMP	2.160	32.969
	COND	.916	1.978
	FLOW	.045	.763

Coefficients[a]

Model		Correlations			Collinearity Statistics	
		Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)					
	QT	-.340	-.187	-.080	.585	1.708
	PH	-.773	-.226	-.097	.217	4.604
	TEMP	.010	.327	.145	.743	1.345
	COND	.874	.638	.346	.216	4.622
	FLOW	-.105	.323	.143	.432	2.315

a. Dependent Variable: FE

Coefficient Correlations[a]

Model			FLOW	PH	TEMP	QT	COND
1	Correlations	FLOW	1.000	.504	.079	-.471	.494
		PH	.504	1.000	-.340	-.089	.855
		TEMP	.079	-.340	1.000	.090	-.202
		QT	-.471	-.089	.090	1.000	.075
		COND	.494	.855	-.202	.075	1.000
	Covariances	FLOW	3.172E-02	15.891	.107	-1.030E-03	2.318E-02
		PH	15.891	31316.370	-460.474	-.193	39.861
		TEMP	.107	-460.474	58.423	8.501E-03	-.406
		QT	-1.030E-03	-.193	8.501E-03	1.511E-04	2.437E-04
		COND	2.318E-02	39.861	-.406	2.437E-04	6.939E-02

a. Dependent Variable: FE

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index
1	1	4.400	1.000
	2	1.016	2.081
	3	.349	3.549
	4	.215	4.528
	5	1.998E-02	14.837
	6	2.589E-04	130.354

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions (Constant)	QT	PH	TEMP	COND	FLOW
1	1	.00	.01	.00	.00	.00	.01
	2	.00	.10	.00	.00	.06	.04
	3	.00	.05	.00	.01	.16	.14
	4	.00	.83	.00	.00	.02	.46
	5	.01	.01	.00	.91	.01	.08
	6	.99	.01	1.00	.08	.75	.28

a. Dependent Variable: FE

Regression for Mn

Descriptive Statistics

	Mean	Std. Deviation	N
MN	2.82614564655194	.95833273585117	50
DRY_H	4.86177472968490	1.04069718768750	50
FLOW	4.74231979617219	1.58493791080735	50
QT	7.0538708695629	1.7511923750221	50
PH	2.0396464105274	5.2133274734E-02	50
REDOX	5.43046382930972	9.1231051325E-02	50
TEMP	3.12378406380180	.21070002533544	50
COND	4.88455781766913	.80472615766296	50

Correlations

		MN	DRY_H	FLOW	QT	PH	REDOX
Pearson Correlation	MN	1.000	.465	.136	-.462	-.774	.802
	DRY_H	.465	1.000	.520	.297	-.387	.414
	FLOW	.136	.520	1.000	.426	-.139	.189
	QT	-.462	.297	.426	1.000	.334	-.276
	PH	-.774	-.387	-.139	.334	1.000	-.977
	REDOX	.802	.414	.189	-.276	-.977	1.000
	TEMP	-.376	-.242	-.075	-.215	.287	-.410
	COND	.728	-.007	-.385	-.820	-.633	.590
Sig. (1-tailed)	MN	.	.000	.173	.000	.000	.000
	DRY_H	.000	.	.000	.018	.003	.001
	FLOW	.173	.000	.	.001	.167	.095
	QT	.000	.018	.001	.	.009	.026
	PH	.000	.003	.167	.009	.	.000
	REDOX	.000	.001	.095	.026	.000	.
	TEMP	.004	.045	.301	.067	.022	.002
	COND	.000	.481	.003	.000	.000	.000
N	MN	50	50	50	50	50	50
	DRY_H	50	50	50	50	50	50
	FLOW	50	50	50	50	50	50
	QT	50	50	50	50	50	50
	PH	50	50	50	50	50	50
	REDOX	50	50	50	50	50	50
	TEMP	50	50	50	50	50	50
	COND	50	50	50	50	50	50

Correlations

		TEMP	COND
Pearson Correlation	MN	-.376	.728
	DRY_H	-.242	-.007
	FLOW	-.075	-.385
	QT	-.215	-.820
	PH	.287	-.633
	REDOX	-.410	.590
	TEMP	1.000	.088
	COND	.088	1.000
Sig. (1-tailed)	MN	.004	.000
	DRY_H	.045	.481
	FLOW	.301	.003
	QT	.067	.000
	PH	.022	.000
	REDOX	.002	.000
	TEMP	.	.271
	COND	.271	.
N	MN	50	50
	DRY_H	50	50
	FLOW	50	50
	QT	50	50
	PH	50	50
	REDOX	50	50
	TEMP	50	50
	COND	50	50

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.802[a]	.643	.636	***********
2	.862[b]	.743	.732	***********
3	.903[c]	.816	.804	***********
4	.934[d]	.873	.861	***********
5	.930[e]	.865	.857	***********
6	.968[f]	.937	.931	***********

Model Summary

Model	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change
1	.643	86.602	1	48	.000
2	.099	18.179	1	47	.000
3	.073	18.149	1	46	.000
4	.057	20.179	1	45	.000
5	-.007	2.562	1	47	.116
6	.071	50.725	1	45	.000

a. Predictors: (Constant), REDOX

b. Predictors: (Constant), REDOX, COND

c. Predictors: (Constant), REDOX, COND, DRY_H

d. Predictors: (Constant), REDOX, COND, DRY_H, TEMP

e. Predictors: (Constant), COND, DRY_H, TEMP

f. Predictors: (Constant), COND, DRY_H, TEMP, FLOW

ANOVA[g]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	28.954	1	28.954	86.602	.000[a]
	Residual	16.048	48	.334		
	Total	45.002	49			
2	Regression	33.430	2	16.715	67.888	.000[b]
	Residual	11.572	47	.246		
	Total	45.002	49			
3	Regression	36.704	3	12.235	67.822	.000[c]
	Residual	8.298	46	.180		
	Total	45.002	49			
4	Regression	39.273	4	9.818	77.119	.000[d]
	Residual	5.729	45	.127		
	Total	45.002	49			
5	Regression	38.946	3	12.982	98.622	.000[e]
	Residual	6.055	46	.132		
	Total	45.002	49			
6	Regression	42.155	4	10.539	166.604	.000[f]
	Residual	2.847	45	6.326E-02		
	Total	45.002	49			

a. Predictors: (Constant), REDOX

b. Predictors: (Constant), REDOX, COND

c. Predictors: (Constant), REDOX, COND, DRY_H

d. Predictors: (Constant), REDOX, COND, DRY_H, TEMP

e. Predictors: (Constant), COND, DRY_H, TEMP

f. Predictors: (Constant), COND, DRY_H, TEMP, FLOW

g. Dependent Variable: MN

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-42.930	4.918		-8.730	.000
	REDOX	8.426	.905	.802	9.306	.000
2	(Constant)	-32.045	4.932		-6.497	.000
	REDOX	6.003	.963	.571	6.236	.000
	COND	.465	.109	.391	4.264	.000
3	(Constant)	-22.619	4.766		-4.746	.000
	REDOX	3.877	.963	.369	4.024	.000
	COND	.610	.099	.512	6.138	.000
	DRY_H	.290	.068	.315	4.260	.000
4	(Constant)	-6.768	5.337		-1.268	.211
	REDOX	1.540	.962	.147	1.601	.116
	COND	.798	.093	.670	8.544	.000
	DRY_H	.311	.057	.337	5.409	.000
	TEMP	-1.337	.298	-.294	-4.492	.000
5	(Constant)	1.652	.920		1.796	.079
	COND	.907	.065	.762	14.028	.000
	DRY_H	.355	.051	.385	6.907	.000
	TEMP	-1.594	.255	-.351	-6.264	.000
6	(Constant)	1.143	.642		1.782	.082
	COND	1.070	.050	.899	21.262	.000
	DRY_H	.180	.043	.195	4.164	.000
	TEMP	-1.738	.178	-.382	-9.784	.000
	FLOW	.213	.030	.352	7.122	.000

Coefficients[a]

Model		95% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	-52.817	-33.043
	REDOX	6.605	10.246
2	(Constant)	-41.967	-22.123
	REDOX	4.066	7.939
	COND	.246	.685
3	(Constant)	-32.214	-13.025
	REDOX	1.938	5.816
	COND	.410	.810
	DRY_H	.153	.428
4	(Constant)	-17.517	3.982
	REDOX	-.398	3.478
	COND	.610	.986
	DRY_H	.195	.426
	TEMP	-1.936	-.737
5	(Constant)	-.200	3.503
	COND	.777	1.037
	DRY_H	.251	.458
	TEMP	-2.107	-1.082
6	(Constant)	-.149	2.435
	COND	.969	1.172
	DRY_H	.093	.267
	TEMP	-2.095	-1.380
	FLOW	.153	.273

Coefficients[a]

Model		Correlations			Collinearity Statistics	
		Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)					
	REDOX	.802	.802	.802	1.000	1.000
2	(Constant)					
	REDOX	.802	.673	.461	.652	1.535
	COND	.728	.528	.315	.652	1.535
3	(Constant)					
	REDOX	.802	.510	.255	.477	2.098
	COND	.728	.671	.389	.575	1.739
	DRY_H	.465	.532	.270	.732	1.367
4	(Constant)					
	REDOX	.802	.232	.085	.337	2.965
	COND	.728	.787	.454	.460	2.173
	DRY_H	.465	.628	.288	.727	1.375
	TEMP	-.376	-.556	-.239	.661	1.513
5	(Constant)					
	COND	.728	.900	.759	.992	1.008
	DRY_H	.465	.714	.374	.941	1.062
	TEMP	-.376	-.678	-.339	.934	1.071
6	(Constant)					
	COND	.728	.954	.797	.787	1.271
	DRY_H	.465	.527	.156	.638	1.567
	TEMP	-.376	-.825	-.367	.922	1.085
	FLOW	.136	.728	.267	.576	1.735

a. Dependent Variable: MN

Excluded Variables[g]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance	VIF	Minimum Tolerance
1	DRY_H	.160[a]	1.722	.092	.244	.829	1.207	.829
	FLOW	-.016[a]	-.179	.859	-.026	.964	1.037	.964
	QT	-.260[a]	-3.164	.003	-.419	.924	1.082	.924
	PH	.199[a]	.491	.625	.072	4.624E-02	21.627	4.624E-02
	TEMP	-.058[a]	-.605	.548	-.088	.832	1.202	.832
	COND	.391[a]	4.264	.000	.528	.652	1.535	.652
2	DRY_H	.315[b]	4.260	.000	.532	.732	1.367	.477
	FLOW	.305[b]	3.518	.001	.460	.586	1.707	.396
	QT	.062[b]	.425	.673	.063	.261	3.828	.184
	PH	.753[b]	2.149	.037	.302	4.138E-02	24.166	4.138E-02
	TEMP	-.266[b]	-3.210	.002	-.428	.665	1.504	.437
3	FLOW	.199[c]	2.332	.024	.328	.500	1.999	.395
	QT	-.146[c]	-1.106	.275	-.163	.228	4.395	.182
	PH	.790[c]	2.706	.010	.374	4.135E-02	24.184	4.135E-02
	TEMP	-.294[c]	-4.492	.000	-.556	.661	1.513	.337
4	FLOW	.405[d]	7.136	.000	.732	.417	2.399	.244
	QT	-.155[d]	-1.409	.166	-.208	.227	4.396	.170
	PH	.258[d]	.847	.401	.127	3.061E-02	32.665	2.717E-02
5	FLOW	.352[e]	7.122	.000	.728	.576	1.735	.576
	QT	-.113[e]	-1.015	.315	-.150	.238	4.208	.238
	PH	-.112[e]	-1.281	.207	-.188	.380	2.631	.380
	REDOX	.147[e]	1.601	.116	.232	.337	2.965	.337
6	QT	-.063[f]	-.812	.421	-.121	.236	4.243	.236
	PH	.093[f]	1.395	.170	.206	.309	3.236	.301
	REDOX	-.132[f]	-1.778	.082	-.259	.244	4.100	.244

a. Predictors in the Model: (Constant), REDOX

b. Predictors in the Model: (Constant), REDOX, COND

c. Predictors in the Model: (Constant), REDOX, COND, DRY_H

d. Predictors in the Model: (Constant), REDOX, COND, DRY_H, TEMP

e. Predictors in the Model: (Constant), COND, DRY_H, TEMP

f. Predictors in the Model: (Constant), COND, DRY_H, TEMP, FLOW

g. Dependent Variable: MN

Coefficient Correlations[a]

Model			REDOX	COND	DRY_H	TEMP	FLOW
1	Correlations	REDOX	1.000				
	Covariances	REDOX	.820				
2	Correlations	REDOX	1.000	-.590			
		COND	-.590	1.000			
	Covariances	REDOX	.927	-6.202E-02			
		COND	-6.202E-02	1.191E-02			
3	Correlations	REDOX	1.000	-.652	-.518		
		COND	-.652	1.000	.342		
		DRY_H	-.518	.342	1.000		
	Covariances	REDOX	.928	-6.242E-02	-3.402E-02		
		COND	-6.242E-02	9.883E-03	2.319E-03		
		DRY_H	-3.402E-02	2.319E-03	4.646E-03		
4	Correlations	REDOX	1.000	-.732	-.477	.541	
		COND	-.732	1.000	.340	-.447	
		DRY_H	-.477	.340	1.000	-.079	
		TEMP	.541	-.447	-.079	1.000	
	Covariances	REDOX	.926	-6.576E-02	-2.636E-02	.155	
		COND	-6.576E-02	8.717E-03	1.826E-03	-1.242E-02	
		DRY_H	-2.636E-02	1.826E-03	3.300E-03	-1.347E-03	
		TEMP	.155	-1.242E-02	-1.347E-03	8.856E-02	
5	Correlations	COND		1.000	-.015	-.089	
		DRY_H		-.015	1.000	.242	
		TEMP		-.089	.242	1.000	
	Covariances	COND		4.182E-03	-4.905E-05	-1.469E-03	
		DRY_H		-4.905E-05	2.635E-03	3.167E-03	
		TEMP		-1.469E-03	3.167E-03	6.479E-02	
6	Correlations	COND		1.000	-.269	-.130	.455
		DRY_H		-.269	1.000	.262	-.567
		TEMP		-.130	.262	1.000	-.113
		FLOW		.455	-.567	-.113	1.000
	Covariances	COND		2.533E-03	-5.848E-04	-1.166E-03	6.834E-04
		DRY_H		-5.848E-04	1.868E-03	2.015E-03	-7.322E-04
		TEMP		-1.166E-03	2.015E-03	3.154E-02	-6.002E-04
		FLOW		6.834E-04	-7.322E-04	-6.002E-04	8.917E-04

a. Dependent Variable: MN

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index
1	1	2.000	1.000
	2	1.383E-04	120.266
2	1	2.983	1.000
	2	1.641E-02	13.484
	3	9.534E-05	176.899
3	1	3.949	1.000
	2	3.655E-02	10.395
	3	1.412E-02	16.726
	4	7.202E-05	234.165
4	1	4.941	1.000
	2	3.858E-02	11.316
	3	1.772E-02	16.699
	4	2.794E-03	42.050
	5	4.561E-05	329.143
5	1	3.943	1.000
	2	3.811E-02	10.172
	3	1.656E-02	15.430
	4	1.854E-03	46.117
6	1	4.865	1.000
	2	9.538E-02	7.142
	3	2.547E-02	13.821
	4	1.198E-02	20.156
	5	1.854E-03	51.227

Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions (Constant)	REDOX	COND	DRY_H	TEMP	FLOW
1	1	.00	.00				
	2	1.00	1.00				
2	1	.00	.00	.00			
	2	.00	.00	.69			
	3	1.00	1.00	.31			
3	1	.00	.00	.00	.00		
	2	.00	.00	.12	.58		
	3	.00	.00	.49	.17		
	4	1.00	1.00	.39	.25		
4	1	.00	.00	.00	.00	.00	
	2	.00	.00	.05	.61	.00	
	3	.00	.00	.42	.06	.03	
	4	.01	.01	.01	.13	.59	
	5	.99	.99	.51	.19	.37	
5	1	.00		.00	.00	.00	
	2	.00		.14	.76	.01	
	3	.03		.84	.08	.07	
	4	.97		.02	.16	.92	
6	1	.00		.00	.00	.00	.00
	2	.00		.05	.01	.00	.37
	3	.01		.00	.77	.02	.22
	4	.03		.93	.12	.06	.41
	5	.96		.01	.11	.91	.00

a. Dependent Variable: MN

Regression for Ni

Descriptive Statistics

	Mean	Std. Deviation	N
NI	11.9140	13.0017	50
DRY_H	221.58	235.94	50
FLOW	256.84	269.13	50
QT	2859.47	3349.42	50
PH	7.6978	.3820	50
REDOX	229.232	22.438	50
TEMP	23.224	4.781	50
COND	199.63	257.11	50

Correlations

		NI	DRY_H	FLOW	QT	PH	REDOX
Pearson Correlation	NI	1.000	.057	-.146	-.414	-.836	.812
	DRY_H	.057	1.000	.429	.521	-.212	.218
	FLOW	-.146	.429	1.000	.595	-.131	.144
	QT	-.414	.521	.595	1.000	.143	-.149
	PH	-.836	-.212	-.131	.143	1.000	-.983
	REDOX	.812	.218	.144	-.149	-.983	1.000
	TEMP	-.065	-.290	-.360	-.223	.338	-.427
	COND	.913	.071	-.304	-.400	-.777	.759
Sig. (1-tailed)	NI	.	.348	.155	.001	.000	.000
	DRY_H	.348	.	.001	.000	.070	.065
	FLOW	.155	.001	.	.000	.183	.160
	QT	.001	.000	.000	.	.161	.151
	PH	.000	.070	.183	.161	.	.000
	REDOX	.000	.065	.160	.151	.000	.
	TEMP	.327	.021	.005	.060	.008	.001
	COND	.000	.311	.016	.002	.000	.000
N	NI	50	50	50	50	50	50
	DRY_H	50	50	50	50	50	50
	FLOW	50	50	50	50	50	50
	QT	50	50	50	50	50	50
	PH	50	50	50	50	50	50
	REDOX	50	50	50	50	50	50
	TEMP	50	50	50	50	50	50
	COND	50	50	50	50	50	50

Correlations

		TEMP	COND
Pearson Correlation	NI	-.065	.913
	DRY_H	-.290	.071
	FLOW	-.360	-.304
	QT	-.223	-.400
	PH	.338	-.777
	REDOX	-.427	.759
	TEMP	1.000	-.043
	COND	-.043	1.000
Sig. (1-tailed)	NI	.327	.000
	DRY_H	.021	.311
	FLOW	.005	.016
	QT	.060	.002
	PH	.008	.000
	REDOX	.001	.000
	TEMP	.	.382
	COND	.382	.
N	NI	50	50
	DRY_H	50	50
	FLOW	50	50
	QT	50	50
	PH	50	50
	REDOX	50	50
	TEMP	50	50
	COND	50	50

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.913[a]	.834	.830	5.3582
2	.935[b]	.874	.869	4.7128
3	.942[c]	.888	.880	4.4982

Model Summary

Model	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change
1	.834	240.513	1	48	.000
2	.040	15.047	1	47	.000
3	.014	5.591	1	46	.022

a. Predictors: (Constant), COND

b. Predictors: (Constant), COND, PH

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6905.129	1	6905.129	240.513	.000[a]
	Residual	1378.079	48	28.710		
	Total	8283.209	49			
2	Regression	7239.331	2	3619.666	162.973	.000[b]
	Residual	1043.878	47	22.210		
	Total	8283.209	49			
3	Regression	7352.464	3	2450.821	121.126	.000[c]
	Residual	930.744	46	20.234		
	Total	8283.209	49			

a. Predictors: (Constant), COND

b. Predictors: (Constant), COND, PH

c. Predictors: (Constant), COND, PH, QT

d. Dependent Variable: NI

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.697	.963		2.800	.007
	COND	4.617E-02	.003	.913	15.508	.000
2	(Constant)	88.887	22.235		3.998	.000
	COND	3.361E-02	.004	.665	8.073	.000
	PH	-10.871	2.802	-.319	-3.879	.000
3	(Constant)	106.214	22.452		4.731	.000
	COND	2.868E-02	.004	.567	6.392	.000
	PH	-12.802	2.797	-.376	-4.577	.000
	QT	-5.176E-04	.000	-.133	-2.365	.022

Coefficients[a]

Model		95% Confidence Interval for B Lower Bound	Upper Bound
1	(Constant)	.760	4.633
	COND	.040	.052
2	(Constant)	44.155	133.619
	COND	.025	.042
	PH	-16.509	-5.233
3	(Constant)	61.020	151.409
	COND	.020	.038
	PH	-18.431	-7.172
	QT	-.001	.000

Coefficients[a]

Model		Correlations Zero-order	Partial	Part	Collinearity Statistics Tolerance	VIF
1	(Constant)					
	COND	.913	.913	.913	1.000	1.000
2	(Constant)					
	COND	.913	.762	.418	.396	2.528
	PH	-.836	-.492	-.201	.396	2.528
3	(Constant)					
	COND	.913	.686	.316	.310	3.224
	PH	-.836	-.559	-.226	.362	2.764
	QT	-.414	-.329	-.117	.768	1.302

a. Dependent Variable: NI

Excluded Variables[d]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance	VIF	Minimum Tolerance
1	DRY_H	-.008[a]	-.140	.889	-.020	.995	1.005	.995
	FLOW	.145[a]	2.467	.017	.339	.907	1.102	.907
	QT	-.058[a]	-.901	.372	-.130	.840	1.191	.840
	PH	-.319[a]	-3.879	.000	-.492	.396	2.528	.396
	REDOX	.281[a]	3.441	.001	.449	.424	2.360	.424
	TEMP	-.025[a]	-.427	.671	-.062	.998	1.002	.998
2	DRY_H	-.063[b]	-1.172	.247	-.170	.933	1.072	.371
	FLOW	.025[b]	.360	.720	.053	.566	1.768	.228
	QT	-.133[b]	-2.365	.022	-.329	.768	1.302	.310
	REDOX	-.190[b]	-.669	.507	-.098	3.348E-02	29.864	3.126E-02
	TEMP	.094[b]	1.614	.113	.232	.764	1.309	.303
3	DRY_H	.010[c]	.153	.879	.023	.629	1.590	.303
	FLOW	.130[c]	1.773	.083	.255	.435	2.300	.226
	REDOX	-.240[c]	-.884	.381	-.131	3.329E-02	30.036	3.049E-02
	TEMP	.076[c]	1.346	.185	.197	.748	1.337	.286

a. Predictors in the Model: (Constant), COND

b. Predictors in the Model: (Constant), COND, PH

c. Predictors in the Model: (Constant), COND, PH, QT

d. Dependent Variable: NI

Coefficient Correlations[a]

Model			COND	PH	QT
1	Correlations	COND	1.000		
	Covariances	COND	8.863E-06		
2	Correlations	COND	1.000	.777	
		PH	.777	1.000	
	Covariances	COND	1.734E-05	9.072E-03	
		PH	9.072E-03	7.854	
3	Correlations	COND	1.000	.794	.465
		PH	.794	1.000	.292
		QT	.465	.292	1.000
	Covariances	COND	2.014E-05	9.967E-03	4.563E-07
		PH	9.967E-03	7.822	1.787E-04
		QT	4.563E-07	1.787E-04	4.791E-08

a. Dependent Variable: NI

Collinearity Diagnostics[a]

				Variance Proportions			
Model	Dimension	Eigenvalue	Condition Index	(Constant)	COND	PH	QT
1	1	1.617	1.000	.19	.19		
	2	.383	2.055	.81	.81		
2	1	2.486	1.000	.00	.02	.00	
	2	.513	2.201	.00	.36	.00	
	3	4.619E-04	73.366	1.00	.62	1.00	
3	1	2.907	1.000	.00	.01	.00	.03
	2	.837	1.864	.00	.13	.00	.23
	3	.256	3.371	.00	.21	.00	.64
	4	4.174E-04	83.457	1.00	.65	1.00	.10

a. Dependent Variable: NI

Regression for Zn

Descriptive Statistics

	Mean	Std. Deviation	N
ZN	182.47	206.90	50
DRY_H	221.58	235.94	50
FLOW	256.84	269.13	50
QT	2859.47	3349.42	50
PH	7.6978	.3820	50
REDOX	229.232	22.438	50
TEMP	23.224	4.781	50
COND	199.63	257.11	50

Correlations

		ZN	DRY_H	FLOW	QT	PH	REDOX
Pearson Correlation	ZN	1.000	-.059	-.312	-.395	-.618	.582
	DRY_H	-.059	1.000	.429	.521	-.212	.218
	FLOW	-.312	.429	1.000	.595	-.131	.144
	QT	-.395	.521	.595	1.000	.143	-.149
	PH	-.618	-.212	-.131	.143	1.000	-.983
	REDOX	.582	.218	.144	-.149	-.983	1.000
	TEMP	.206	-.290	-.360	-.223	.338	-.427
	COND	.913	.071	-.304	-.400	-.777	.759
Sig. (1-tailed)	ZN	.	.341	.014	.002	.000	.000
	DRY_H	.341	.	.001	.000	.070	.065
	FLOW	.014	.001	.	.000	.183	.160
	QT	.002	.000	.000	.	.161	.151
	PH	.000	.070	.183	.161	.	.000
	REDOX	.000	.065	.160	.151	.000	.
	TEMP	.075	.021	.005	.060	.008	.001
	COND	.000	.311	.016	.002	.000	.000
N	ZN	50	50	50	50	50	50
	DRY_H	50	50	50	50	50	50
	FLOW	50	50	50	50	50	50
	QT	50	50	50	50	50	50
	PH	50	50	50	50	50	50
	REDOX	50	50	50	50	50	50
	TEMP	50	50	50	50	50	50
	COND	50	50	50	50	50	50

Correlations

		TEMP	COND
Pearson Correlation	ZN	.206	.913
	DRY_H	-.290	.071
	FLOW	-.360	-.304
	QT	-.223	-.400
	PH	.338	-.777
	REDOX	-.427	.759
	TEMP	1.000	-.043
	COND	-.043	1.000
Sig. (1-tailed)	ZN	.075	.000
	DRY_H	.021	.311
	FLOW	.005	.016
	QT	.060	.002
	PH	.008	.000
	REDOX	.001	.000
	TEMP	.	.382
	COND	.382	.
N	ZN	50	50
	DRY_H	50	50
	FLOW	50	50
	QT	50	50
	PH	50	50
	REDOX	50	50
	TEMP	50	50
	COND	50	50

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.913[a]	.833	.830	85.37
2	.945[b]	.894	.889	68.84

Model Summary

Model	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change
1	.833	239.796	1	48	.000
2	.061	26.829	1	47	.000

a. Predictors: (Constant), COND

b. Predictors: (Constant), COND, TEMP

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1747736.9	1	1747736.853	239.796	.000[a]
	Residual	349844.78	48	7288.433		
	Total	2097581.6	49			
2	Regression	1874868.5	2	937434.255	197.830	.000[b]
	Residual	222713.13	47	4738.577		
	Total	2097581.6	49			

a. Predictors: (Constant), COND

b. Predictors: (Constant), COND, TEMP

c. Dependent Variable: ZN

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	35.833	15.344		2.335	.024
	COND	.735	.047	.913	15.485	.000
2	(Constant)	-213.572	49.715		-4.296	.000
	COND	.743	.038	.924	19.412	.000
	TEMP	10.665	2.059	.246	5.180	.000

Coefficients[a]

Model		95% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	4.981	66.684
	COND	.639	.830
2	(Constant)	-313.585	-113.559
	COND	.666	.820
	TEMP	6.523	14.807

Coefficients[a]

Model		Correlations			Collinearity Statistics	
		Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)					
	COND	.913	.913	.913	1.000	1.000
2	(Constant)					
	COND	.913	.943	.923	.998	1.002
	TEMP	.206	.603	.246	.998	1.002

a. Dependent Variable: ZN

Excluded Variables[c]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	DRY_H	-.125[a]	-2.198	.033	-.305	.995	1.005	.995
	FLOW	-.037[a]	-.594	.555	-.086	.907	1.102	.907
	QT	-.035[a]	-.547	.587	-.080	.840	1.191	.840
	PH	.231[a]	2.611	.012	.356	.396	2.528	.396
	REDOX	-.263[a]	-3.160	.003	-.419	.424	2.360	.424
	TEMP	.246[a]	5.180	.000	.603	.998	1.002	.998
2	DRY_H	-.059[b]	-1.188	.241	-.173	.913	1.096	.913
	FLOW	.076[b]	1.419	.163	.205	.767	1.303	.767
	QT	.038[b]	.698	.489	.102	.782	1.279	.782
	PH	.054[b]	.624	.536	.092	.303	3.303	.303
	REDOX	-.053[b]	-.572	.570	-.084	.268	3.728	.268

a. Predictors in the Model: (Constant), COND

b. Predictors in the Model: (Constant), COND, TEMP

c. Dependent Variable: ZN

Coefficient Correlations[a]

Model			COND	TEMP
1	Correlations	COND	1.000	
	Covariances	COND	2.250E-03	
2	Correlations	COND	1.000	.043
		TEMP	.043	1.000
	Covariances	COND	1.466E-03	3.426E-03
		TEMP	3.426E-03	4.240

a. Dependent Variable: ZN

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	COND	TEMP
1	1	1.617	1.000	.19	.19	
	2	.383	2.055	.81	.81	
2	1	2.479	1.000	.01	.06	.01
	2	.501	2.224	.01	.92	.01
	3	1.983E-02	11.181	.99	.02	.98

a. Dependent Variable: ZN

APPENDIX B

storm	Samplenr	Al	Cr	Mn	Fe	Ni	Cu	Zn	As	Cd	Pb	Dry h	Rain t	FLOW	Runofft	Qt	TSS	VDS	TDS	VSS	COD	PH	Redox	BOD	Turb	Temp	Cond l	Alcal
1	1											132	6	120	0	0	229	240	720	94	565	7.78	-48.1		54	17		51.5
1	2											132	8	135	2	255	286	210	560	144	588	0.74	-45.1		48	16.6		46.5
1	3											132	10	150	4	540	143	460	620	73	614	7.74	-44.8		42	16.6	627	44.5
1	4											132	15	300	9	1665	111	180	520	58	480	7.75	-44.6		36	16.6	520	42.1
1	5											132	19	420	13	3105	60	170	500	28	167	7.99	-59.5		21	16.2	120	24.8
1	6											132	24	100	18	4405	30	160	480	21	128	7.99	-58.3		15	16.2	82.4	24
1	7											132	27	120	21	4735	38	170	500	20	132	8.03	-60.7		16	16.2	78.2	22
1	8											132	31	140	25	5255	12	160	420	9	142	8	-59.3		15	16.3	73.9	23.5
1	9											132	35	130	29	5795	33	145	390	11	127	7.95	-56.7		12	16.2	65.6	24.2
1	10											132	39	180	33	6415	30	150	300	16	110	7.86	-53		10	16.2	50.8	14.5
1	11											132	43	450	37	7675	21	130	290	12	110	7.85	-50.7		14	16	34.2	13.5
1	12											132	47	130	41	8835	25	90	280	3	91	7.88	-52		12	16.1	39.8	17.5
1	13											132	51	78	45	9251	16	110	260	10	113	7.9	-51.8		9	16.2	52.9	17
1	14											132	55	65	49	9537	30	80	220	19	111	7.99	-57.8		11	16.2	60.8	20.3
1	15											132	62	93	56	10090	21	70	190	10	110	7.95	-55.5		10	16	59.8	20.5
2	1											42	15	75	0	0	801	580	750	357	1086	6.92			59	16.4	144.5	66
2	2	26.2	5.42	27	254	7.96	14.4	164	0.429	0.436	0.528	42	17	210	2	285	294	360	410	211	135	8.05	-42.3		19	16.2	149	19
2	3	13.2	3.61	19.9	192	5.12	10.36	42.5	0.0998	0.164	0.106	42	19	225	4	720	52	210	390	29	70	7.93	-51.1		16	16.2	86.4	18
2	4	10.4	3.01	12.6	174	3.23	8.93	38.5	0.284	0.107	0.496	42	22	75	7	1170	32	180	380	13	61	7.85	-51.4		14	16.1	89.4	20
2	5	8.64	3.1	14.5	170	3.02	8.47	21.6	0.399	0.0661	0.0691	42	25	20.8	10	1314	20	162	360	19	53	7.9	-52.4		12	16.2	102.3	19
2	6	5.31	3.36	15.1	187	3.72	9.06	27.6	0.659	0.107	0.179	42	29	3.7	14	1363	7	170	370	6	62	7.88	-51.1		3	16.1	123.3	25
2	7	3.36	3.67	15.4	174	4.12	10.5	31.4	0.818	0.125	0.397	42	36	2.4	21	1384	8	80	350	7	78	7.89	-51.7		10	16.1	157.2	31
2	8	4.08	3.63	13.4	176	3.97	9.76	22.1	0.48	0.123	0.145	42	41	2.75	26	1397	9	78	370	7	86	7.92	-53.5		11	16.2	163.1	31
2	9	3.21	3.26	10.6	162	4.28	10.3	29.1	0.742	0.14	0.112	42	46	1.8	31	1408	8	50	350	6	80	7.93			9	16	157.1	28
4	1											648	15	5.20833	0	0					1650	6.44	28.4	338	74	22.1	2589	64
4	2	192	11.3	424	1210	48.7	83.1	869	2.32	2.06	1.04	648	17	120	2	125.2	837	180	880	397	1195	7.07	-7.1	172	80	21.9	992	38
4	3	153	5.34	102	449	17.3	28.6	197	0.639	0.596	0.679	648	19	480	4	725.2	510	130	380	311	298	7.36	-23.3	37	42	21.5	382.7	35
4	4	147.3	4.76	65.1	317	10.8	19.8	136	0.448	0.335	1.17	648	21	420	6	1625	235	30	60	70	323	7.47	-30.6	27	43	21.5	214.5	30
4	5	121.4	3.75	35.7	234	7.44	12.8	65.3	0.25	0.218	1.11	648	23	420	8	2465	151	30	50	69	151	7.64	-38.7	22	34	21.4	129.6	28
4	6	97.7	3.8	24.7	221	6.43	10.8	43.8	0.219	0.188	1.55	648	25	450	10	3335	138	40	50	36	160	7.74	-44.2	15	30	21.3	107.3	25
4	7	101.2	4.28	21.3	186	3.36	6.69	23.1	0.0658	0.073	0.866	648	29	540	14	5315	143	10	10	52	195	7.89	-51.4	4	23	21.2	67.8	22
4	8	87.2	3.2	14.4	142	2.96	6.44	29.6	0	0.101	0.538	648	33	540	18	7475	57	10	30	23	60	7.92	-54.2	5	19	21.1	59.8	20
4	9	89.5	2.4	12.6	141	3.69	6.63	24.5	0	0.128	0.93	648	37	225	22	9005	40	30	40	17	44.5	7.75	-44.6	5	16	21.2	67.3	20
4	10	98.2	3.02	14.5	182	3.76	7.72	27.5	0.0593	0.114	0.961	648	41	240	26	9935	51	10	40	23	70.5	7.78	-45.3	7	22	21.2	70.8	22
4	11	109	3.15	13.2	175	4.54	7.01	46.8	0.0926	0.241	1.4	648	45	225	30	10865	40	10	20	18	56.5	7.76	-45.6	2	17.5	21.2	68.1	20
4	12	86.1	2.6	15.6	167	3.48	11.9	57.2	0.0952	0.576	4.64	648	51	900	36	14240	67	10	20	25	30	8.01	-63		16	20.9	46.4	13
5	1	707.6	18.5	18.2	1011.4	26.4	9.7	260.1	0	0	0	120	8	17.15	0	0	315	120	160	102	317	7.8	-60.8		50	27	253.3	30
5	2	354.2	13.7	10.2	620.5	18.2	5.6	224.3	0	0	4.9	120	11	240	3	385.7	185	80	110	40	274	8.02	-60.6		39	27	122.5	29
5	3	392.1	12.5	8.2	410.7	10.6	4.4	205.7	0	0	0	120	14	240	6	1106	72	60	100	21	127	7.97	-58.2		23	26.9	83.5	27
5	4	342.9	13.5	7.6	390.2	6	2.8	202.9	0	0	0	120	17	80	9	1586	43	60	80	20	98	7.93	-56		20	27.1	87.5	25
5	5	248.2	13.1	4.4	259.4	6.7	4.2	178.8	0	0	0	120	19	30	11	1696	46	40	60	14	96	7.96	-57.8		22	27.2	100.8	25
5	6	305.1	12.8	4.9	262.4	6.7	3.6	191.9	0	0	0	120	22	10.5	14	1756	42	40	70	14	110	7.93	-57.2		23	27.2	115.2	34
5	7	315.6	11.7	5.8	302.8	7.1	3.5	196.4	0	0	0	120	25	4.3	17	1779	42	40	60	27	108	7.97	-58.4		25	27.2	127.3	50
6	1	746.1	15	19.2	929.8	20.1	10.3	229.9	0	0	0	48	16	30	0	0	246	210	250	84	354	7.8	-51.9	28	50	28.8		39
6	2	539.9	15.9	15.3	608.2	20.1	10.6	205.6	0	0	0.4	48	18	42.9	2	72.9	157	220	260	69	303	7.9	-54.2	21	44	30.2		50
6	3	461.6	13	17.9	510.9	13.3	6.8	229	0	0	21.9	48	20	19.5	4	135.3	149	210	240	71	304	7.9	-54.1	21	45	30.2		47
6	4	634.1	13	14.8	818.3	11.8	9.3	220.9	0	0	1	48	22	27.9	6	182.7	153	150	190	61	324	7.9	-55.5	8	53	29.7		51.8
6	5	744.5	13	16.3	898.4	4.8	10.9	230.5	0	0	0	48	24	162	8	372.6	144	110	190	63	288	8	-57.4	25	38	28.9		52
6	6	544.7	12.6	13.8	568.7	9.5	7.8	226.3	0	0	0	48	26	240	10	774.6	102	110	160	50	169	8	-60.3	13	25	28.9		29.3
6	7	372.1	12.5	10.6	352.8	5.2	4.8	231.1	0	0	0	48	28	180	12	1195	93	110	180	38	83	7.9	-60	11	21	28.9		35.3
6	8	401.7	11.7	10.2	494.2	3.6	6.1	218.5	0	0	0	48	30	172.5	14	1547	94	110	180	33	71	7.9	-57.8	4	20	28.8		31
6	9	298.3	11.3	6	210	4.1	2.9	189.3	0	0	0	48	32	340	16	2060	51	100	180	23	75	7.9	-57.4	3	14	28.8		14.5
6	10	268.7	12.7	4.9	165.6	2.4	2.1	178.4	0	0	0	48	35	180	19	2840	27	50	150	16	74	7.9	-58.3	3	10	28.7		24
6	11	262.7	14.6	5.1	174	2.2	3.2	176.5	0	0	0	48	39	75	23	3350	24	50	140	16	97	7.9	-58.2	12	14	28.6		27
6	12	317.7	13.8	5.6	177.6	2.9	4	187	0	0	0	48	43	150	27	3800	29	60	150	20	67	7.9	-58	6	12	28.8		16
6	13	280	13.8	5.1	162.4	4.4	2.4	197	0	0	2.9	48	47	112.5	31	4325	13	50	160	13	51	7.9	-59.7	3	9	28.8		24
6	14	231.4	14.6	5.4	152.1	2.3	2	172.3	0	0	0	48	51	34.3	35	4618	14	60	160	13	55	8	-60.3		10	28.8		24
11	1	4223.9	164.2	219.3	3097.3	65.4	151.4	1255.6	14.6	9.5	56.2	195	11	24	0	0	1200	580	1350	350	583	6.3	37.5	235.5	23	20.9	1439	68
11	2	1653.3	91.8	91.2	1502.4	39.1	57.5	369.5	5.8	4	0	195	13	80	2	104	263	260	690	115	458	6.7	16.5	120	32	21.2	766	61
11	3	1156.3	77.3	75.9	1156.3	32.9	66.5	365.9	0	0.2	0	195	15	120	4	304	181	190	610	68	434	6.8	9	75	34	20.9	619	51
11	4	847.1	71.9	47.2	877.3	29.4	28.7	279.1	0	1.6	0	195	17	120	6	544	196	190	370	98	421	7	-0.9	53.15	31	20.7	427	44
11	5	674.7	55.6	32.1	685.9	26.6	21.8	166.6	0	0.7	0	195	19	210	8	874	163	120	230	47	383	7.2	-10.1	25.7	29	20	212	37
11	6	400.3	18.3	21.1	686.8	25.1	11.7	97.5	0	0	0	195	21	780	10	1864	101	60	130	31	348	7.3	-19.4	12.9	25	19.4	99.7	17
11	7	244.7	12.6	17.6	561.5	17.4	6.6	83.3	0	0	0	195	23	720	12	3364	67	30	70	23	330	7.4	-25.9	6.06	24	19	63.6	17
11	8	237.1	12.3	17.5	573.5	8.7	6.9	72	0	0	0	195	25	840	14	4924	53	40	50	19	318	7.5	-27.5	6.12	22	18.9	50.8	13
11	9	206.6	10.7	22.1	873.4	9.5	6.5	73.4	0	0	0	195	27	840	16	6604	48	90	150	19	311	7.5	-29.7	4.98	20	18.9	50.1	15
11	10	201	8.7	8.8	282.2	5	5	61.2	0	0	0	195	29	780	18	8224	45	50	80	22	318	7.5	-31.2	4.74	21	18.7	49.7	15
11	11	153	7.1	14.5	709.5	4.6	4.5	79.7	0	0	0	195	31	840	20	9844	35	50	60	11	306	7.5	-33.1	4.8	18	18.6	45.1	12

storm	Samplenr	Al	Cr	Mn	Fe	Ni	Cu	Zn	As	Cd	Pb	Dry h	Rain t	FLOW	Runofft	Qt	TSS	VDS	TDS	VSS	COD	PH	Redox	BOD	Turb	Temp	Cond l	Alcal
3	1	17.5	7.94	4.24	513	15.4	30.3	19.5	1.14	0.488	0.366	72	15	2.33333	0	0	49	360	470	34	464	8.04	-60.6		30	13.5	447.5	58
3	2	10.1	8.36	70.4	512	16.9	31.4	423	1.22	0.45	0.218	72	18	3.6	3	8.9	47	310	390	42	433	7.97	-56		34	13	382.2	59
3	3	20.1	7.44	53	485	14.8	27.1	19.8	1.42	0.483	0.242	72	21	2	6	17.3	30	220	250	25	377	7.96	-55.2		30	12.9	351.4	50
3	4	26.5	7.7	30.9	492	12.5	24.7	558	1.2	0.453	0.244	72	25	1.33333	10	23.97	19	200	290	18	327	7.98	-56		22	12.9	339.6	49
3	5	5.67	5.14	18.8	374	8.9	18.1	145	1.13	0.231	0.156	72	39	1.5	24	43.8	18	120	150	16	182	8	-57.7		16	12.6	285.8	54
3	6	14.1	5.88	10.2	363	9.05	17.5	427	1.08	0.353	0.125	72	43	3.45	28	53.7	16	70	100	11	198	8.2	-57.3		21	12.7	258.4	50
3	7	13	7.11	11	332	8.58	17.1	16.7	3.31	0.335	0.0876	72	47	3.33333	32	67.27	15	150	180	14	176	8.3	-58.2		19	12.6	232	51
3	8	16.3	6.48	3.17	345	7.86	16.2	423	2.28	0.326	0.134	72	51	1.38	36	76.69	6	70	120	4	142	7.97	-55.7		14	12.5	226.3	49
3	9	18.2	6.3	7.79	245	5.58	12	267	2.07	0.219	0.206	72	95	6	80	239.1	72	20	30	55	127	8.07	-60.7		20	12.2	148.6	45
3	10	36.6	5.08	37.6	226	4.36	9.84	217	2.02	0.623	0.547	72	97	10	82	255.1	65	20	30	44	134	8.06	-60		25	12	130.5	42
3	11	23.8	4.91	7.09	189	4.11	9.25	145	1.21	0.189	0.213	72	99	18	84	283.1	51	20	20	19	119	8.07	-60.5		22	11.7	105.6	34
3	12	21.1	5.42	6.59	329	4.16	8.11	123	1.43	0.17	0.198	72	101	18	86	319.1	40	30	40	28	109	8.07	-60.7		19	11.6	95.4	32
3	13	19.3	4.82	4.23	167	3.35	6.7	110	1.26	0.596	0.229	72	103	20	88	357.1	28	20	40	23	90	8.07	-61		16	11.6	89.1	28
3	14	16.1	4.53	3.64	169	2.91	6.29	90.3	1.03	0.197	0.43	72	105	18	90	395.1	23	30	40	22	76	8.06	-60.5		15	11.6	84.4	30
3	15	19.5	4.08	4.07	168	2.98	6	80.2	1	0.128	0.198	72	107	18	92	431.1	23	10	10	14	82	8.06	-60.3		15	11.6	81.4	32
7	1	122.5	17.4	131.2	177.3	51.6	54.4	490.5	17.7	6.1	0	432	23	2	0	0	20	380	1130	16	399	7.9	-49.6	72.1	67	24.1	1065	58
7	2	122.9	14.3	124.7	155.4	37.5	34.7	357.6	4.4	10.9	0	432	27	2	4	8	59	290	770	44	367	7.9	-50.9	59.9	63	23.5	777	67
7	3	121.1	13.6	118	149.1	16	29.1	297	4	5.2	20.1	432	26	1.5	5	10	30	130	400	30	326	7.8	-46.1	19.6	40	22.8	504	81
7	4	22.4	2.9	86.6	175.8	17.4	32.3	373	9.6	0.5	23.1	432	35	2	12	22	4	190	670	2	352	7.7	-43.6	34.3	38	23.1	698	74
7	5	123.4	3.2	47.8	125.8	15.2	34.3	409.3	6	1.6	60.6	432	39	1.5	16	29	7	70	680	4	353	7.8	-46	36.6	36	23.3	795	81
7	6	74.2	12.4	27	122.9	8.7	33.3	407	10.4	0	6.8	432	43	1	20	34	5	130	710	2	365	7.8	-47.8	40.7	35	23.2	807	79
7	7	64.6	3.8	17.3	113.2	6.2	34.3	485	6.4	0	23.1	432	53	1	30	44	13	30	940	9	370	7.9	-51.6	40.8	32	23.4	968	77
7	8	24	9.3	17.6	72.9	3.6	35.7	546.6	13.7	0.6	46.4	432	56	2.5	33	49	31	170	900	29	363	7.9	-51.2	42.7	45	23.5	941	75
7	9	27.7	3.2	17.4	73.7	3.7	33	397.4	3.4	0	33.4	432	58	4	35	56	16	250	810	9	359	7.9	-50	30.2	66	23.6	857	76
7	10	30.1	6	23.9	47.3	3.2	35.3	367	7	0	21.7	432	60	4.5	37	64	28	350	980	23	358	7.8	-48.3	32.8	62	23.5	803	80
7	11	21.2	4.7	16.3	58	3.8	33.2	353	2.7	0	0	432	62	4	39	73	8	120	730	5	351	7.8	-47.3	31.6	57	23.5	788	77
7	12	28.8	2.6	14.9	33.8	5.8	32.2	352.3	9.1	0	13	432	64	3	41	80	21	140	740	16	349	7.9	-46.6	35	40	23.5	775	74
8	1	195	9.7	670.8	192.4	99.9	273.7	3831.9	15.9	3.2	100.1	1032	27	1.14	0	0	96	150	486	53	937	7.53	-29.6	111.05	16	17.3	2935	114
8	2	226	11.8	518.3	172.1	108.8	259.9	2400.4	10.6	2.8	108.1	1032	32.5	2	5.5	9	76	93	430	47	947	7.52	-29.7	111.7	16	17.4	2645	160
8	3	170.4	8.4	427.3	108.8	79.8	236.6	1752.9	6.7	2.1	58.7	1032	36.5	2.67	9.5	18	66	134	407	43	960	7.54	-31	111.85	18	17.5	2574	166
8	4	154.8	7.1	404	102.7	66.3	230.9	1744	18.3	1.1	47.3	1032	40	0.44	13	23	44	109	386	33	961	7.54	-31.4	111.9	14	17.6	2542	158
8	5	143.6	7.5	324.8	136.3	71.5	215.6	1824.9	15.1	1.3	67.1	1032	62	1.33	35	43	40	111	353	25	852	7.64	-36.8	111.65	9	17.5	2337	97
8	6	216.2	6.9	297.2	105.6	66.1	216	1772.2	0	1.4	28.6	1032	68	3.5	41	57	78	57	290	47	801	7.65	-37.8	111.9	16	17.6	1998	77
8	7	90	5.1	242.7	93	51.2	172.9	1415.7	3.5	0.8	71.1	1032	71	7	44	73	147	55	229	73	751	7.62	-35.7	111.65	19	17.8	1683	80
8	8	123.8	6	206.7	91	41.8	149.9	1233.2	0	0.6	24.6	1032	73.5	15	46.5	101	235	56	175	101	634	7.62	-35.3	111.45	21	17.9	1353	98
8	9	116.6	4.6	152.8	71.3	42.9	110.2	780	6.1	0.4	12.8	1032	75.5	24	48.5	140	351	28	130	147	602	7.63	-36.1	85.1	20	17.9	1078	93
8	10	91.2	3.1	122.3	58.6	31.1	89.3	596.6	0	0.4	5.2	1032	78	54	51	237	274	14	85	102	518	7.63	-36.5	76.9	25	18	862	85
8	11	68.2	5.9	84.5	46.4	24.5	60.8	409.8	0.2	0.4	0	1032	80	60	53	351	200	14	70	83	462	7.62	-35.6	58.167	24	18	673	72
8	12	57.6	2.7	68	39.8	25.5	46.1	311.8	0	0	9.2	1032	82	80	55	491	209	4	56	76	434	7.66	-38.2	50.5	21	18	554	61
9	1	48.6	14.6	212.2	314.3	199.3	62.9	3019.9	5.5	1.3	30.4	168	9	10.5	0	0	491	720	730	170	466	7.7	-41.1	118.8	38	18.6	683	82
9	2	43.2	13.5	68.9	87.8	46.5	28.8	354	0	0	0	168	11	34.3	2	45	193	390	410	91	411	7.7	-49.7	63.3	33	18.6	413	60
9	3	33.5	7.5	41.9	40.6	14.9	23	192.1	1.2	0	5.3	168	13	40	4	119	68	120	360	25	395	7.8	-47.8	30.6	27	18.4	367	50
9	4	32.2	9	36.3	45.8	8.7	15.9	145.6	7.3	0	24.9	168	15	34.3	6	193	47	120	400	20	386	7.8	-47.2	26.8	27	18.5	350	42
9	5	33.4	4.6	30	26.9	10.1	14.2	151.6	2.1	0	20.9	168	17	21.4	8	249	24	280	350	10	376	7.8	-45.5	17.6	24	18.4	338	40
9	6	37.2	13.9	30.9	66.4	18.7	17.4	171.3	0	0	0	168	19	16.9	10	287	26	250	330	11	372	7.8	-45.7	14.2	25	18.4	325	39
9	7	38.3	14.8	26.9	72.6	19.2	16.2	150.6	0	0	11.2	168	21	12.6	12	317	33	110	410	15	373	7.8	-46.8	17.8	23	18.2	302	36
9	8	250.5	12.9	27.8	364	18.2	16.8	176.5	0	0	4.1	168	23	9.6	14	339	20	70	270	11	372	7.8	-46.3	18.2	21	18.4	294	36
9	9	178.2	5.2	24.2	235.5	1.7	23.7	214.8	3.6	0	3.6	168	25	4.8	16	354	18	30	310	13	375	7.8	-46.8	19.8	17	18.6	313	34
10	1	770.9	91.7	34.4	992.6	39.2	35.2	163	0	0	0	192	20	2.5	0	0	75	200	510	33	398	7.7	-37.9	33.12	28	11.6	608	90
10	2	864.4	75.1	34.3	1129.6	39.2	28.8	131.9	13.3	0	0	192	22	4.5	2	7	76	230	390	36	406	7.7	-37	33.36	31	11.2	530	90
10	3	879.6	24.5	31.3	1009.6	24.7	32.9	139.8	8	0	0	192	24	6	4	18	108	230	380	38	396	7.7	-36.7	28.08	34	11.1	474	81
10	4	1267.6	9.8	33.5	1352.3	7.3	28.8	130.1	5.1	0	0	192	26	13.5	6	37	157	220	370	62	395	7.6	-35.9	29.64	35	11.2	401	69
10	5	1017.7	25	28.9	1218.5	0	22.2	101.5	9.8	0	0	192	28	24	8	75	157	180	280	72	397	7.6	-33.8	34.08	35	11.3	329	56
10	6	1150.5	102	37.3	1538	55	31.3	132.4	6.1	0	5.3	192	30	33.3	10	132	155	150	250	57	401	7.6	-32.5	35.4	36	11.4	289	56
10	7	1023.6	164.4	36.3	1593.2	71.9	26.4	107.6	0	0	13.4	192	32	48	12	213	153	150	200	60	395	7.6	-31.9	28.2	34	11.4	259	53
10	8	1216.1	313.2	46.7	2127.3	138	29.2	114.9	0	0	28.7	192	34	67.5	14	329	185	110	170	82	401	7.5	-30.7	27.84	34	11.4	222	46
10	9	1065.3	460.2	57	2592.1	205.3	32.5	114.3	0	0	0	192	36	80	16	476	181	140	230	72	388	7.5	-26.4	22.32	33	11.4	184	43
10	10	978.5	28.4	27.9	1251	10	21.5	104.7	0	0	0	192	38	70	18	626	164	50	80	69	383	7.5	-25.6	17.28	32	11.4	165	39

APPENDIX C

al all.l

The REG Procedur
Model: MODEL1
Dependent Variable: Al_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
1	0.7072	216.0894	VDS_log
1	0.6412	271.5336	TDS_log
1	0.6168	292.0787	Qt_log
1	0.4708	414.7198	Alcal_log
1	0.4675	417.5163	CondI_log
1	0.4089	466.7574	FLOW_log
1	0.3749	495.3751	Runofft_log
1	0.3657	503.0278	BOD_log
1	0.2881	568.2933	Dryh_log
1	0.2830	572.5400	PH_log
1	0.2294	617.6503	COD_log
1	0.2170	628.0210	VSS_log
1	0.2058	637.4436	TSS_log
1	0.0667	754.3406	Temp_log
1	0.0522	766.5138	Turb_log
1	0.0377	778.7223	Red_log
2	0.8624	87.6700	PH_log Dryh_log
2	0.7607	173.1018	PH_log Temp_log
2	0.7535	179.1909	BOD_log Dryh_log
2	0.7481	183.6651	CondI_log Dryh_log
2	0.7343	195.3349	VDS_log Alcal_log
2	0.7338	195.7567	Qt_log Turb_log
2	0.7330	196.4087	VDS_log PH_log
2	0.7319	197.3456	Qt_log VDS_log
2	0.7295	199.3308	FLOW_log VDS_log
2	0.7266	201.8022	VDS_log Turb_log
2	0.7260	202.2664	Red_log Dryh_log
2	0.7243	203.6999	VDS_log Dryh_log
2	0.7133	212.9709	VDS_log CondI_log
2	0.7117	214.3150	Qt_log TDS_log
2	0.7107	215.1646	VDS_log VSS_log
2	0.7097	215.9443	VDS_log TDS_log
3	0.9366	27.2428	PH_log Alcal_log Dryh_log
3	0.9208	40.5283	Qt_log PH_log Dryh_log
3	0.9123	47.7247	TSS_log PH_log Dryh_log
3	0.9066	52.4587	PH_log CondI_log Dryh_log
3	0.9052	53.6592	Runofft_log PH_log Dryh_log
3	0.9009	57.3219	VSS_log PH_log Dryh_log
3	0.9000	58.0432	FLOW_log PH_log Dryh_log
3	0.8974	60.2289	PH_log BOD_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Al_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.8933	63.6472	PH_log Turb_log Dryh_log
3	0.8923	64.5466	Temp_log CondI_log Dryh_log
3	0.8888	67.4246	Red_log Alcal_log Dryh_log
3	0.8878	68.3221	PH_log Temp_log Dryh_log
3	0.8791	75.6197	Temp_log Alcal_log Dryh_log
3	0.8748	79.2023	VDS_log PH_log Dryh_log
3	0.8659	86.7183	PH_log Red_log Dryh_log
3	0.8659	86.7317	COD_log PH_log Dryh_log
4	0.9527	15.7883	TDS_log PH_log Alcal_log Dryh_log
4	0.9424	24.4226	PH_log Temp_log Alcal_log Dryh_log
4	0.9410	25.5795	PH_log CondI_log Alcal_log Dryh_log
4	0.9393	26.9812	VDS_log PH_log Alcal_log Dryh_log
4	0.9393	27.0354	Qt_log PH_log Alcal_log Dryh_log
4	0.9380	28.0952	PH_log BOD_log Alcal_log Dryh_log

4	0.9380	28.1233	TSS_log PH_log Alcal_log Dryh_log
4	0.9373	28.6898	Runofft_log PH_log Alcal_log Dryh_log
4	0.9372	28.7536	FLOW_log PH_log Alcal_log Dryh_log
4	0.9369	28.9920	VSS_log PH_log Alcal_log Dryh_log
4	0.9369	29.0265	PH_log Red_log Alcal_log Dryh_log
4	0.9366	29.2421	PH_log Turb_log Alcal_log Dryh_log
4	0.9366	29.2423	COD_log PH_log Alcal_log Dryh_log
4	0.9356	30.1316	TDS_log PH_log CondI_log Dryh_log
4	0.9328	32.4932	Qt_log TDS_log PH_log Dryh_log
4	0.9271	37.2725	Qt_log VDS_log PH_log Dryh_log
5	0.9597	11.8401	Qt_log TDS_log PH_log Alcal_log Dryh_log
5	0.9594	12.1157	TSS_log TDS_log PH_log Alcal_log Dryh_log
5	0.9570	14.1431	Qt_log PH_log CondI_log Alcal_log Dryh_log
5	0.9566	14.4722	TDS_log VSS_log PH_log Alcal_log Dryh_log
5	0.9558	15.1578	Runofft_log TDS_log PH_log Alcal_log Dryh_log
5	0.9551	15.7651	VDS_log TDS_log PH_log Alcal_log Dryh_log
5	0.9541	16.5628	TDS_log PH_log Turb_log Alcal_log Dryh_log
5	0.9536	16.9598	TDS_log PH_log BOD_log Alcal_log Dryh_log
5	0.9533	17.2612	FLOW_log TDS_log PH_log Alcal_log Dryh_log
5	0.9532	17.3199	TDS_log PH_log CondI_log Alcal_log Dryh_log
5	0.9532	17.3509	TDS_log PH_log Temp_log Alcal_log Dryh_log
5	0.9529	17.5930	TDS_log COD_log PH_log Alcal_log Dryh_log
5	0.9528	17.6507	TDS_log PH_log Red_log Alcal_log Dryh_log
5	0.9492	20.7042	TSS_log VSS_log PH_log Alcal_log Dryh_log
5	0.9490	20.8555	TSS_log PH_log CondI_log Alcal_log Dryh_log
5	0.9474	22.2340	TDS_log COD_log Temp_log CondI_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Al_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
6	0.9637	10.5413	TSS_log TDS_log COD_log Temp_log CondI_log Dryh_log
6	0.9629	11.2100	FLOW_log Qt_log TDS_log PH_log Alcal_log Dryh_log
6	0.9620	11.9428	Qt_log TDS_log PH_log CondI_log Alcal_log Dryh_log
6	0.9614	12.4737	TSS_log TDS_log COD_log PH_log Alcal_log Dryh_log
6	0.9608	12.9657	Qt_log TDS_log PH_log Temp_log Alcal_log Dryh_log
6	0.9607	13.0070	Qt_log TSS_log TDS_log PH_log Alcal_log Dryh_log
6	0.9605	13.2295	Qt_log TDS_log COD_log PH_log Alcal_log Dryh_log
6	0.9600	13.5988	Runofft_log Qt_log TDS_log PH_log Alcal_log Dryh_log
6	0.9600	13.6569	TSS_log TDS_log VSS_log PH_log Alcal_log Dryh_log
6	0.9599	13.6893	TSS_log TDS_log PH_log Turb_log Alcal_log Dryh_log
6	0.9599	13.7145	Qt_log TDS_log VSS_log PH_log Alcal_log Dryh_log
6	0.9599	13.7285	Qt_log TDS_log PH_log Turb_log Alcal_log Dryh_log
6	0.9599	13.7407	Qt_log VDS_log TDS_log PH_log Alcal_log Dryh_log
6	0.9598	13.7651	Qt_log TDS_log PH_log Red_log Alcal_log Dryh_log
6	0.9598	13.7800	Runofft_log TSS_log TDS_log PH_log Alcal_log Dryh_log
6	0.9598	13.7982	TSS_log TDS_log PH_log CondI_log Alcal_log Dryh_log
7	0.9704	6.8370	FLOW_log Runofft_log Qt_log TDS_log PH_log Alcal_log Dryh_log
7	0.9667	9.9900	TSS_log TDS_log COD_log Temp_log CondI_log Alcal_log Dryh_log
7	0.9665	10.1461	FLOW_log Qt_log TDS_log COD_log PH_log Alcal_log Dryh_log
7	0.9659	10.6607	TSS_log TDS_log COD_log Red_log Temp_log CondI_log Dryh_log
7	0.9656	10.8962	TSS_log TDS_log COD_log PH_log Temp_log Alcal_log Dryh_log
7	0.9656	10.9320	Runofft_log TSS_log TDS_log COD_log Temp_log CondI_log Dryh_log
7	0.9655	10.9718	TSS_log TDS_log COD_log BOD_log Temp_log CondI_log Dryh_log
7	0.9653	11.1618	Qt_log TDS_log COD_log PH_log Temp_log Alcal_log Dryh_log
7	0.9649	11.4889	TSS_log TDS_log COD_log Turb_log Temp_log CondI_log Dryh_log
7	0.9649	11.5251	TSS_log VDS_log TDS_log COD_log Temp_log CondI_log Dryh_log
7	0.9647	11.6309	TSS_log TDS_log COD_log PH_log Temp_log CondI_log Dryh_log
7	0.9644	11.9558	FLOW_log Qt_log TDS_log PH_log Turb_log Alcal_log Dryh_log
7	0.9638	12.3976	FLOW_log TSS_log TDS_log COD_log Temp_log CondI_log Dryh_log
7	0.9638	12.4504	FLOW_log Qt_log TDS_log PH_log CondI_log Alcal_log Dryh_log
7	0.9637	12.5377	TSS_log TDS_log VSS_log COD_log Temp_log CondI_log Dryh_log
7	0.9637	12.5382	Qt_log TSS_log TDS_log COD_log Temp_log CondI_log Dryh_log
8	0.9728	6.8299	FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log Alcal_log Dryh_log
8	0.9719	7.6201	FLOW_log Runofft_log Qt_log TDS_log PH_log Red_log Alcal_log Dryh_log
8	0.9716	7.8729	FLOW_log Runofft_log Qt_log TDS_log PH_log Temp_log Alcal_log Dryh_log
8	0.9709	8.4513	FLOW_log Runofft_log Qt_log TDS_log PH_log Turb_log Alcal_log

Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Al_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
8	0.9707	8.6314	FLOW_log Runofft_log Qt_log TDS_log COD_log PH_log Alcal_log Dryh_log
8	0.9706	8.6798	FLOW_log Runofft_log Qt_log TDS_log PH_log CondI_log Alcal_log Dryh_log
8	0.9706	8.6893	FLOW_log Runofft_log Qt_log TSS_log TDS_log PH_log Alcal_log Dryh_log
8	0.9706	8.7414	FLOW_log Runofft_log Qt_log TDS_log VSS_log PH_log Alcal_log Dryh_log
8	0.9704	8.8346	FLOW_log Runofft_log Qt_log TDS_log PH_log BOD_log Alcal_log Dryh_log
8	0.9703	8.9480	TSS_log TDS_log COD_log PH_log Temp_log CondI_log Alcal_log Dryh_log
8	0.9700	9.2437	TSS_log TDS_log COD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
8	0.9695	9.6457	Qt_log TSS_log TDS_log COD_log PH_log Temp_log Alcal_log Dryh_log
8	0.9691	9.9586	FLOW_log Qt_log TDS_log COD_log PH_log Temp_log Alcal_log Dryh_log
8	0.9691	9.9713	Runofft_log TSS_log TDS_log COD_log Temp_log CondI_log Alcal_log Dryh_log
8	0.9688	10.2508	Qt_log TDS_log VSS_log COD_log PH_log Temp_log Alcal_log Dryh_log
8	0.9681	10.8018	Runofft_log TSS_log TDS_log COD_log BOD_log Temp_log CondI_log Dryh_log
9	0.9739	7.9103	FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log Red_log Alcal_log Dryh_log
9	0.9735	8.3079	FLOW_log Runofft_log Qt_log TDS_log COD_log PH_log Red_log Alcal_log Dryh_log
9	0.9734	8.3415	FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log Turb_log Alcal_log Dryh_log
9	0.9734	8.3621	FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log Temp_log Alcal_log Dryh_log
9	0.9733	8.4242	FLOW_log Runofft_log Qt_log TDS_log COD_log PH_log Turb_log Alcal_log Dryh_log
9	0.9732	8.5532	FLOW_log Runofft_log Qt_log TDS_log COD_log PH_log Temp_log Alcal_log Dryh_log
9	0.9730	8.6572	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log Alcal_log Dryh_log
9	0.9730	8.6950	FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log PH_log Alcal_log Dryh_log
9	0.9729	8.7911	FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log BOD_log Alcal_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Al_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
9	0.9728	8.8255	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log PH_log Alcal_log Dryh_log
9	0.9728	8.8298	FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log CondI_log Alcal_log Dryh_log
9	0.9725	9.1021	FLOW_log Runofft_log Qt_log TSS_log TDS_log PH_log Red_log Alcal_log Dryh_log
9	0.9722	9.3475	FLOW_log Runofft_log Qt_log TSS_log TDS_log PH_log Temp_log Alcal_log Dryh_log
9	0.9720	9.5558	FLOW_log Runofft_log Qt_log TDS_log PH_log Red_log Temp_log Alcal_log Dryh_log
9	0.9719	9.6067	FLOW_log Runofft_log Qt_log TDS_log PH_log Red_log CondI_log Alcal_log Dryh_log
9	0.9719	9.6108	FLOW_log Runofft_log Qt_log TDS_log PH_log Red_log BOD_log Alcal_log Dryh_log

10	0.9760	8.1351	FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log Temp_log CondI_log Alcal_log Dryh_log
10	0.9759	8.2211	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log Turb_log Alcal_log Dryh_log
10	0.9757	8.4293	FLOW_log Runofft_log Qt_log TDS_log COD_log PH_log Temp_log CondI_log Alcal_log Dryh_log
10	0.9752	8.8480	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log Red_log Alcal_log Dryh_log
10	0.9751	8.9253	FLOW_log Runofft_log Qt_log TDS_log COD_log PH_log Turb_log Temp_log Alcal_log Dryh_log
10	0.9749	9.0578	FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log Red_log Alcal_log Dryh_log
10	0.9749	9.1167	FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log Temp_log Alcal_log Dryh_log
10	0.9747	9.2754	FLOW_log Runofft_log Qt_log TDS_log COD_log PH_log Red_log Turb_log Alcal_log Dryh_log
10	0.9745	9.4631	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log Temp_log Alcal_log Dryh_log
10	0.9741	9.7624	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log PH_log Red_log Alcal_log Dryh_log
10	0.9740	9.8143	FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log Red_log BOD_log Alcal_log Dryh_log
10	0.9740	9.8583	FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log Red_log CondI_log Alcal_log Dryh_log
10	0.9740	9.8804	FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log Red_log Turb_log Alcal_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Al_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
10	0.9739	9.9069	FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log PH_log Red_log Alcal_log Dryh_log
10	0.9739	9.9095	FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log Red_log Temp_log Alcal_log Dryh_log
10	0.9739	9.9413	FLOW_log Runofft_log Qt_log TDS_log COD_log PH_log Red_log Temp_log Alcal_log Dryh_log
11	0.9782	8.2905	FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9773	9.0735	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9769	9.3898	FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9768	9.5192	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Alcal_log Dryh_log
11	0.9768	9.5359	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log Turb_log Temp_log Alcal_log Dryh_log
11	0.9766	9.6525	FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9765	9.7847	FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9764	9.8053	FLOW_log Runofft_log Qt_log TDS_log COD_log PH_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9763	9.8873	FLOW_log Runofft_log Qt_log TDS_log VSS_log COD_log PH_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9763	9.9314	FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log Red_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9763	9.9412	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9762	10.0296	FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log Turb_log Temp_log Alcal_log Dryh_log
11	0.9761	10.1103	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log BOD_log Turb_log Alcal_log Dryh_log
11	0.9760	10.1633	FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log Red_log Temp_log Alcal_log Dryh_log
11	0.9760	10.1988	FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log PH_log Turb_log Alcal_log Dryh_log
11	0.9759	10.2118	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log PH_log Turb_log Alcal_log Dryh_log
12	0.9787	9.8973	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log PH_log Temp_log CondI_log Alcal_log Dryh_log

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                         The REG Procedure
                          Model: MODEL1
                    Dependent Variable: Al_log

                     R-Square Selection Method

      R-Square       C(p)  Variables in Model

 12     0.9787     9.9160  FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log
                           BOD_log Temp_log CondI_log Alcal_log Dryh_log
 12     0.9785    10.0831  FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log
                           PH_log Temp_log CondI_log Alcal_log Dryh_log
 12     0.9784    10.1201  FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log
                           Red_log Temp_log CondI_log Alcal_log Dryh_log
 12     0.9784    10.1580  FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log
                           Turb_log Temp_log CondI_log Alcal_log Dryh_log
 12     0.9782    10.2956  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                           Turb_log Temp_log CondI_log Alcal_log Dryh_log
 12     0.9776    10.7937  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                           BOD_log Temp_log CondI_log Alcal_log Dryh_log
 12     0.9775    10.8807  FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log
                           PH_log Temp_log CondI_log Alcal_log Dryh_log
 12     0.9774    10.9829  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                           Red_log Temp_log CondI_log Alcal_log Dryh_log
 12     0.9774    10.9984  FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log Red_log
                           BOD_log Temp_log CondI_log Alcal_log Dryh_log
 12     0.9774    11.0060  FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log BOD_log
                           Turb_log Temp_log CondI_log Alcal_log Dryh_log
 12     0.9773    11.0668  FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log
                           BOD_log Temp_log CondI_log Alcal_log Dryh_log
 12     0.9772    11.1251  FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log
                           Turb_log Temp_log CondI_log Alcal_log Dryh_log
 12     0.9772    11.1292  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                           BOD_log Temp_log CondI_log Alcal_log Dryh_log
 12     0.9772    11.1759  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                           Red_log BOD_log Turb_log Alcal_log Dryh_log
 12     0.9771    11.2462  FLOW_log Runofft_log Qt_log TDS_log VSS_log COD_log PH_log
                           Turb_log Temp_log CondI_log Alcal_log Dryh_log
-------------------------------------------------------------------------------------------
 13     0.9792    11.4780  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                           PH_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
 13     0.9790    11.6191  FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log
                           Red_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
 13     0.9790    11.6257  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                           PH_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
 13     0.9789    11.7086  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                           COD_log PH_log Temp_log CondI_log Alcal_log Dryh_log
 13     0.9789    11.7130  FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log
                           PH_log BOD_log Temp_log CondI_log Alcal_log Dryh_log


                         The REG Procedure
                          Model: MODEL1
                    Dependent Variable: Al_log

                     R-Square Selection Method

      R-Square       C(p)  Variables in Model

 13     0.9789    11.7324  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                           PH_log Red_log Temp_log CondI_log Alcal_log Dryh_log
 13     0.9788    11.8106  FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log
                           BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
 13     0.9786    11.9566  FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log
                           PH_log Red_log Temp_log CondI_log Alcal_log Dryh_log
 13     0.9785    12.0267  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                           BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
 13     0.9785    12.0356  FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log
                           PH_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
 13     0.9785    12.0508  FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log
                           Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
 13     0.9785    12.1078  FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log
                           PH_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
 13     0.9782    12.2840  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                           Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
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13	0.9780	12.4706	FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
13	0.9780	12.5281	FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
13	0.9779	12.5602	FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log PH_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
14	0.9796	13.1810	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log PH_log Red_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
14	0.9795	13.2414	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14	0.9794	13.2948	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
14	0.9792	13.4749	FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
14	0.9791	13.5516	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14	0.9791	13.5579	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14	0.9791	13.5848	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log Temp_log CondI_log Alcal_log Dryh_log
14	0.9791	13.5882	FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14	0.9790	13.6815	FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log

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The REG Procedure
Model: MODEL1
Dependent Variable: Al_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
14	0.9788	13.7995	FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14	0.9787	13.9378	FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14	0.9786	13.9818	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14	0.9785	14.0745	FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14	0.9785	14.0989	FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14	0.9783	14.2565	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14	0.9782	14.3092	FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9797	15.0536	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9797	15.0647	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9796	15.1699	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9792	15.4720	FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9792	15.4883	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9789	15.7059	FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9787	15.9045	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9780	16.4614	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
15	0.9775	16.9051	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log CondI_log Alcal_log Dryh_log

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The REG Procedure
Model: MODEL1
Dependent Variable: Al_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
15	0.9750	19.0231	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9748	19.1735	Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9732	20.5364	FLOW_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9728	20.8869	FLOW_log Runofft_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9715	21.9244	FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9709	22.4560	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
15	0.9556	35.2898	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
16	0.9798	17.0000	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Al_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
1	0.4361	337.6451	Temp_log
1	0.1887	505.9981	PH_log
1	0.1480	533.6696	CondI_log
1	0.1480	533.6921	Qt_log
1	0.1167	555.0040	Runofft_log
1	0.0533	598.1350	FLOW_log
1	0.0145	624.5134	Dryh_log
1	0.0141	624.7892	Red_log
2	0.8603	51.0576	PH_log Temp_log
2	0.7513	125.2090	Red_log Temp_log
2	0.5435	266.5729	CondI_log Temp_log
2	0.5399	269.0495	Runofft_log Temp_log
2	0.5196	282.8741	Dryh_log Temp_log
2	0.5153	285.7701	FLOW_log Temp_log
2	0.4979	297.6381	Qt_log Temp_log
2	0.3716	383.5497	PH_log Red_log
2	0.3382	406.2697	FLOW_log Qt_log
2	0.3167	420.9356	CondI_log FLOW_log
2	0.2533	464.0196	Qt_log PH_log
2	0.2229	484.7412	Runofft_log PH_log
2	0.2183	487.8750	FLOW_log PH_log
2	0.2088	494.3009	CondI_log PH_log
2	0.2083	494.6608	Dryh_log Qt_log
2	0.1914	506.1684	Dryh_log PH_log
2	0.1846	510.7833	FLOW_log Runofft_log
2	0.1632	525.3465	CondI_log Dryh_log
2	0.1627	525.7131	CondI_log Qt_log
2	0.1574	529.2802	CondI_log Runofft_log
2	0.1519	533.0016	Qt_log Red_log
2	0.1510	533.6554	CondI_log Red_log
2	0.1487	535.2258	Runofft_log Qt_log
2	0.1356	544.1551	Dryh_log Runofft_log
2	0.1167	556.9842	Runofft_log Red_log
2	0.0584	596.6380	FLOW_log Red_log
2	0.0533	600.1349	Dryh_log FLOW_log
2	0.0202	622.6339	Dryh_log Red_log
3	0.9014	25.1034	FLOW_log PH_log Temp_log
3	0.8884	33.9139	CondI_log PH_log Temp_log
3	0.8652	49.6900	Dryh_log PH_log Temp_log
3	0.8630	51.1979	Runofft_log PH_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Al_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.8615	52.2494	PH_log Red_log Temp_log
3	0.8612	52.4561	Qt_log PH_log Temp_log
3	0.7806	107.2636	FLOW_log Red_log Temp_log
3	0.7611	120.5308	Dryh_log Red_log Temp_log
3	0.7575	123.0118	Runofft_log Red_log Temp_log
3	0.7567	123.5467	Qt_log Red_log Temp_log
3	0.7513	127.1861	CondI_log Red_log Temp_log
3	0.7366	137.2113	CondI_log FLOW_log Temp_log
3	0.6788	176.5343	FLOW_log Qt_log Temp_log
3	0.6354	206.0604	FLOW_log Runofft_log Temp_log
3	0.6318	208.5420	Dryh_log Runofft_log Temp_log
3	0.6313	208.8243	Dryh_log Qt_log Temp_log
3	0.6242	213.6774	CondI_log Dryh_log Temp_log
3	0.5596	257.6487	CondI_log Runofft_log Temp_log
3	0.5449	267.6122	CondI_log Qt_log Temp_log

3	0.5437	268.4816	Runofft_log Qt_log Temp_log
3	0.5432	268.7727	Dryh_log FLOW_log Temp_log
3	0.4337	343.3102	FLOW_log PH_log Red_log
3	0.4193	353.0874	FLOW_log Runofft_log Qt_log
3	0.4177	354.1778	Runofft_log PH_log Red_log
3	0.3955	369.2665	Qt_log PH_log Red_log
3	0.3904	372.7675	CondI_log FLOW_log Red_log
3	0.3749	383.3201	CondI_log PH_log Red_log
3	0.3748	383.3626	FLOW_log Qt_log PH_log
3	0.3724	385.0406	Dryh_log PH_log Red_log
3	0.3612	392.5987	CondI_log FLOW_log Qt_log
3	0.3437	404.5521	FLOW_log Qt_log Red_log
3	0.3410	406.3966	Dryh_log FLOW_log Qt_log
3	0.3334	411.5442	CondI_log Dryh_log FLOW_log
3	0.3176	422.2654	CondI_log FLOW_log PH_log
3	0.3172	422.5542	CondI_log FLOW_log Runofft_log
3	0.2695	455.0516	CondI_log Qt_log PH_log
3	0.2640	458.7670	FLOW_log Runofft_log PH_log
3	0.2603	461.2820	Dryh_log Qt_log PH_log
3	0.2556	464.4534	Runofft_log Qt_log PH_log
3	0.2447	471.9076	Dryh_log FLOW_log PH_log
3	0.2237	486.1634	CondI_log Runofft_log PH_log
3	0.2229	486.6987	Dryh_log Runofft_log PH_log
3	0.2148	492.2076	Dryh_log Runofft_log Qt_log
3	0.2125	493.8130	Dryh_log Qt_log Red_log
3	0.2088	496.2986	CondI_log Dryh_log PH_log
3	0.2086	496.4702	CondI_log Dryh_log Qt_log

The REG Procedure
Model: MODEL1
Dependent Variable: Al_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.1903	508.8753	FLOW_log Runofft_log Red_log
3	0.1846	512.7785	Dryh_log FLOW_log Runofft_log
3	0.1791	516.5030	CondI_log Dryh_log Red_log
3	0.1742	519.8672	CondI_log Dryh_log Runofft_log
3	0.1631	527.4007	CondI_log Runofft_log Qt_log
3	0.1627	527.6925	CondI_log Qt_log Red_log
3	0.1613	528.6070	CondI_log Runofft_log Red_log
3	0.1520	534.9956	Runofft_log Qt_log Red_log
3	0.1417	541.9697	Dryh_log Runofft_log Red_log
3	0.0592	598.1120	Dryh_log FLOW_log Red_log
4	0.9316	6.5598	CondI_log Runofft_log PH_log Temp_log
4	0.9212	13.5942	CondI_log Qt_log PH_log Temp_log
4	0.9095	21.5557	FLOW_log Qt_log PH_log Temp_log
4	0.9084	22.3552	FLOW_log Runofft_log PH_log Temp_log
4	0.9036	25.5564	CondI_log FLOW_log PH_log Temp_log
4	0.9029	26.0832	Dryh_log FLOW_log PH_log Temp_log
4	0.9014	27.0993	FLOW_log PH_log Red_log Temp_log
4	0.8896	35.0858	CondI_log PH_log Red_log Temp_log
4	0.8887	35.7229	CondI_log Dryh_log PH_log Temp_log
4	0.8811	40.8730	Runofft_log Qt_log PH_log Temp_log
4	0.8701	48.4057	Dryh_log Runofft_log PH_log Temp_log
4	0.8659	51.2314	Dryh_log PH_log Red_log Temp_log
4	0.8653	51.6791	Dryh_log Qt_log PH_log Temp_log
4	0.8636	52.7799	Runofft_log PH_log Red_log Temp_log
4	0.8622	53.7348	Qt_log PH_log Red_log Temp_log
4	0.8171	84.4321	FLOW_log Qt_log Red_log Temp_log
4	0.8011	95.3299	CondI_log FLOW_log Red_log Temp_log
4	0.7938	100.3018	FLOW_log Runofft_log Red_log Temp_log
4	0.7809	109.0504	Dryh_log FLOW_log Red_log Temp_log
4	0.7770	111.7347	Dryh_log Qt_log Red_log Temp_log
4	0.7722	114.9935	Dryh_log Runofft_log Red_log Temp_log
4	0.7661	119.1438	CondI_log Qt_log Red_log Temp_log
4	0.7621	121.8866	CondI_log Dryh_log Red_log Temp_log
4	0.7605	122.9826	CondI_log Runofft_log Red_log Temp_log
4	0.7576	124.9126	Runofft_log Qt_log Red_log Temp_log
4	0.7394	137.2951	CondI_log FLOW_log Qt_log Temp_log
4	0.7384	138.0006	CondI_log Dryh_log FLOW_log Temp_log
4	0.7366	139.2111	CondI_log FLOW_log Runofft_log Temp_log
4	0.7142	154.4678	Dryh_log FLOW_log Qt_log Temp_log
4	0.6830	175.6644	FLOW_log Runofft_log Qt_log Temp_log

4	0.6634	189.0198	Dryh_log FLOW_log Runofft_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Al_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
4	0.6464	200.5924	CondI_log Dryh_log Runofft_log Temp_log
4	0.6383	206.0852	Dryh_log Runofft_log Qt_log Temp_log
4	0.6365	207.2898	CondI_log Dryh_log Qt_log Temp_log
4	0.5915	237.9153	CondI_log Runofft_log Qt_log Temp_log
4	0.5332	277.5945	FLOW_log Qt_log PH_log Red_log
4	0.5016	299.1258	CondI_log FLOW_log PH_log Red_log
4	0.5015	299.1905	FLOW_log Runofft_log PH_log Red_log
4	0.4605	327.0772	FLOW_log Runofft_log Qt_log PH_log
4	0.4521	332.8026	CondI_log FLOW_log Runofft_log Qt_log
4	0.4459	337.0158	Dryh_log FLOW_log PH_log Red_log
4	0.4320	346.4683	CondI_log Runofft_log PH_log Red_log
4	0.4313	346.9079	Dryh_log FLOW_log Runofft_log Qt_log
4	0.4250	351.2267	Dryh_log Runofft_log PH_log Red_log
4	0.4226	352.8427	Runofft_log Qt_log PH_log Red_log
4	0.4203	354.4246	FLOW_log Runofft_log Qt_log Red_log
4	0.4112	360.6024	CondI_log Qt_log PH_log Red_log
4	0.4082	362.6332	Dryh_log Qt_log PH_log Red_log
4	0.4052	364.7123	CondI_log FLOW_log Qt_log Red_log
4	0.3933	372.7560	CondI_log Dryh_log FLOW_log Red_log
4	0.3920	373.7021	CondI_log FLOW_log Runofft_log Red_log
4	0.3773	383.6950	CondI_log Dryh_log PH_log Red_log
4	0.3765	384.2201	Dryh_log FLOW_log Qt_log PH_log
4	0.3751	385.1541	CondI_log FLOW_log Qt_log PH_log
4	0.3622	393.9304	CondI_log Dryh_log FLOW_log Qt_log
4	0.3519	400.9574	Dryh_log FLOW_log Qt_log Red_log
4	0.3387	409.9557	CondI_log Dryh_log FLOW_log PH_log
4	0.3374	410.8238	CondI_log Dryh_log FLOW_log Runofft_log
4	0.3179	424.1226	CondI_log FLOW_log Runofft_log PH_log
4	0.2795	450.2483	Dryh_log FLOW_log Runofft_log PH_log
4	0.2792	450.4229	CondI_log Dryh_log Qt_log PH_log
4	0.2741	453.9080	CondI_log Runofft_log Qt_log PH_log
4	0.2671	458.6785	Dryh_log Runofft_log Qt_log PH_log
4	0.2237	488.1634	CondI_log Dryh_log Runofft_log PH_log
4	0.2165	493.0896	Dryh_log Runofft_log Qt_log Red_log
4	0.2150	494.0871	CondI_log Dryh_log Qt_log Red_log
4	0.2149	494.1999	CondI_log Dryh_log Runofft_log Qt_log
4	0.1940	508.3942	CondI_log Dryh_log Runofft_log Red_log
4	0.1916	509.9922	Dryh_log FLOW_log Runofft_log Red_log
4	0.1635	529.1366	CondI_log Runofft_log Qt_log Red_log
5	0.9365	5.2175	CondI_log FLOW_log Qt_log PH_log Temp_log
5	0.9339	6.9851	CondI_log Runofft_log Qt_log PH_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Al_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
5	0.9326	7.8317	CondI_log FLOW_log Runofft_log PH_log Temp_log
5	0.9320	8.2806	CondI_log Dryh_log Runofft_log PH_log Temp_log
5	0.9319	8.3456	CondI_log Runofft_log PH_log Red_log Temp_log
5	0.9297	9.8275	CondI_log Dryh_log Qt_log PH_log Temp_log
5	0.9244	13.4239	CondI_log Qt_log PH_log Red_log Temp_log
5	0.9097	23.4209	Dryh_log FLOW_log Qt_log PH_log Temp_log
5	0.9096	23.5344	FLOW_log Qt_log PH_log Red_log Temp_log
5	0.9096	23.5402	FLOW_log Runofft_log Qt_log PH_log Temp_log
5	0.9090	23.9315	Dryh_log FLOW_log Runofft_log PH_log Temp_log
5	0.9088	24.0241	FLOW_log Runofft_log PH_log Red_log Temp_log
5	0.9051	26.5612	CondI_log Dryh_log FLOW_log PH_log Temp_log
5	0.9037	27.5374	CondI_log FLOW_log PH_log Red_log Temp_log
5	0.9029	28.0824	Dryh_log FLOW_log PH_log Red_log Temp_log
5	0.8898	36.9834	CondI_log Dryh_log PH_log Red_log Temp_log

5	0.8825	41.9772	Runofft_log Qt_log PH_log Red_log Temp_log
5	0.8813	42.7550	Dryh_log Runofft_log Qt_log PH_log Temp_log
5	0.8702	50.3329	Dryh_log Runofft_log PH_log Red_log Temp_log
5	0.8659	53.2191	Dryh_log Qt_log PH_log Red_log Temp_log
5	0.8338	75.0575	FLOW_log Runofft_log Qt_log Red_log Temp_log
5	0.8208	83.9545	Dryh_log FLOW_log Qt_log Red_log Temp_log
5	0.8171	86.4321	CondI_log FLOW_log Qt_log Red_log Temp_log
5	0.8020	96.7496	CondI_log FLOW_log Runofft_log Red_log Temp_log
5	0.8011	97.3125	CondI_log Dryh_log FLOW_log Red_log Temp_log
5	0.7952	101.3563	Dryh_log FLOW_log Runofft_log Red_log Temp_log
5	0.7932	102.7043	CondI_log Dryh_log Qt_log Red_log Temp_log
5	0.7770	113.7199	Dryh_log Runofft_log Qt_log Red_log Temp_log
5	0.7738	115.9143	CondI_log Dryh_log Runofft_log Red_log Temp_log
5	0.7661	121.1400	CondI_log Runofft_log Qt_log Red_log Temp_log
5	0.7451	135.4088	CondI_log FLOW_log Runofft_log Qt_log Temp_log
5	0.7448	135.6010	CondI_log Dryh_log FLOW_log Qt_log Temp_log
5	0.7385	139.8867	CondI_log Dryh_log FLOW_log Runofft_log Temp_log
5	0.7219	151.2018	Dryh_log FLOW_log Runofft_log Qt_log Temp_log
5	0.6464	202.5829	CondI_log Dryh_log Runofft_log Qt_log Temp_log
5	0.5397	275.2137	FLOW_log Runofft_log Qt_log PH_log Red_log
5	0.5341	278.9835	CondI_log FLOW_log Qt_log PH_log Red_log
5	0.5335	279.3965	Dryh_log FLOW_log Qt_log PH_log Red_log
5	0.5120	294.0010	CondI_log FLOW_log Runofft_log PH_log Red_log
5	0.5114	294.4130	CondI_log Dryh_log FLOW_log PH_log Red_log
5	0.5049	298.8261	Dryh_log FLOW_log Runofft_log PH_log Red_log
5	0.4628	327.5184	CondI_log FLOW_log Runofft_log Qt_log PH_log
5	0.4625	327.6759	CondI_log FLOW_log Runofft_log Qt_log Red_log
5	0.4608	328.8759	Dryh_log FLOW_log Runofft_log Qt_log PH_log

The REG Procedure
Model: MODEL1
Dependent Variable: Al_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
5	0.4524	334.5517	CondI_log Dryh_log FLOW_log Runofft_log Qt_log
5	0.4357	345.9566	CondI_log Dryh_log Runofft_log PH_log Red_log
5	0.4321	348.3793	CondI_log Runofft_log Qt_log PH_log Red_log
5	0.4314	348.8370	Dryh_log FLOW_log Runofft_log Qt_log Red_log
5	0.4276	351.4738	CondI_log Dryh_log Qt_log PH_log Red_log
5	0.4259	352.6169	Dryh_log Runofft_log Qt_log PH_log Red_log
5	0.4052	366.7063	CondI_log Dryh_log FLOW_log Qt_log Red_log
5	0.3966	372.5342	CondI_log Dryh_log FLOW_log Runofft_log Red_log
5	0.3775	385.5510	CondI_log Dryh_log FLOW_log Qt_log PH_log
5	0.3408	410.4964	CondI_log Dryh_log FLOW_log Runofft_log PH_log
5	0.2920	443.7440	CondI_log Dryh_log Runofft_log Qt_log PH_log
5	0.2173	494.5042	CondI_log Dryh_log Runofft_log Qt_log Red_log
6	0.9383	5.9516	CondI_log FLOW_log Runofft_log Qt_log PH_log Temp_log
6	0.9381	6.0859	CondI_log Dryh_log FLOW_log Qt_log PH_log Temp_log
6	0.9372	6.7099	CondI_log FLOW_log Qt_log PH_log Red_log Temp_log
6	0.9367	7.0810	CondI_log Dryh_log Runofft_log Qt_log PH_log Temp_log
6	0.9339	8.9775	CondI_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.9332	9.4772	CondI_log FLOW_log Runofft_log PH_log Red_log Temp_log
6	0.9327	9.8126	CondI_log Dryh_log FLOW_log Runofft_log PH_log Temp_log
6	0.9324	9.9865	CondI_log Dryh_log Runofft_log PH_log Red_log Temp_log
6	0.9320	10.2636	CondI_log Dryh_log Qt_log PH_log Red_log Temp_log
6	0.9098	25.3801	Dryh_log FLOW_log Runofft_log Qt_log PH_log Temp_log
6	0.9098	25.4044	Dryh_log FLOW_log Qt_log PH_log Red_log Temp_log
6	0.9096	25.4883	FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.9094	25.6545	Dryh_log FLOW_log Runofft_log PH_log Red_log Temp_log
6	0.9052	28.5313	CondI_log Dryh_log FLOW_log PH_log Red_log Temp_log
6	0.8826	43.9029	Dryh_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.8386	73.8323	Dryh_log FLOW_log Runofft_log Qt_log Red_log Temp_log
6	0.8340	76.9572	CondI_log FLOW_log Runofft_log Qt_log Red_log Temp_log
6	0.8214	85.5136	CondI_log Dryh_log FLOW_log Qt_log Red_log Temp_log
6	0.8022	98.6113	CondI_log Dryh_log FLOW_log Runofft_log Red_log Temp_log
6	0.7961	102.7455	CondI_log Dryh_log Runofft_log Qt_log Red_log Temp_log
6	0.7520	132.7490	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Temp_log
6	0.5411	276.2061	CondI_log FLOW_log Runofft_log Qt_log PH_log Red_log
6	0.5397	277.2128	Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log
6	0.5349	280.4743	CondI_log Dryh_log FLOW_log Qt_log PH_log Red_log
6	0.5178	292.0627	CondI_log Dryh_log FLOW_log Runofft_log PH_log Red_log
6	0.4633	329.1663	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Red_log
6	0.4628	329.5101	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log

6	0.4382	346.2707	CondI_log Dryh_log Runofft_log Qt_log PH_log Red_log

The REG Procedure
Model: MODEL1
Dependent Variable: Al_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
7	0.9396	7.1100	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Temp_log
7	0.9389	7.5526	CondI_log Dryh_log FLOW_log Qt_log PH_log Red_log Temp_log
7	0.9384	7.8878	CondI_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
7	0.9368	9.0246	CondI_log Dryh_log Runofft_log Qt_log PH_log Red_log Temp_log
7	0.9332	11.4424	CondI_log Dryh_log FLOW_log Runofft_log PH_log Red_log Temp_log
7	0.9099	27.3186	Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
7	0.8404	74.5813	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Red_log Temp_log
7	0.5413	278.0960	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log
8	0.9397	9.0000	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log

cr all.lst

The REG Procedure
Model: MODEL1
Dependent Variable: Cr_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
1	0.6285	179.2304	TDS_log
1	0.6000	195.2705	VDS_log
1	0.4644	271.6455	PH_log
1	0.4102	302.1505	CondI_log
1	0.4035	305.9661	Qt_log
1	0.3697	324.9786	BOD_log
1	0.3080	359.7111	Alcal_log
1	0.2763	377.5947	COD_log
1	0.2713	380.3930	Runofft_log
1	0.2299	403.7310	FLOW_log
1	0.1648	440.3620	Dryh_log
1	0.1596	443.3111	VSS_log
1	0.1485	449.5443	TSS_log
1	0.1359	456.6437	Red_log
1	0.0156	524.4174	Turb_log
1	0.0020	532.0607	Temp_log
2	0.9212	16.3825	PH_log Dryh_log
2	0.7751	98.6396	Red_log Dryh_log
2	0.7511	112.1928	PH_log Temp_log
2	0.7325	122.6630	VDS_log PH_log
2	0.7097	135.5131	TDS_log PH_log
2	0.7046	138.3684	PH_log Red_log
2	0.6584	164.4153	TDS_log Red_log
2	0.6554	166.0862	TDS_log Turb_log
2	0.6547	166.4587	TDS_log Temp_log
2	0.6504	168.9062	VDS_log Red_log
2	0.6496	169.3378	VDS_log Turb_log
2	0.6458	171.4705	TDS_log VSS_log
2	0.6445	172.2376	TDS_log COD_log
2	0.6433	172.8841	VDS_log Temp_log
2	0.6388	175.4487	VDS_log TDS_log
2	0.6371	176.3572	TDS_log Dryh_log
3	0.9298	13.5514	PH_log Alcal_log Dryh_log
3	0.9233	17.1859	PH_log BOD_log Dryh_log
3	0.9231	17.3020	PH_log CondI_log Dryh_log
3	0.9227	17.5108	FLOW_log PH_log Dryh_log
3	0.9223	17.7683	TDS_log PH_log Dryh_log
3	0.9220	17.9298	VDS_log PH_log Dryh_log
3	0.9217	18.0890	Runofft_log PH_log Dryh_log
3	0.9216	18.1434	TSS_log PH_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cr_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.9215	18.2070	VSS_log PH_log Dryh_log
3	0.9215	18.2100	Qt_log PH_log Dryh_log
3	0.9215	18.2117	PH_log Temp_log Dryh_log
3	0.9215	18.2290	PH_log Red_log Dryh_log
3	0.9214	18.2511	PH_log Turb_log Dryh_log
3	0.9212	18.3711	COD_log PH_log Dryh_log
3	0.8780	42.7124	Temp_log CondI_log Dryh_log
3	0.8377	65.4208	Red_log Alcal_log Dryh_log
4	0.9399	9.8238	Turb_log Temp_log CondI_log Dryh_log
4	0.9394	10.1377	VDS_log PH_log Alcal_log Dryh_log
4	0.9393	10.1933	TDS_log PH_log Alcal_log Dryh_log
4	0.9367	11.6459	Qt_log PH_log Alcal_log Dryh_log
4	0.9366	11.6997	PH_log Temp_log Alcal_log Dryh_log
4	0.9365	11.7722	PH_log CondI_log Alcal_log Dryh_log

4	0.9364	11.8171	VSS_log PH_log Alcal_log Dryh_log
4	0.9344	12.9265	TSS_log PH_log Alcal_log Dryh_log
4	0.9331	13.6666	PH_log Turb_log Alcal_log Dryh_log
4	0.9330	13.7175	Runofft_log PH_log Alcal_log Dryh_log
4	0.9323	14.1376	TDS_log PH_log CondI_log Dryh_log
4	0.9322	14.1582	FLOW_log PH_log Alcal_log Dryh_log
4	0.9314	14.6436	PH_log BOD_log Alcal_log Dryh_log
4	0.9312	14.7728	TDS_log PH_log BOD_log Dryh_log
4	0.9304	15.1773	VDS_log PH_log CondI_log Dryh_log
4	0.9304	15.1906	VDS_log PH_log BOD_log Dryh_log
5	0.9505	5.8598	Turb_log Temp_log CondI_log Alcal_log Dryh_log
5	0.9498	6.2993	TDS_log Turb_log Temp_log CondI_log Dryh_log
5	0.9488	6.8332	VDS_log Turb_log Temp_log CondI_log Dryh_log
5	0.9448	9.0937	VDS_log PH_log Temp_log Alcal_log Dryh_log
5	0.9437	9.7053	PH_log Turb_log Temp_log Alcal_log Dryh_log
5	0.9431	10.0537	Qt_log TDS_log PH_log Alcal_log Dryh_log
5	0.9424	10.4395	FLOW_log VDS_log PH_log Alcal_log Dryh_log
5	0.9421	10.5958	Red_log Turb_log Temp_log CondI_log Dryh_log
5	0.9418	10.7601	FLOW_log TDS_log PH_log Alcal_log Dryh_log
5	0.9414	10.9861	Qt_log Turb_log Temp_log CondI_log Dryh_log
5	0.9413	11.0724	TDS_log PH_log Temp_log Alcal_log Dryh_log
5	0.9412	11.0879	VDS_log PH_log Red_log Alcal_log Dryh_log
5	0.9412	11.0918	Qt_log PH_log Temp_log Alcal_log Dryh_log
5	0.9411	11.1692	Runofft_log PH_log Temp_log Alcal_log Dryh_log
5	0.9411	11.1791	VDS_log TDS_log PH_log Alcal_log Dryh_log
5	0.9410	11.2384	Qt_log VDS_log PH_log Alcal_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cr_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
6	0.9558	4.8896	VDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
6	0.9553	5.1602	Qt_log TDS_log Turb_log Temp_log CondI_log Dryh_log
6	0.9547	5.5086	TDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
6	0.9529	6.5346	FLOW_log TDS_log Turb_log Temp_log CondI_log Dryh_log
6	0.9522	6.9393	TDS_log BOD_log Turb_log Temp_log CondI_log Dryh_log
6	0.9519	7.1123	Qt_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
6	0.9518	7.1248	FLOW_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
6	0.9515	7.3166	VDS_log TDS_log Turb_log Temp_log CondI_log Dryh_log
6	0.9514	7.3983	TDS_log Red_log Turb_log Temp_log CondI_log Dryh_log
6	0.9512	7.4956	TSS_log VDS_log Turb_log Temp_log CondI_log Dryh_log
6	0.9510	7.5827	BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
6	0.9508	7.6881	TSS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
6	0.9508	7.7243	Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
6	0.9507	7.7417	TDS_log COD_log Turb_log Temp_log CondI_log Dryh_log
6	0.9506	7.8105	COD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
6	0.9506	7.8203	VSS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
7	0.9591	5.0246	FLOW_log TDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
7	0.9588	5.2093	Qt_log TDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
7	0.9587	5.2659	Qt_log TSS_log TDS_log Turb_log Temp_log CondI_log Dryh_log
7	0.9585	5.3895	FLOW_log VDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
7	0.9582	5.5657	Qt_log TDS_log BOD_log Turb_log Temp_log CondI_log Dryh_log
7	0.9577	5.8428	TSS_log VDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
7	0.9574	6.0121	Runofft_log Qt_log TDS_log Turb_log Temp_log CondI_log Dryh_log
7	0.9572	6.1254	Qt_log TDS_log Red_log Turb_log Temp_log CondI_log Dryh_log
7	0.9571	6.1730	FLOW_log Qt_log TDS_log Turb_log Temp_log CondI_log Dryh_log
7	0.9570	6.2447	Qt_log VDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
7	0.9568	6.3372	VDS_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
7	0.9565	6.4835	VDS_log TDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
7	0.9563	6.5959	Qt_log TDS_log COD_log Turb_log Temp_log CondI_log Dryh_log
7	0.9562	6.6514	TDS_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
7	0.9562	6.6771	Runofft_log VDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
7	0.9560	6.7656	VDS_log VSS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
8	0.9617	5.5791	Qt_log TSS_log TDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
8	0.9616	5.6146	FLOW_log Qt_log TDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
8	0.9614	5.7130	Qt_log TSS_log VDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cr_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
8	0.9608	6.0652	Qt_log TSS_log TDS_log BOD_log Turb_log Temp_log CondI_log Dryh_log
8	0.9608	6.0968	Qt_log TSS_log TDS_log COD_log Turb_log Temp_log CondI_log Dryh_log
8	0.9608	6.1046	Qt_log TDS_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
8	0.9607	6.1252	FLOW_log VDS_log TDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
8	0.9606	6.2146	FLOW_log Runofft_log TDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
8	0.9605	6.2395	Runofft_log Qt_log VDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
8	0.9605	6.2409	Qt_log TSS_log TDS_log VSS_log Turb_log Temp_log CondI_log Dryh_log
8	0.9603	6.3409	Runofft_log Qt_log TDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
8	0.9602	6.3992	Qt_log TSS_log VDS_log VSS_log Turb_log Temp_log CondI_log Dryh_log
8	0.9602	6.4281	Qt_log TSS_log VDS_log TDS_log Turb_log Temp_log CondI_log Dryh_log
8	0.9600	6.5095	FLOW_log TDS_log VSS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
8	0.9598	6.6656	FLOW_log TDS_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
8	0.9597	6.6825	Qt_log TDS_log COD_log BOD_log Turb_log Temp_log CondI_log Dryh_log
9	0.9643	6.1234	Qt_log TSS_log VDS_log VSS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
9	0.9641	6.2171	Qt_log TSS_log VDS_log VSS_log PH_log Turb_log Temp_log CondI_log Dryh_log
9	0.9635	6.5808	Qt_log TSS_log TDS_log COD_log BOD_log Turb_log Temp_log CondI_log Dryh_log
9	0.9634	6.6143	Qt_log TSS_log VDS_log TDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
9	0.9631	6.7566	Qt_log TSS_log TDS_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
9	0.9630	6.8453	Qt_log TSS_log TDS_log VSS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
9	0.9627	7.0107	Qt_log TSS_log TDS_log VSS_log BOD_log Turb_log Temp_log CondI_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cr_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
9	0.9627	7.0132	Runofft_log Qt_log TSS_log VDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
9	0.9627	7.0241	FLOW_log Qt_log TDS_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
9	0.9627	7.0273	Qt_log TSS_log VDS_log TDS_log COD_log Turb_log Temp_log CondI_log Dryh_log
9	0.9626	7.0786	Qt_log TSS_log VDS_log TDS_log VSS_log Turb_log Temp_log CondI_log Dryh_log
9	0.9623	7.2390	FLOW_log Qt_log TSS_log TDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
9	0.9623	7.2538	Qt_log TSS_log TDS_log COD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
9	0.9622	7.2668	FLOW_log Qt_log VDS_log TDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
9	0.9622	7.2973	Qt_log TSS_log TDS_log VSS_log PH_log Turb_log Temp_log CondI_log Dryh_log

9	0.9621	7.3357	FLOW_log Qt_log TDS_log COD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
10	0.9662	7.0377	Qt_log TSS_log VDS_log VSS_log PH_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
10	0.9657	7.3302	Qt_log TSS_log VDS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
10	0.9653	7.5622	Runofft_log Qt_log TSS_log VDS_log VSS_log PH_log Turb_log Temp_log CondI_log Dryh_log
10	0.9652	7.5724	Runofft_log Qt_log TSS_log VDS_log VSS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
10	0.9652	7.5973	Qt_log TSS_log VDS_log TDS_log VSS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
10	0.9652	7.6050	Qt_log TSS_log VDS_log VSS_log COD_log PH_log Turb_log Temp_log CondI_log Dryh_log
10	0.9652	7.6179	Qt_log TSS_log VDS_log TDS_log VSS_log PH_log Turb_log Temp_log CondI_log Dryh_log
10	0.9650	7.6949	Qt_log TSS_log VDS_log TDS_log COD_log BOD_log Turb_log Temp_log CondI_log Dryh_log
10	0.9650	7.7048	Qt_log TSS_log VDS_log VSS_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
10	0.9647	7.9024	Qt_log TSS_log TDS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
10	0.9646	7.9414	Qt_log TSS_log TDS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cr_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
10	0.9646	7.9510	Qt_log TSS_log VDS_log TDS_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
10	0.9645	7.9697	Qt_log TSS_log TDS_log VSS_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
10	0.9644	8.0421	Qt_log TSS_log VDS_log TDS_log VSS_log BOD_log Turb_log Temp_log CondI_log Dryh_log
10	0.9643	8.0799	FLOW_log Qt_log TSS_log VDS_log VSS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
10	0.9643	8.0961	Qt_log TSS_log VDS_log VSS_log COD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9673	8.3931	Qt_log TSS_log VDS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9673	8.4387	Qt_log TSS_log VDS_log TDS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
11	0.9671	8.5345	Runofft_log Qt_log TSS_log VDS_log VSS_log PH_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9671	8.5541	Qt_log TSS_log VDS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
11	0.9667	8.7535	Qt_log TSS_log VDS_log TDS_log VSS_log PH_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9666	8.8080	Qt_log TSS_log VDS_log TDS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
11	0.9666	8.8166	Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log PH_log Turb_log Temp_log CondI_log Dryh_log
11	0.9665	8.8816	Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Turb_log Temp_log CondI_log Dryh_log
11	0.9664	8.8997	Qt_log TSS_log VDS_log VSS_log COD_log PH_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9664	8.9018	Qt_log TSS_log VDS_log TDS_log VSS_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9664	8.9192	Runofft_log Qt_log TSS_log VDS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
11	0.9664	8.9199	FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log PH_log Turb_log Temp_log CondI_log Dryh_log
11	0.9662	9.0137	Qt_log TSS_log VDS_log VSS_log PH_log Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9662	9.0263	FLOW_log Qt_log TSS_log VDS_log VSS_log PH_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9662	9.0360	Qt_log TSS_log TDS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cr_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
11	0.9661	9.0818	FLOW_log Qt_log TSS_log VDS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
12	0.9690	9.4531	Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
12	0.9682	9.8835	Qt_log TSS_log VDS_log TDS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
12	0.9680	10.0470	Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
12	0.9679	10.0639	Runofft_log Qt_log TSS_log VDS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
12	0.9679	10.0881	FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
12	0.9678	10.1262	Qt_log TSS_log VDS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
12	0.9676	10.2263	Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
12	0.9676	10.2514	Qt_log TSS_log VDS_log VSS_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
12	0.9675	10.2813	FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log PH_log Turb_log Temp_log CondI_log Dryh_log
12	0.9675	10.2959	Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Turb_log Temp_log CondI_log Dryh_log
12	0.9675	10.3027	Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log PH_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
12	0.9674	10.3453	Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log PH_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
12	0.9674	10.3793	FLOW_log Qt_log TSS_log VDS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
12	0.9674	10.3854	FLOW_log Qt_log TSS_log VDS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
12	0.9673	10.4025	FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log PH_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
12	0.9673	10.4106	FLOW_log Qt_log TSS_log VDS_log TDS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
13	0.9695	11.1843	Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
13	0.9692	11.3332	FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
13	0.9692	11.3577	Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log

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The REG Procedure
Model: MODEL1
Dependent Variable: Cr_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
13	0.9691	11.4289	Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
13	0.9690	11.4529	FLOW_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
13	0.9686	11.6840	Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
13	0.9685	11.7159	Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
13	0.9684	11.7935	FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
13	0.9684	11.8061	Qt_log TSS_log VDS_log TDS_log VSS_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
13	0.9683	11.8748	FLOW_log Qt_log TSS_log VDS_log TDS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
13	0.9682	11.9190	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
13	0.9681	11.9893	Qt_log TSS_log VDS_log VSS_log COD_log PH_log Red_log BOD_log

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                                 Turb_log Temp_log CondI_log Alcal_log Dryh_log
13       0.9681    11.9915       Runofft_log Qt_log TSS_log VDS_log VSS_log PH_log Red_log BOD_log
                                 Turb_log Temp_log CondI_log Alcal_log Dryh_log
13       0.9680    12.0113       Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log
                                 Turb_log Temp_log CondI_log Alcal_log Dryh_log
13       0.9680    12.0363       Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log PH_log Red_log
                                 BOD_log Turb_log Temp_log CondI_log Dryh_log
13       0.9679    12.0829       FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log PH_log
                                 Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
-------------------------------------------------------------------------------------------
14       0.9698    13.0194       FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                 COD_log PH_log BOD_log Turb_log Temp_log CondI_log Dryh_log
14       0.9696    13.1048       Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log
                                 BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14       0.9695    13.1788       Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log
                                 Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
14       0.9693    13.2995       Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log
                                 BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14       0.9693    13.3076       FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                                 PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14       0.9692    13.3332       FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                                 PH_log Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
14       0.9692    13.3504       FLOW_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log
                                 BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
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                                      The REG Procedure
                                        Model: MODEL1
                                  Dependent Variable: Cr_log

                                   R-Square Selection Method


         R-Square       C(p)     Variables in Model

14       0.9691    13.4287       FLOW_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log
                                 Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
14       0.9687    13.6190       FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                 PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14       0.9687    13.6426       Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log PH_log Red_log
                                 BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14       0.9687    13.6547       Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log PH_log Red_log
                                 BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14       0.9684    13.7774       FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log PH_log
                                 Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14       0.9684    13.7922       FLOW_log Qt_log TSS_log VDS_log TDS_log VSS_log PH_log Red_log
                                 BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14       0.9682    13.9152       FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                 PH_log Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
14       0.9681    13.9723       FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                 COD_log PH_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14       0.9681    13.9756       FLOW_log Qt_log TSS_log VDS_log VSS_log COD_log PH_log Red_log
                                 BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
-------------------------------------------------------------------------------------------
15       0.9698    15.0050       FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                 COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                                 Dryh_log
15       0.9698    15.0188       FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                 COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log
                                 Dryh_log
15       0.9697    15.0812       Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log
                                 Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15       0.9693    15.2881       FLOW_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log
                                 Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15       0.9693    15.3038       FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                                 PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                                 Dryh_log
15       0.9688    15.5992       FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                 PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                                 Dryh_log
15       0.9681    15.9500       FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                 COD_log PH_log Red_log Turb_log Temp_log CondI_log Alcal_log
                                 Dryh_log
15       0.9677    16.1935       FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                                 PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                                 Dryh_log
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                                      The REG Procedure
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R-Square Selection Method

	R-Square	C(p)	Variables in Model
15	0.9675	16.3054	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9667	16.7693	FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9653	17.5489	FLOW_log Runofft_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9645	17.9809	FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9578	21.7769	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9538	24.0003	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
15	0.9509	25.6248	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
15	0.9209	42.5453	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
16	0.9698	17.0000	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cr_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
1	0.4117	154.1374	PH_log
1	0.3593	171.9711	CondI_log
1	0.2941	194.1498	Qt_log
1	0.1872	230.5246	Runofft_log
1	0.1207	253.1340	Temp_log
1	0.1002	260.1101	Red_log
1	0.0273	284.9401	Dryh_log
1	0.0085	291.3081	FLOW_log
2	0.7197	51.3653	PH_log Temp_log
2	0.6130	87.6485	Dryh_log PH_log
2	0.5566	106.8483	PH_log Red_log
2	0.5329	114.9255	Qt_log PH_log
2	0.4768	134.0051	Red_log Temp_log
2	0.4741	134.9152	CondI_log PH_log
2	0.4497	143.2209	Runofft_log PH_log
2	0.4468	144.2185	CondI_log Temp_log
2	0.4454	144.6670	FLOW_log PH_log
2	0.3852	165.1672	CondI_log Dryh_log
2	0.3818	166.3196	CondI_log FLOW_log
2	0.3672	171.2844	CondI_log Qt_log
2	0.3631	172.6864	CondI_log Red_log
2	0.3594	173.9399	CondI_log Runofft_log
2	0.3515	176.6368	Qt_log Red_log
2	0.3500	177.1404	Qt_log Temp_log
2	0.3176	188.1785	FLOW_log Qt_log
2	0.2993	194.3899	Runofft_log Temp_log
2	0.2973	195.0636	Runofft_log Qt_log
2	0.2941	196.1430	Dryh_log Qt_log
2	0.2166	222.5214	Runofft_log Red_log
2	0.2079	225.4707	Dryh_log Runofft_log
2	0.2067	225.8912	Dryh_log Red_log
2	0.1903	231.4562	FLOW_log Runofft_log
2	0.1277	252.7623	Dryh_log Temp_log
2	0.1268	253.0868	FLOW_log Red_log
2	0.1252	253.6328	FLOW_log Temp_log
2	0.0273	286.9203	Dryh_log FLOW_log
3	0.8570	6.6549	Dryh_log PH_log Temp_log
3	0.7476	43.8541	Qt_log PH_log Temp_log
3	0.7463	44.3235	FLOW_log PH_log Temp_log
3	0.7309	49.5430	Runofft_log PH_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cr_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.7271	50.8352	PH_log Red_log Temp_log
3	0.7223	52.4666	CondI_log PH_log Temp_log
3	0.7050	58.3730	Dryh_log PH_log Red_log
3	0.6347	82.2942	Dryh_log Qt_log PH_log
3	0.6259	85.2730	Qt_log PH_log Red_log
3	0.6226	86.4112	CondI_log Dryh_log PH_log
3	0.6212	86.8776	Dryh_log Runofft_log PH_log
3	0.6159	88.6927	Dryh_log FLOW_log PH_log
3	0.6057	92.1593	Runofft_log PH_log Red_log
3	0.5879	98.1908	CondI_log PH_log Red_log
3	0.5738	103.0060	Dryh_log Red_log Temp_log
3	0.5710	103.9488	FLOW_log PH_log Red_log
3	0.5695	104.4610	Qt_log Red_log Temp_log
3	0.5620	107.0173	Runofft_log Qt_log PH_log
3	0.5543	109.6400	CondI_log Red_log Temp_log

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         3      0.5382  115.1003  CondI_log Qt_log PH_log
         3      0.5329  116.8998  FLOW_log Qt_log PH_log
         3      0.5134  123.5583  FLOW_log Red_log Temp_log
         3      0.5068  125.7987  Runofft_log Red_log Temp_log
         3      0.4760  136.2704  CondI_log Runofft_log PH_log
         3      0.4755  136.4379  CondI_log FLOW_log PH_log
         3      0.4739  136.9898  FLOW_log Runofft_log PH_log
         3      0.4735  137.1302  CondI_log FLOW_log Temp_log
         3      0.4694  138.5344  CondI_log Dryh_log FLOW_log
         3      0.4552  143.3426  CondI_log Dryh_log Temp_log
         3      0.4473  146.0297  CondI_log Runofft_log Temp_log
         3      0.4470  146.1382  CondI_log Qt_log Temp_log
         3      0.4089  159.0969  CondI_log Dryh_log Red_log
         3      0.3969  163.1888  CondI_log FLOW_log Qt_log
         3      0.3865  166.7332  Runofft_log Qt_log Red_log
         3      0.3853  167.1435  CondI_log Dryh_log Qt_log
         3      0.3852  167.1671  CondI_log Dryh_log Runofft_log
         3      0.3831  167.8879  CondI_log FLOW_log Runofft_log
         3      0.3819  168.2990  CondI_log FLOW_log Red_log
         3      0.3787  169.3844  CondI_log Qt_log Red_log
         3      0.3721  171.6118  FLOW_log Qt_log Temp_log
         3      0.3717  171.7481  CondI_log Runofft_log Qt_log
         3      0.3706  172.1192  Dryh_log Qt_log Red_log
         3      0.3631  174.6796  CondI_log Runofft_log Red_log
         3      0.3585  176.2417  FLOW_log Qt_log Red_log
         3      0.3517  178.5559  Dryh_log Qt_log Temp_log
         3      0.3504  179.0116  FLOW_log Runofft_log Qt_log


                                  The REG Procedure
                                    Model: MODEL1
                             Dependent Variable: Cr_log

                              R-Square Selection Method

Number in
  Model    R-Square      C(p)  Variables in Model

         3      0.3502  179.0607  Runofft_log Qt_log Temp_log
         3      0.3245  187.8084  Dryh_log FLOW_log Qt_log
         3      0.3036  194.9416  Dryh_log Runofft_log Temp_log
         3      0.3003  196.0495  FLOW_log Runofft_log Temp_log
         3      0.2977  196.9235  Dryh_log Runofft_log Qt_log
         3      0.2806  202.7485  Dryh_log Runofft_log Red_log
         3      0.2275  220.8262  FLOW_log Runofft_log Red_log
         3      0.2084  227.3090  Dryh_log FLOW_log Runofft_log
         3      0.2067  227.8838  Dryh_log FLOW_log Red_log
         3      0.1285  254.5138  Dryh_log FLOW_log Temp_log
----------------------------------------------------------------------
         4      0.8623    6.8430  CondI_log Dryh_log PH_log Temp_log
         4      0.8586    8.0909  Dryh_log PH_log Red_log Temp_log
         4      0.8579    8.3334  Dryh_log FLOW_log PH_log Temp_log
         4      0.8576    8.4419  Dryh_log Runofft_log PH_log Temp_log
         4      0.8571    8.6267  Dryh_log Qt_log PH_log Temp_log
         4      0.7682   38.8559  CondI_log Qt_log PH_log Temp_log
         4      0.7554   43.2004  FLOW_log Qt_log PH_log Temp_log
         4      0.7533   43.9267  Qt_log PH_log Red_log Temp_log
         4      0.7531   44.0057  FLOW_log Runofft_log PH_log Temp_log
         4      0.7515   44.5321  Runofft_log Qt_log PH_log Temp_log
         4      0.7514   44.5911  CondI_log FLOW_log PH_log Temp_log
         4      0.7496   45.1973  FLOW_log PH_log Red_log Temp_log
         4      0.7428   47.5087  Runofft_log PH_log Red_log Temp_log
         4      0.7314   51.3875  CondI_log Runofft_log PH_log Temp_log
         4      0.7298   51.9290  CondI_log PH_log Red_log Temp_log
         4      0.7211   54.8940  Dryh_log Runofft_log PH_log Red_log
         4      0.7139   57.3501  Dryh_log Qt_log PH_log Red_log
         4      0.7116   58.1270  Dryh_log FLOW_log PH_log Red_log
         4      0.7078   59.4019  CondI_log Dryh_log PH_log Red_log
         4      0.6467   80.1957  Dryh_log FLOW_log Qt_log PH_log
         4      0.6387   82.9296  Dryh_log Runofft_log Qt_log PH_log
         4      0.6385   82.9925  CondI_log Dryh_log FLOW_log PH_log
         4      0.6360   83.8337  CondI_log Dryh_log Qt_log PH_log
         4      0.6311   85.5185  CondI_log Qt_log PH_log Red_log
         4      0.6263   87.1428  Runofft_log Qt_log PH_log Red_log
         4      0.6260   87.2453  FLOW_log Qt_log PH_log Red_log
         4      0.6244   87.7936  Dryh_log FLOW_log Runofft_log PH_log
         4      0.6240   87.9206  CondI_log Dryh_log Runofft_log PH_log
         4      0.6175   90.1431  CondI_log Dryh_log Red_log Temp_log
         4      0.6127   91.7620  FLOW_log Runofft_log PH_log Red_log
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4	0.6108	92.4091	Dryh_log Qt_log Red_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cr_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
4	0.6070	93.6957	CondI_log Runofft_log PH_log Red_log
4	0.5974	96.9602	Runofft_log Qt_log Red_log Temp_log
4	0.5882	100.0983	CondI_log FLOW_log PH_log Red_log
4	0.5841	101.4830	Dryh_log Runofft_log Red_log Temp_log
4	0.5758	104.3208	Dryh_log FLOW_log Red_log Temp_log
4	0.5729	105.3022	FLOW_log Runofft_log Qt_log PH_log
4	0.5720	105.6000	CondI_log Runofft_log Qt_log PH_log
4	0.5718	105.6801	CondI_log Qt_log Red_log Temp_log
4	0.5709	105.9784	FLOW_log Qt_log Red_log Temp_log
4	0.5548	111.4535	CondI_log FLOW_log Red_log Temp_log
4	0.5543	111.6397	CondI_log Runofft_log Red_log Temp_log
4	0.5400	116.4869	CondI_log FLOW_log Qt_log PH_log
4	0.5324	119.0773	FLOW_log Runofft_log Red_log Temp_log
4	0.5238	122.0176	CondI_log Dryh_log FLOW_log Temp_log
4	0.4850	135.1948	CondI_log Dryh_log FLOW_log Runofft_log
4	0.4797	137.0193	CondI_log FLOW_log Runofft_log PH_log
4	0.4759	138.2895	CondI_log FLOW_log Qt_log Temp_log
4	0.4757	138.3735	CondI_log Dryh_log FLOW_log Red_log
4	0.4741	138.9202	CondI_log FLOW_log Runofft_log Temp_log
4	0.4699	140.3561	CondI_log Dryh_log FLOW_log Qt_log
4	0.4563	144.9877	CondI_log Dryh_log Qt_log Temp_log
4	0.4555	145.2492	CondI_log Dryh_log Runofft_log Temp_log
4	0.4473	148.0287	CondI_log Runofft_log Qt_log Temp_log
4	0.4411	150.1541	CondI_log FLOW_log Runofft_log Qt_log
4	0.4330	152.9113	FLOW_log Runofft_log Qt_log Red_log
4	0.4109	160.4319	CondI_log Dryh_log Qt_log Red_log
4	0.4093	160.9572	CondI_log Dryh_log Runofft_log Red_log
4	0.3997	164.2139	CondI_log Runofft_log Qt_log Red_log
4	0.3984	164.6707	CondI_log FLOW_log Qt_log Red_log
4	0.3958	165.5506	Dryh_log Runofft_log Qt_log Red_log
4	0.3918	166.9342	Dryh_log FLOW_log Qt_log Red_log
4	0.3854	169.1096	CondI_log Dryh_log Runofft_log Qt_log
4	0.3832	169.8547	CondI_log FLOW_log Runofft_log Red_log
4	0.3819	170.2914	FLOW_log Runofft_log Qt_log Temp_log
4	0.3731	173.2653	Dryh_log FLOW_log Qt_log Temp_log
4	0.3528	180.1832	Dryh_log FLOW_log Runofft_log Qt_log
4	0.3517	180.5558	Dryh_log Runofft_log Qt_log Temp_log
4	0.3036	196.9395	Dryh_log FLOW_log Runofft_log Temp_log
4	0.2808	204.6698	Dryh_log FLOW_log Runofft_log Red_log
5	0.8702	6.1578	CondI_log Dryh_log Runofft_log PH_log Temp_log
5	0.8685	6.7418	CondI_log Dryh_log Qt_log PH_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cr_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
5	0.8637	8.3664	CondI_log Dryh_log PH_log Red_log Temp_log
5	0.8626	8.7601	CondI_log Dryh_log FLOW_log PH_log Temp_log
5	0.8610	9.2814	Dryh_log Runofft_log Qt_log PH_log Temp_log
5	0.8600	9.6311	Dryh_log FLOW_log PH_log Red_log Temp_log
5	0.8599	9.6677	Dryh_log Runofft_log PH_log Red_log Temp_log
5	0.8587	10.0604	Dryh_log Qt_log PH_log Red_log Temp_log
5	0.8586	10.0962	Dryh_log FLOW_log Runofft_log PH_log Temp_log
5	0.8579	10.3310	Dryh_log FLOW_log Qt_log PH_log Temp_log
5	0.7972	30.9961	CondI_log FLOW_log Qt_log PH_log Temp_log
5	0.7888	33.8554	CondI_log FLOW_log Runofft_log PH_log Temp_log
5	0.7747	38.6639	CondI_log Runofft_log Qt_log PH_log Temp_log
5	0.7720	39.5602	CondI_log Qt_log PH_log Red_log Temp_log
5	0.7592	43.9150	FLOW_log Runofft_log PH_log Red_log Temp_log
5	0.7592	43.9387	FLOW_log Qt_log PH_log Red_log Temp_log

5	0.7555	45.1723	FLOW_log Runofft_log Qt_log PH_log Temp_log
5	0.7543	45.5934	Runofft_log Qt_log PH_log Red_log Temp_log
5	0.7535	45.8506	CondI_log FLOW_log PH_log Red_log Temp_log
5	0.7443	48.9781	CondI_log Runofft_log PH_log Red_log Temp_log
5	0.7287	54.2839	Dryh_log FLOW_log Runofft_log PH_log Red_log
5	0.7281	54.5132	Dryh_log FLOW_log Qt_log PH_log Red_log
5	0.7248	55.6151	CondI_log Dryh_log FLOW_log PH_log Red_log
5	0.7226	56.3709	Dryh_log Runofft_log Qt_log PH_log Red_log
5	0.7225	56.4041	CondI_log Dryh_log Runofft_log PH_log Red_log
5	0.7153	58.8599	CondI_log Dryh_log Qt_log PH_log Red_log
5	0.6652	75.9076	Dryh_log FLOW_log Runofft_log Qt_log PH_log
5	0.6471	82.0775	CondI_log Dryh_log FLOW_log Qt_log PH_log
5	0.6413	84.0481	CondI_log Dryh_log Runofft_log Qt_log PH_log
5	0.6390	84.8342	CondI_log Dryh_log FLOW_log Runofft_log PH_log
5	0.6321	87.1510	CondI_log Runofft_log Qt_log PH_log Red_log
5	0.6316	87.3464	CondI_log FLOW_log Qt_log PH_log Red_log
5	0.6272	88.8458	CondI_log Dryh_log FLOW_log Red_log Temp_log
5	0.6270	88.9012	FLOW_log Runofft_log Qt_log PH_log Red_log
5	0.6254	89.4417	Dryh_log Runofft_log Qt_log Red_log Temp_log
5	0.6188	91.6916	CondI_log Dryh_log Qt_log Red_log Temp_log
5	0.6183	91.8678	CondI_log Dryh_log Runofft_log Red_log Temp_log
5	0.6134	93.5185	CondI_log FLOW_log Runofft_log PH_log Red_log
5	0.6121	93.9770	Dryh_log FLOW_log Qt_log Red_log Temp_log
5	0.6020	97.4107	FLOW_log Runofft_log Qt_log Red_log Temp_log
5	0.5974	98.9599	CondI_log Runofft_log Qt_log Red_log Temp_log
5	0.5854	103.0604	Dryh_log FLOW_log Runofft_log Red_log Temp_log
5	0.5770	105.9091	CondI_log FLOW_log Runofft_log Qt_log PH_log
5	0.5722	107.5380	CondI_log FLOW_log Qt_log Red_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cr_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
5	0.5549	113.4293	CondI_log FLOW_log Runofft_log Red_log Temp_log
5	0.5334	120.7440	CondI_log Dryh_log FLOW_log Runofft_log Temp_log
5	0.5270	122.9306	CondI_log Dryh_log FLOW_log Qt_log Temp_log
5	0.4979	132.8115	CondI_log Dryh_log FLOW_log Runofft_log Qt_log
5	0.4919	134.8597	CondI_log Dryh_log FLOW_log Runofft_log Red_log
5	0.4887	135.9671	CondI_log FLOW_log Runofft_log Qt_log Temp_log
5	0.4757	140.3724	CondI_log Dryh_log FLOW_log Qt_log Red_log
5	0.4612	145.3106	Dryh_log FLOW_log Runofft_log Qt_log Red_log
5	0.4603	145.6130	CondI_log Dryh_log Runofft_log Qt_log Temp_log
5	0.4577	146.4938	CondI_log FLOW_log Runofft_log Qt_log Red_log
5	0.4193	159.5558	CondI_log Dryh_log Runofft_log Qt_log Red_log
5	0.3823	172.1513	Dryh_log FLOW_log Runofft_log Qt_log Temp_log
6	0.8752	6.4728	CondI_log Dryh_log FLOW_log Runofft_log PH_log Temp_log
6	0.8741	6.8435	CondI_log Dryh_log Runofft_log PH_log Red_log Temp_log
6	0.8705	8.0573	CondI_log Dryh_log Runofft_log Qt_log PH_log Temp_log
6	0.8695	8.3987	CondI_log Dryh_log Qt_log PH_log Red_log Temp_log
6	0.8694	8.4182	CondI_log Dryh_log FLOW_log Qt_log PH_log Temp_log
6	0.8671	9.2203	Dryh_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.8638	10.3443	CondI_log Dryh_log FLOW_log PH_log Red_log Temp_log
6	0.8615	11.1323	Dryh_log FLOW_log Runofft_log PH_log Red_log Temp_log
6	0.8611	11.2608	Dryh_log FLOW_log Runofft_log Qt_log PH_log Temp_log
6	0.8600	11.6234	Dryh_log FLOW_log Qt_log PH_log Red_log Temp_log
6	0.7987	32.4981	CondI_log FLOW_log Runofft_log Qt_log PH_log Temp_log
6	0.7976	32.8458	CondI_log FLOW_log Qt_log PH_log Red_log Temp_log
6	0.7951	33.7150	CondI_log FLOW_log Runofft_log PH_log Red_log Temp_log
6	0.7754	40.4209	CondI_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.7596	45.7887	FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.7295	56.0318	CondI_log Dryh_log FLOW_log Runofft_log PH_log Red_log
6	0.7291	56.1548	Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log
6	0.7286	56.3399	CondI_log Dryh_log FLOW_log Qt_log PH_log Red_log
6	0.7229	58.2809	CondI_log Dryh_log Runofft_log Qt_log PH_log Red_log
6	0.6658	77.6960	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log
6	0.6388	86.8859	Dryh_log FLOW_log Runofft_log Qt_log Red_log Temp_log
6	0.6326	88.9916	CondI_log Dryh_log FLOW_log Runofft_log Red_log Temp_log
6	0.6322	89.1471	CondI_log FLOW_log Runofft_log Qt_log PH_log Red_log
6	0.6279	90.6082	CondI_log Dryh_log Runofft_log Qt_log Red_log Temp_log
6	0.6275	90.7284	CondI_log Dryh_log FLOW_log Qt_log Red_log Temp_log
6	0.6024	99.2782	CondI_log FLOW_log Runofft_log Qt_log Red_log Temp_log
6	0.5347	122.3112	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Temp_log

```
6     0.5199  127.3325  CondI_log Dryh_log FLOW_log Runofft_log Qt_log Red_log
```


The REG Procedure
Model: MODEL1
Dependent Variable: Cr_log

R-Square Selection Method

```
    R-Square      C(p)  Variables in Model

7     0.8783    7.4110  CondI_log Dryh_log FLOW_log Runofft_log PH_log Red_log Temp_log
7     0.8752    8.4503  CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Temp_log
7     0.8742    8.8088  CondI_log Dryh_log Runofft_log Qt_log PH_log Red_log Temp_log
7     0.8701   10.1975  CondI_log Dryh_log FLOW_log Qt_log PH_log Red_log Temp_log
7     0.8675   11.0838  Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
7     0.8004   33.9110  CondI_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
7     0.7296   58.0037  CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log
7     0.6496   85.1950  CondI_log Dryh_log FLOW_log Runofft_log Qt_log Red_log Temp_log
------------------------------------------------------------------------------------------
8     0.8795    9.0000  CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log
                        Temp_log
```

The REG Procedure
Model: MODEL1
Dependent Variable: Cu_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
1	0.8213	142.4130	BOD_log
1	0.7706	191.2659	TSS_log
1	0.7363	224.3974	CondI_log
1	0.7167	243.2551	VSS_log
1	0.7092	250.5599	PH_log
1	0.5864	368.9883	Runofft_log
1	0.5686	386.1751	Red_log
1	0.5094	443.2823	COD_log
1	0.4246	525.0569	Turb_log
1	0.4223	527.3331	Alcal_log
1	0.3978	550.9378	Qt_log
1	0.3425	604.2427	TDS_log
1	0.2647	679.3361	VDS_log
1	0.1518	788.2316	Dryh_log
1	0.1361	803.3674	Temp_log
1	0.0776	859.8507	FLOW_log
2	0.9458	24.3284	Temp_log CondI_log
2	0.9278	41.6808	TSS_log PH_log
2	0.9169	52.1241	VSS_log PH_log
2	0.9134	55.5711	Red_log CondI_log
2	0.9039	64.7323	Red_log BOD_log
2	0.9025	66.0853	PH_log Turb_log
2	0.8995	68.9492	VSS_log Red_log
2	0.8951	73.2240	CondI_log Dryh_log
2	0.8950	73.2613	BOD_log Dryh_log
2	0.8934	74.8796	BOD_log Temp_log
2	0.8922	75.9967	PH_log BOD_log
2	0.8881	79.9253	TSS_log Red_log
2	0.8880	80.0903	FLOW_log CondI_log
2	0.8815	86.3140	Red_log Alcal_log
2	0.8757	91.9042	PH_log CondI_log
2	0.8606	106.4812	TSS_log BOD_log
3	0.9564	16.0327	TSS_log Temp_log CondI_log
3	0.9536	18.7279	Red_log Temp_log CondI_log
3	0.9515	20.8334	VSS_log Temp_log CondI_log
3	0.9507	21.5886	FLOW_log Temp_log CondI_log
3	0.9506	21.6859	BOD_log Temp_log CondI_log
3	0.9490	23.1556	Temp_log CondI_log Dryh_log
3	0.9487	23.4466	Temp_log CondI_log Alcal_log
3	0.9474	24.6999	Turb_log Temp_log CondI_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cu_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.9473	24.8003	TDS_log Temp_log CondI_log
3	0.9470	25.1510	VDS_log Temp_log CondI_log
3	0.9467	25.4203	COD_log Temp_log CondI_log
3	0.9466	25.4795	PH_log Temp_log CondI_log
3	0.9459	26.1664	Runofft_log Temp_log CondI_log
3	0.9458	26.2470	Qt_log Temp_log CondI_log
3	0.9418	30.1822	PH_log CondI_log Dryh_log
3	0.9401	31.8064	COD_log PH_log Turb_log
4	0.9622	12.5046	Runofft_log TSS_log Temp_log CondI_log
4	0.9607	13.9339	TSS_log COD_log Temp_log CondI_log
4	0.9600	14.5668	PH_log Red_log Turb_log Dryh_log
4	0.9600	14.6224	TSS_log Red_log Temp_log CondI_log
4	0.9591	15.4743	VSS_log COD_log PH_log Turb_log
4	0.9590	15.5240	TSS_log BOD_log Temp_log CondI_log

4	0.9589	15.6729	TSS_log PH_log CondI_log Dryh_log
4	0.9588	15.7462	Qt_log TSS_log Temp_log CondI_log
4	0.9584	16.1531	TSS_log Temp_log CondI_log Alcal_log
4	0.9583	16.1901	TSS_log COD_log PH_log Turb_log
4	0.9577	16.7832	TSS_log PH_log Alcal_log Dryh_log
4	0.9573	17.1840	FLOW_log TSS_log Temp_log CondI_log
4	0.9573	17.2302	TSS_log Turb_log Temp_log CondI_log
4	0.9572	17.2522	TSS_log VDS_log Temp_log CondI_log
4	0.9572	17.2558	PH_log Turb_log Temp_log Dryh_log
4	0.9571	17.3456	TSS_log Temp_log CondI_log Dryh_log
5	0.9669	9.9556	Runofft_log TSS_log BOD_log Temp_log CondI_log
5	0.9663	10.5096	PH_log Red_log Turb_log Alcal_log Dryh_log
5	0.9658	11.0043	PH_log Red_log Turb_log CondI_log Dryh_log
5	0.9657	11.1184	Runofft_log TSS_log VSS_log Temp_log CondI_log
5	0.9652	11.5323	TSS_log COD_log BOD_log Temp_log CondI_log
5	0.9650	11.8032	COD_log PH_log Red_log Turb_log Dryh_log
5	0.9648	11.9174	TSS_log PH_log BOD_log Alcal_log Dryh_log
5	0.9647	12.0377	TSS_log COD_log PH_log BOD_log Turb_log
5	0.9646	12.1838	Runofft_log TSS_log Temp_log CondI_log Alcal_log
5	0.9644	12.3178	PH_log Red_log Turb_log Temp_log Dryh_log
5	0.9641	12.6207	PH_log Red_log BOD_log Turb_log Dryh_log
5	0.9633	13.4099	TSS_log PH_log BOD_log CondI_log Dryh_log
5	0.9629	13.7687	Runofft_log TSS_log Red_log Temp_log CondI_log
5	0.9629	13.8207	Runofft_log TSS_log PH_log Temp_log CondI_log
5	0.9628	13.9103	FLOW_log Runofft_log TSS_log Temp_log CondI_log
5	0.9627	13.9648	Runofft_log TSS_log COD_log Temp_log CondI_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cu_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
6	0.9718	7.1837	Runofft_log TSS_log COD_log PH_log BOD_log Turb_log
6	0.9714	7.5952	Runofft_log TSS_log VSS_log BOD_log Temp_log CondI_log
6	0.9690	9.9429	Runofft_log TSS_log BOD_log Temp_log CondI_log Alcal_log
6	0.9687	10.2196	COD_log PH_log Red_log BOD_log Turb_log Dryh_log
6	0.9684	10.5232	PH_log Red_log BOD_log Turb_log Alcal_log Dryh_log
6	0.9683	10.5554	Runofft_log TSS_log COD_log PH_log Turb_log Alcal_log
6	0.9681	10.8068	TSS_log PH_log Red_log Turb_log Alcal_log Dryh_log
6	0.9680	10.8299	FLOW_log Runofft_log TSS_log VSS_log Temp_log CondI_log
6	0.9679	10.9382	Runofft_log TSS_log COD_log BOD_log Temp_log CondI_log
6	0.9679	10.9886	TDS_log PH_log Red_log Turb_log Alcal_log Dryh_log
6	0.9678	11.0206	VDS_log PH_log Red_log Turb_log Alcal_log Dryh_log
6	0.9677	11.1277	Runofft_log TSS_log PH_log BOD_log Turb_log Alcal_log
6	0.9677	11.1674	COD_log PH_log Red_log Turb_log Alcal_log Dryh_log
6	0.9676	11.2349	TSS_log VDS_log COD_log PH_log BOD_log Turb_log
6	0.9676	11.2524	PH_log Red_log Turb_log CondI_log Alcal_log Dryh_log
6	0.9676	11.2679	Runofft_log TSS_log COD_log PH_log Turb_log CondI_log
7	0.9738	7.3116	Runofft_log TSS_log COD_log PH_log BOD_log Turb_log Alcal_log
7	0.9726	8.4155	Runofft_log TSS_log COD_log PH_log BOD_log Turb_log CondI_log
7	0.9725	8.4836	FLOW_log Runofft_log TSS_log VSS_log BOD_log Temp_log CondI_log
7	0.9725	8.5456	Runofft_log TSS_log VSS_log BOD_log Temp_log CondI_log Alcal_log
7	0.9724	8.6591	Runofft_log TSS_log COD_log PH_log Red_log BOD_log Turb_log
7	0.9723	8.7261	Runofft_log Qt_log TSS_log COD_log PH_log BOD_log Turb_log
7	0.9720	9.0002	Runofft_log TSS_log PH_log BOD_log Turb_log Alcal_log Dryh_log
7	0.9720	9.0503	Runofft_log TSS_log VSS_log COD_log BOD_log Temp_log CondI_log
7	0.9719	9.0710	Runofft_log TSS_log VSS_log Red_log BOD_log Temp_log CondI_log
7	0.9719	9.1112	Runofft_log TSS_log COD_log PH_log BOD_log Turb_log Temp_log
7	0.9719	9.1364	FLOW_log Runofft_log TSS_log COD_log PH_log BOD_log Turb_log
7	0.9719	9.1459	Runofft_log TSS_log TDS_log COD_log PH_log BOD_log Turb_log
7	0.9719	9.1473	Runofft_log TSS_log VSS_log COD_log PH_log BOD_log Turb_log
7	0.9719	9.1545	Runofft_log TSS_log VDS_log COD_log PH_log BOD_log Turb_log
7	0.9718	9.1830	Runofft_log TSS_log COD_log PH_log BOD_log Turb_log Dryh_log
7	0.9715	9.4904	Runofft_log TSS_log VSS_log BOD_log Turb_log Temp_log CondI_log
8	0.9753	7.7993	FLOW_log Runofft_log Qt_log PH_log Turb_log Temp_log Alcal_log Dryh_log
8	0.9746	8.5029	FLOW_log Runofft_log TSS_log COD_log PH_log BOD_log Turb_log Alcal_log
8	0.9746	8.5329	Runofft_log TSS_log COD_log PH_log BOD_log Turb_log Alcal_log Dryh_log
8	0.9745	8.5633	FLOW_log Runofft_log TSS_log VSS_log BOD_log Temp_log CondI_log

```
                    Alcal_log


                       The REG Procedure
                         Model: MODEL1
                 Dependent Variable: Cu_log

                  R-Square Selection Method


      R-Square      C(p)  Variables in Model

  8     0.9742    8.8721  Runofft_log TSS_log COD_log PH_log BOD_log Turb_log Temp_log
                          Alcal_log
  8     0.9742    8.8865  Runofft_log TSS_log VDS_log COD_log PH_log BOD_log Turb_log
                          Alcal_log
  8     0.9742    8.9070  Runofft_log TSS_log TDS_log COD_log PH_log BOD_log Turb_log
                          Alcal_log
  8     0.9741    9.0224  Runofft_log TSS_log VSS_log COD_log PH_log BOD_log Turb_log
                          Alcal_log
  8     0.9738    9.3068  Runofft_log TSS_log COD_log PH_log Red_log BOD_log Turb_log
                          Alcal_log
  8     0.9738    9.3092  Runofft_log Qt_log TSS_log COD_log PH_log BOD_log Turb_log
                          Alcal_log
  8     0.9738    9.3114  Runofft_log TSS_log COD_log PH_log BOD_log Turb_log CondI_log
                          Alcal_log
  8     0.9736    9.5023  Runofft_log TSS_log COD_log PH_log BOD_log Turb_log Temp_log
                          CondI_log
  8     0.9735    9.5350  Runofft_log TSS_log TDS_log COD_log PH_log BOD_log Turb_log
                          CondI_log
  8     0.9735    9.5863  Runofft_log TSS_log VSS_log COD_log PH_log BOD_log Turb_log
                          CondI_log
  8     0.9734    9.6981  Runofft_log TSS_log COD_log PH_log Red_log BOD_log Turb_log
                          Dryh_log
  8     0.9732    9.8432  FLOW_log Runofft_log TSS_log COD_log PH_log BOD_log Turb_log
                          CondI_log
-------------------------------------------------------------------------------------------
  9     0.9768    8.3667  FLOW_log Runofft_log Qt_log TSS_log COD_log PH_log BOD_log
                          Turb_log Alcal_log
  9     0.9768    8.4003  FLOW_log Runofft_log Qt_log PH_log BOD_log Turb_log Temp_log
                          Alcal_log Dryh_log
  9     0.9765    8.7093  FLOW_log Runofft_log Qt_log VDS_log PH_log Turb_log Temp_log
                          Alcal_log Dryh_log
  9     0.9763    8.9080  FLOW_log Runofft_log Qt_log TSS_log PH_log Turb_log Temp_log
                          Alcal_log Dryh_log
  9     0.9762    8.9693  FLOW_log Runofft_log Qt_log TSS_log PH_log BOD_log Turb_log
                          Alcal_log Dryh_log
  9     0.9761    9.0539  FLOW_log Runofft_log Qt_log TSS_log VSS_log BOD_log Temp_log
                          CondI_log Alcal_log
  9     0.9758    9.3475  FLOW_log Runofft_log Qt_log COD_log PH_log Turb_log Temp_log
                          Alcal_log Dryh_log
  9     0.9758    9.3753  FLOW_log Runofft_log Qt_log PH_log Red_log Turb_log Temp_log
                          Alcal_log Dryh_log


                       The REG Procedure
                         Model: MODEL1
                 Dependent Variable: Cu_log

                  R-Square Selection Method


      R-Square      C(p)  Variables in Model

  9     0.9754    9.7436  FLOW_log Runofft_log Qt_log TSS_log PH_log Turb_log CondI_log
                          Alcal_log Dryh_log
  9     0.9753    9.7868  FLOW_log Runofft_log Qt_log PH_log Turb_log Temp_log CondI_log
                          Alcal_log Dryh_log
  9     0.9753    9.7918  FLOW_log Runofft_log Qt_log VSS_log PH_log Turb_log Temp_log
                          Alcal_log Dryh_log
  9     0.9753    9.7991  FLOW_log Runofft_log Qt_log TDS_log PH_log Turb_log Temp_log
                          Alcal_log Dryh_log
  9     0.9753    9.8236  Runofft_log TSS_log COD_log PH_log Red_log BOD_log Turb_log
                          Temp_log CondI_log
  9     0.9753    9.8669  FLOW_log Runofft_log Qt_log VDS_log PH_log Red_log Turb_log
                          Alcal_log Dryh_log
  9     0.9752    9.9340  Runofft_log TSS_log COD_log PH_log Red_log BOD_log Turb_log
                          Alcal_log Dryh_log
  9     0.9752    9.9472  FLOW_log Runofft_log TSS_log COD_log PH_log BOD_log Turb_log
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			CondI_log Alcal_log
10	0.9789	8.3309	FLOW_log Runofft_log Qt_log TSS_log COD_log PH_log BOD_log Turb_log Alcal_log Dryh_log
10	0.9781	9.1268	FLOW_log Runofft_log Qt_log TSS_log PH_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
10	0.9778	9.3985	FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log Turb_log Temp_log Alcal_log Dryh_log
10	0.9778	9.4088	FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log BOD_log Turb_log Alcal_log
10	0.9777	9.5421	FLOW_log Runofft_log Qt_log COD_log PH_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
10	0.9776	9.5616	FLOW_log Runofft_log Qt_log VDS_log PH_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
10	0.9774	9.8027	FLOW_log Runofft_log Qt_log TSS_log PH_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
10	0.9774	9.8131	FLOW_log Runofft_log Qt_log TSS_log VSS_log PH_log Turb_log CondI_log Alcal_log Dryh_log
10	0.9773	9.8659	FLOW_log Runofft_log Qt_log TSS_log VDS_log COD_log PH_log BOD_log Turb_log Alcal_log
10	0.9773	9.9267	FLOW_log Runofft_log Qt_log TSS_log COD_log PH_log BOD_log Turb_log Temp_log Alcal_log
10	0.9772	10.0092	FLOW_log Runofft_log Qt_log TSS_log VSS_log PH_log Turb_log Temp_log Alcal_log Dryh_log
10	0.9772	10.0361	FLOW_log Runofft_log Qt_log TSS_log VSS_log BOD_log Turb_log Temp_log CondI_log Alcal_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cu_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
10	0.9771	10.0565	FLOW_log Runofft_log Qt_log TSS_log COD_log PH_log BOD_log Turb_log CondI_log Alcal_log
10	0.9771	10.0787	FLOW_log Runofft_log Qt_log VDS_log PH_log Red_log Turb_log Temp_log Alcal_log Dryh_log
10	0.9771	10.1237	FLOW_log Runofft_log Qt_log COD_log PH_log Red_log BOD_log Turb_log Alcal_log Dryh_log
10	0.9771	10.1344	FLOW_log Runofft_log Qt_log TSS_log VDS_log PH_log Turb_log Temp_log Alcal_log Dryh_log
11	0.9799	9.3859	FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
11	0.9798	9.4486	FLOW_log Runofft_log Qt_log TSS_log VSS_log PH_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
11	0.9797	9.6016	FLOW_log Runofft_log Qt_log TSS_log VSS_log PH_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
11	0.9795	9.7640	FLOW_log Runofft_log Qt_log TSS_log COD_log PH_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
11	0.9795	9.7988	FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log BOD_log Turb_log CondI_log Alcal_log
11	0.9794	9.8372	FLOW_log Runofft_log Qt_log TSS_log COD_log PH_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
11	0.9792	10.0402	FLOW_log Runofft_log Qt_log TSS_log VDS_log COD_log PH_log BOD_log Turb_log Alcal_log Dryh_log
11	0.9792	10.0885	FLOW_log Runofft_log Qt_log TSS_log COD_log PH_log Red_log BOD_log Turb_log Alcal_log Dryh_log
11	0.9791	10.1662	FLOW_log Runofft_log Qt_log TSS_log VSS_log COD_log PH_log BOD_log Turb_log Alcal_log Dryh_log
11	0.9790	10.2759	FLOW_log Runofft_log Qt_log TSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log
11	0.9789	10.3309	FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log BOD_log Turb_log Alcal_log Dryh_log
11	0.9786	10.6407	FLOW_log Runofft_log Qt_log TSS_log VSS_log COD_log BOD_log Turb_log Temp_log CondI_log Alcal_log
11	0.9786	10.6470	FLOW_log Runofft_log Qt_log TSS_log VDS_log PH_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
11	0.9786	10.6797	FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log PH_log Turb_log Temp_log Alcal_log Dryh_log
11	0.9784	10.8791	FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
11	0.9783	10.9416	FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log Red_log BOD_log Turb_log Alcal_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cu_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
12	0.9810	10.3446	FLOW_log Runofft_log Qt_log TSS_log VSS_log COD_log PH_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
12	0.9808	10.5570	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
12	0.9807	10.5999	FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log PH_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
12	0.9806	10.7577	FLOW_log Runofft_log Qt_log TSS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log
12	0.9804	10.9191	FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log PH_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
12	0.9803	11.0035	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log PH_log BOD_log Turb_log CondI_log Alcal_log
12	0.9803	11.0139	FLOW_log Runofft_log Qt_log TSS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
12	0.9802	11.0741	FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log PH_log BOD_log Turb_log CondI_log Alcal_log
12	0.9801	11.1673	FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log PH_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
12	0.9801	11.2123	FLOW_log Runofft_log Qt_log TSS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
12	0.9801	11.2124	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log PH_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
12	0.9800	11.2603	FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log Red_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
12	0.9800	11.2911	FLOW_log Runofft_log Qt_log TSS_log VSS_log PH_log Red_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
12	0.9800	11.3343	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
12	0.9799	11.3632	FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
12	0.9799	11.4320	FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
13	0.9813	12.0396	FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log PH_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
13	0.9813	12.0453	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log PH_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
13	0.9812	12.1389	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log PH_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
13	0.9811	12.1904	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log PH_log BOD_log Turb_log Temp_log Alcal_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cu_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
13	0.9811	12.2708	FLOW_log Runofft_log Qt_log TSS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
13	0.9810	12.2918	FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log PH_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
13	0.9810	12.3201	FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
13	0.9810	12.3435	FLOW_log Runofft_log Qt_log TSS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
13	0.9809	12.3938	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
13	0.9809	12.4459	FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log
13	0.9809	12.4687	FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
13	0.9808	12.4818	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log Red_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
13	0.9808	12.4975	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log

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                        BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
13      0.9808   12.5107  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                        COD_log PH_log BOD_log Turb_log CondI_log Alcal_log
13      0.9808   12.5412  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log PH_log
                        Red_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
13      0.9808   12.5460  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                        PH_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
-------------------------------------------------------------------------------------------
14      0.9821   13.2207  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                        COD_log PH_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
14      0.9817   13.6492  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                        COD_log PH_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
14      0.9815   13.8002  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                        COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log
14      0.9815   13.8368  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                        PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14      0.9815   13.8539  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                        PH_log Red_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
14      0.9814   13.9209  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                        PH_log Red_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
14      0.9813   14.0029  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                        PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14      0.9813   14.0053  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                        PH_log Red_log BOD_log Turb_log Temp_log Alcal_log Dryh_log


                               The REG Procedure
                                Model: MODEL1
                         Dependent Variable: Cu_log

                          R-Square Selection Method


     R-Square      C(p)   Variables in Model

14      0.9813   14.0061  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                        PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14      0.9812   14.1323  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                        PH_log Red_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
14      0.9812   14.1476  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                        PH_log Red_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
14      0.9811   14.2359  FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log
                        PH_log Red_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
14      0.9811   14.2380  FLOW_log Runofft_log Qt_log TSS_log VSS_log COD_log PH_log
                        Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14      0.9811   14.2539  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                        Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14      0.9811   14.2556  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                        PH_log Red_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
14      0.9810   14.2856  FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log
                        PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
-------------------------------------------------------------------------------------------
15      0.9824   15.0105  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                        COD_log PH_log Red_log BOD_log Turb_log CondI_log Alcal_log
                        Dryh_log
15      0.9822   15.1405  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                        COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                        Dryh_log
15      0.9818   15.6054  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                        COD_log PH_log Red_log BOD_log Turb_log Temp_log Alcal_log
                        Dryh_log
15      0.9817   15.6344  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                        COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log
                        Alcal_log
15      0.9816   15.7480  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                        PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                        Dryh_log
15      0.9815   15.8539  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                        PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                        Dryh_log
15      0.9815   15.8836  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                        PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                        Dryh_log
15      0.9811   16.1928  FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log
                        PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                        Dryh_log


                               The REG Procedure
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cu all.lst
Model: MODEL1
Dependent Variable: Cu_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
15	0.9811	16.2145	FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9799	17.3719	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9798	17.4463	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
15	0.9795	17.8221	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9786	18.6767	FLOW_log Runofft_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9771	20.0960	Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9770	20.2298	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9739	23.1676	FLOW_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
16	0.9824	17.0000	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cu_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
1	0.6276	257.6371	CondI_log
1	0.6242	260.3929	PH_log
1	0.4618	392.7904	Red_log
1	0.3670	470.0755	Runofft_log
1	0.2931	530.3410	Qt_log
1	0.1458	650.4080	Temp_log
1	0.1222	669.6028	Dryh_log
1	0.0000	769.2156	FLOW_log
2	0.8332	91.9581	CondI_log Temp_log
2	0.7666	146.2564	CondI_log PH_log
2	0.7655	147.2168	CondI_log Red_log
2	0.7537	156.7566	CondI_log Dryh_log
2	0.7320	174.4701	CondI_log FLOW_log
2	0.7262	179.2007	Runofft_log PH_log
2	0.7109	191.7188	Qt_log PH_log
2	0.6632	230.5537	CondI_log Qt_log
2	0.6610	232.4090	Qt_log Red_log
2	0.6504	241.0174	PH_log Temp_log
2	0.6381	251.0429	FLOW_log PH_log
2	0.6313	256.6080	CondI_log Runofft_log
2	0.6264	260.5697	Dryh_log PH_log
2	0.6263	260.6220	PH_log Red_log
2	0.6106	273.4814	Runofft_log Red_log
2	0.5784	299.7139	Dryh_log Qt_log
2	0.5533	320.1459	Qt_log Temp_log
2	0.5269	341.6621	Runofft_log Temp_log
2	0.5113	354.4233	Dryh_log Runofft_log
2	0.4853	375.5759	FLOW_log Red_log
2	0.4672	390.3538	Dryh_log Red_log
2	0.4622	394.4683	Red_log Temp_log
2	0.3693	470.2079	Runofft_log Qt_log
2	0.3690	470.4524	FLOW_log Runofft_log
2	0.3542	482.4934	FLOW_log Qt_log
2	0.2161	595.1152	Dryh_log Temp_log
2	0.1710	631.8076	Dryh_log FLOW_log
2	0.1470	651.3718	FLOW_log Temp_log
3	0.9251	19.0565	CondI_log FLOW_log Temp_log
3	0.8972	41.8272	CondI_log Dryh_log Temp_log
3	0.8698	64.1242	CondI_log PH_log Temp_log
3	0.8442	85.0542	CondI_log Red_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cu_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.8393	89.0131	CondI_log Qt_log Temp_log
3	0.8348	92.6792	CondI_log Runofft_log Temp_log
3	0.8079	114.5895	CondI_log Dryh_log Red_log
3	0.8039	117.8667	CondI_log Dryh_log PH_log
3	0.7953	124.8446	CondI_log FLOW_log Red_log
3	0.7895	129.6004	Qt_log PH_log Temp_log
3	0.7880	130.8548	CondI_log FLOW_log PH_log
3	0.7822	135.5446	CondI_log PH_log Red_log
3	0.7763	140.3345	CondI_log Runofft_log PH_log
3	0.7762	140.4741	CondI_log Dryh_log FLOW_log
3	0.7732	142.8922	Runofft_log PH_log Temp_log
3	0.7680	147.1578	CondI_log Qt_log PH_log
3	0.7671	147.8592	CondI_log Qt_log Red_log
3	0.7664	148.4736	CondI_log Runofft_log Red_log
3	0.7607	153.0832	CondI_log Dryh_log Runofft_log

3	0.7592	154.3371	Dryh_log Qt_log PH_log
3	0.7538	158.6775	CondI_log Dryh_log Qt_log
3	0.7513	160.7921	Dryh_log Qt_log Temp_log
3	0.7475	163.8814	CondI_log FLOW_log Qt_log
3	0.7424	167.9865	Dryh_log Runofft_log PH_log
3	0.7359	173.3027	Dryh_log Qt_log Red_log
3	0.7332	175.4915	CondI_log FLOW_log Runofft_log
3	0.7311	177.2320	FLOW_log Runofft_log PH_log
3	0.7289	179.0229	Runofft_log Qt_log PH_log
3	0.7269	180.6553	CondI_log Runofft_log Qt_log
3	0.7268	180.7013	Runofft_log PH_log Red_log
3	0.7258	181.5806	Qt_log PH_log Red_log
3	0.7122	192.6658	FLOW_log Qt_log PH_log
3	0.6968	205.1883	Qt_log Red_log Temp_log
3	0.6658	230.4577	FLOW_log PH_log Temp_log
3	0.6652	230.9595	FLOW_log Qt_log Red_log
3	0.6610	234.4053	Runofft_log Qt_log Red_log
3	0.6538	240.2811	Dryh_log FLOW_log PH_log
3	0.6531	240.7760	PH_log Red_log Temp_log
3	0.6509	242.5650	Dryh_log PH_log Temp_log
3	0.6427	249.2855	FLOW_log PH_log Red_log
3	0.6393	252.0567	Dryh_log Runofft_log Red_log
3	0.6290	260.4911	Runofft_log Red_log Temp_log
3	0.6279	261.3576	Dryh_log PH_log Red_log
3	0.6192	268.4353	FLOW_log Qt_log Temp_log
3	0.6181	269.3501	FLOW_log Runofft_log Red_log
3	0.6123	274.0914	Dryh_log Runofft_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cu_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.5825	298.3779	Dryh_log Runofft_log Qt_log
3	0.5784	301.6998	Dryh_log FLOW_log Qt_log
3	0.5699	308.6683	Runofft_log Qt_log Temp_log
3	0.5431	330.5229	Dryh_log FLOW_log Runofft_log
3	0.5272	343.4687	FLOW_log Runofft_log Temp_log
3	0.5142	354.0265	Dryh_log FLOW_log Red_log
3	0.4855	377.4417	FLOW_log Red_log Temp_log
3	0.4675	392.0871	Dryh_log Red_log Temp_log
3	0.3803	463.2219	FLOW_log Runofft_log Qt_log
3	0.2571	563.6419	Dryh_log FLOW_log Temp_log
4	0.9348	13.1896	CondI_log Dryh_log FLOW_log Temp_log
4	0.9312	16.1265	CondI_log FLOW_log Red_log Temp_log
4	0.9276	18.9905	CondI_log FLOW_log Runofft_log Temp_log
4	0.9255	20.7223	CondI_log FLOW_log PH_log Temp_log
4	0.9254	20.8354	CondI_log FLOW_log Qt_log Temp_log
4	0.9044	37.9596	CondI_log Dryh_log PH_log Temp_log
4	0.9007	40.9753	CondI_log Dryh_log Runofft_log Temp_log
4	0.8995	41.9235	CondI_log Dryh_log Qt_log Temp_log
4	0.8972	43.8265	CondI_log Dryh_log Red_log Temp_log
4	0.8742	62.5756	CondI_log Runofft_log PH_log Temp_log
4	0.8727	63.7816	CondI_log PH_log Red_log Temp_log
4	0.8700	66.0229	CondI_log Qt_log PH_log Temp_log
4	0.8570	76.5667	CondI_log Runofft_log Qt_log Temp_log
4	0.8462	85.3570	CondI_log Qt_log Red_log Temp_log
4	0.8452	86.1944	CondI_log Runofft_log Red_log Temp_log
4	0.8410	89.6282	Dryh_log Qt_log PH_log Temp_log
4	0.8162	109.8232	CondI_log Dryh_log FLOW_log Red_log
4	0.8143	111.4193	CondI_log Dryh_log PH_log Red_log
4	0.8142	111.4885	CondI_log Dryh_log Runofft_log PH_log
4	0.8109	114.1892	CondI_log Dryh_log Runofft_log Red_log
4	0.8098	115.0273	CondI_log Dryh_log Qt_log Red_log
4	0.8096	115.2147	CondI_log Dryh_log FLOW_log PH_log
4	0.8055	118.6070	CondI_log Dryh_log Qt_log PH_log
4	0.8014	121.8847	CondI_log FLOW_log PH_log Red_log
4	0.7977	124.9240	CondI_log Runofft_log Qt_log PH_log
4	0.7967	125.7695	FLOW_log Qt_log PH_log Temp_log
4	0.7967	125.7817	CondI_log FLOW_log Qt_log Red_log
4	0.7957	126.5182	CondI_log FLOW_log Runofft_log Red_log
4	0.7944	127.6481	Runofft_log Qt_log PH_log Temp_log
4	0.7903	130.9769	Qt_log PH_log Red_log Temp_log

4	0.7898	131.3898	CondI_log FLOW_log Runofft_log PH_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cu_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
4	0.7895	131.5763	CondI_log FLOW_log Qt_log PH_log
4	0.7883	132.5914	Runofft_log PH_log Red_log Temp_log
4	0.7880	132.8017	Dryh_log Qt_log Red_log Temp_log
4	0.7868	133.7939	CondI_log Runofft_log PH_log Red_log
4	0.7839	136.2002	Dryh_log Runofft_log PH_log Temp_log
4	0.7826	137.2418	CondI_log Qt_log PH_log Red_log
4	0.7785	140.6047	FLOW_log Runofft_log PH_log Temp_log
4	0.7769	141.9048	CondI_log Dryh_log FLOW_log Runofft_log
4	0.7769	141.9207	CondI_log Dryh_log FLOW_log Qt_log
4	0.7766	142.1263	CondI_log Runofft_log Qt_log Red_log
4	0.7721	145.7637	CondI_log Dryh_log Runofft_log Qt_log
4	0.7703	147.2626	Dryh_log Qt_log PH_log Red_log
4	0.7657	150.9994	Dryh_log FLOW_log Runofft_log PH_log
4	0.7629	153.2589	Dryh_log Runofft_log Qt_log PH_log
4	0.7611	154.7844	Dryh_log FLOW_log Qt_log PH_log
4	0.7574	157.7825	CondI_log FLOW_log Runofft_log Qt_log
4	0.7543	160.3480	Dryh_log FLOW_log Qt_log Temp_log
4	0.7529	161.4419	Dryh_log Runofft_log Qt_log Temp_log
4	0.7424	169.9843	Dryh_log Runofft_log PH_log Red_log
4	0.7407	171.3997	Dryh_log Runofft_log Qt_log Red_log
4	0.7374	174.0720	Dryh_log FLOW_log Qt_log Red_log
4	0.7328	177.7956	Runofft_log Qt_log PH_log Red_log
4	0.7326	178.0351	FLOW_log Runofft_log PH_log Red_log
4	0.7311	179.2125	FLOW_log Runofft_log Qt_log PH_log
4	0.7266	182.8992	FLOW_log Qt_log PH_log Red_log
4	0.7107	195.8754	FLOW_log Qt_log Red_log Temp_log
4	0.6969	207.1020	Runofft_log Qt_log Red_log Temp_log
4	0.6761	224.1002	Dryh_log FLOW_log PH_log Temp_log
4	0.6743	225.5335	Dryh_log FLOW_log Runofft_log Red_log
4	0.6670	231.4440	FLOW_log Runofft_log Qt_log Red_log
4	0.6667	231.7064	FLOW_log PH_log Red_log Temp_log
4	0.6599	237.2523	Dryh_log Runofft_log Red_log Temp_log
4	0.6567	239.9035	Dryh_log FLOW_log PH_log Red_log
4	0.6541	242.0288	Dryh_log PH_log Red_log Temp_log
4	0.6375	255.5558	Dryh_log FLOW_log Runofft_log Temp_log
4	0.6343	258.1171	FLOW_log Runofft_log Red_log Temp_log
4	0.6208	269.1376	FLOW_log Runofft_log Qt_log Temp_log
4	0.5835	299.5603	Dryh_log FLOW_log Runofft_log Qt_log
4	0.5142	356.0151	Dryh_log FLOW_log Red_log Temp_log
5	0.9434	8.1153	CondI_log Dryh_log FLOW_log Red_log Temp_log
5	0.9385	12.1503	CondI_log FLOW_log PH_log Red_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cu_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
5	0.9357	14.4216	CondI_log Dryh_log FLOW_log Qt_log Temp_log
5	0.9352	14.8185	CondI_log Dryh_log FLOW_log Runofft_log Temp_log
5	0.9348	15.1886	CondI_log Dryh_log FLOW_log PH_log Temp_log
5	0.9347	15.2106	CondI_log FLOW_log Runofft_log Red_log Temp_log
5	0.9327	16.8880	CondI_log FLOW_log Qt_log Red_log Temp_log
5	0.9294	19.5285	CondI_log FLOW_log Runofft_log Qt_log Temp_log
5	0.9276	20.9899	CondI_log FLOW_log Runofft_log PH_log Temp_log
5	0.9256	22.6236	CondI_log FLOW_log Qt_log PH_log Temp_log
5	0.9106	34.9022	CondI_log Dryh_log PH_log Red_log Temp_log
5	0.9092	36.0649	CondI_log Dryh_log Runofft_log PH_log Temp_log
5	0.9085	36.6347	CondI_log Dryh_log Qt_log PH_log Temp_log
5	0.9007	42.9290	CondI_log Dryh_log Runofft_log Red_log Temp_log
5	0.9007	42.9547	CondI_log Dryh_log Runofft_log Qt_log Temp_log
5	0.8996	43.8791	CondI_log Dryh_log Qt_log Red_log Temp_log

5	0.8809	59.0878	CondI_log Runofft_log Qt_log PH_log Temp_log
5	0.8794	60.2957	CondI_log Runofft_log PH_log Red_log Temp_log
5	0.8730	65.5306	CondI_log Qt_log PH_log Red_log Temp_log
5	0.8577	78.0328	CondI_log Runofft_log Qt_log Red_log Temp_log
5	0.8437	89.4457	Dryh_log Qt_log PH_log Red_log Temp_log
5	0.8412	91.4622	Dryh_log Runofft_log Qt_log PH_log Temp_log
5	0.8410	91.6044	Dryh_log FLOW_log Qt_log PH_log Temp_log
5	0.8202	108.6145	CondI_log Dryh_log Runofft_log PH_log Red_log
5	0.8198	108.9451	CondI_log Dryh_log FLOW_log PH_log Red_log
5	0.8171	111.0983	CondI_log Dryh_log Runofft_log Qt_log PH_log
5	0.8170	111.1839	CondI_log Dryh_log FLOW_log Qt_log Red_log
5	0.8168	111.3782	CondI_log Dryh_log Qt_log PH_log Red_log
5	0.8167	111.4484	CondI_log Dryh_log FLOW_log Runofft_log Red_log
5	0.8153	112.5902	CondI_log Dryh_log FLOW_log Runofft_log PH_log
5	0.8109	116.1886	CondI_log Dryh_log Runofft_log Qt_log Red_log
5	0.8102	116.7190	CondI_log Dryh_log FLOW_log Qt_log PH_log
5	0.8043	121.5343	Dryh_log Runofft_log PH_log Red_log Temp_log
5	0.8042	121.6483	Dryh_log FLOW_log Runofft_log PH_log Temp_log
5	0.8020	123.4428	CondI_log FLOW_log Qt_log PH_log Red_log
5	0.8016	123.7633	CondI_log FLOW_log Runofft_log PH_log Red_log
5	0.8016	123.7754	CondI_log FLOW_log Runofft_log Qt_log PH_log
5	0.7992	125.7339	CondI_log Runofft_log Qt_log PH_log Red_log
5	0.7989	125.9819	Runofft_log Qt_log PH_log Red_log Temp_log
5	0.7985	126.2659	FLOW_log Qt_log PH_log Red_log Temp_log
5	0.7971	127.3950	FLOW_log Runofft_log Qt_log PH_log Temp_log
5	0.7969	127.5654	CondI_log FLOW_log Runofft_log Qt_log Red_log
5	0.7957	128.5923	Dryh_log Runofft_log Qt_log Red_log Temp_log
5	0.7905	132.7965	FLOW_log Runofft_log PH_log Red_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cu_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
5	0.7882	134.6636	Dryh_log FLOW_log Qt_log Red_log Temp_log
5	0.7820	139.6849	CondI_log Dryh_log FLOW_log Runofft_log Qt_log
5	0.7725	147.4465	Dryh_log FLOW_log Qt_log PH_log Red_log
5	0.7704	149.1997	Dryh_log Runofft_log Qt_log PH_log Red_log
5	0.7703	149.2923	Dryh_log FLOW_log Runofft_log Qt_log PH_log
5	0.7659	152.8560	Dryh_log FLOW_log Runofft_log PH_log Red_log
5	0.7614	156.5587	Dryh_log FLOW_log Runofft_log Qt_log Temp_log
5	0.7407	173.3729	Dryh_log FLOW_log Runofft_log Qt_log Red_log
5	0.7337	179.1136	FLOW_log Runofft_log Qt_log PH_log Red_log
5	0.7191	190.9693	FLOW_log Runofft_log Qt_log Red_log Temp_log
5	0.6904	214.3798	Dryh_log FLOW_log Runofft_log Red_log Temp_log
5	0.6772	225.1548	Dryh_log FLOW_log PH_log Red_log Temp_log
6	0.9485	5.9663	CondI_log Dryh_log FLOW_log PH_log Red_log Temp_log
6	0.9442	9.4526	CondI_log Dryh_log FLOW_log Runofft_log Red_log Temp_log
6	0.9435	10.0442	CondI_log Dryh_log FLOW_log Qt_log Red_log Temp_log
6	0.9414	11.7551	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Temp_log
6	0.9393	13.5169	CondI_log FLOW_log Runofft_log PH_log Red_log Temp_log
6	0.9391	13.6448	CondI_log FLOW_log Qt_log PH_log Red_log Temp_log
6	0.9358	16.3615	CondI_log Dryh_log FLOW_log Qt_log PH_log Temp_log
6	0.9353	16.7812	CondI_log Dryh_log FLOW_log Runofft_log PH_log Temp_log
6	0.9350	16.9619	CondI_log FLOW_log Runofft_log Qt_log Red_log Temp_log
6	0.9294	21.5281	CondI_log FLOW_log Runofft_log Qt_log PH_log Temp_log
6	0.9191	29.9621	CondI_log Dryh_log Runofft_log PH_log Red_log Temp_log
6	0.9140	34.1366	CondI_log Dryh_log Qt_log PH_log Red_log Temp_log
6	0.9095	37.8140	CondI_log Dryh_log Runofft_log Qt_log PH_log Temp_log
6	0.9007	44.9249	CondI_log Dryh_log Runofft_log Qt_log Red_log Temp_log
6	0.8952	49.4390	CondI_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.8438	91.3056	Dryh_log FLOW_log Qt_log PH_log Red_log Temp_log
6	0.8438	91.3583	Dryh_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.8415	93.2407	Dryh_log FLOW_log Runofft_log Qt_log PH_log Temp_log
6	0.8220	109.0895	CondI_log Dryh_log FLOW_log Runofft_log PH_log Red_log
6	0.8210	109.9042	CondI_log Dryh_log FLOW_log Qt_log PH_log Red_log
6	0.8206	110.2878	CondI_log Dryh_log Runofft_log Qt_log PH_log Red_log
6	0.8192	111.4030	Dryh_log FLOW_log Runofft_log PH_log Red_log Temp_log
6	0.8176	112.7279	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log
6	0.8170	113.1817	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Red_log
6	0.8051	122.8753	CondI_log FLOW_log Runofft_log Qt_log PH_log Red_log
6	0.8006	126.5346	FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.8004	126.7494	Dryh_log FLOW_log Runofft_log Qt_log Red_log Temp_log

6	0.7743	147.9795	Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log

The REG Procedure
Model: MODEL1
Dependent Variable: Cu_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
7	0.9489	7.6929	CondI_log Dryh_log FLOW_log Qt_log PH_log Red_log Temp_log
7	0.9485	7.9645	CondI_log Dryh_log FLOW_log Runofft_log PH_log Red_log Temp_log
7	0.9472	9.0726	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Red_log Temp_log
7	0.9416	13.6236	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Temp_log
7	0.9393	15.5092	CondI_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
7	0.9198	31.3568	CondI_log Dryh_log Runofft_log Qt_log PH_log Red_log Temp_log
7	0.8439	93.2957	Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
7	0.8221	111.0596	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log
8	0.9497	9.0000	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log

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The REG Procedure
Model: MODEL1
Dependent Variable: Fe_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
1	0.7032	76.7090	COD_log
1	0.6100	110.2498	VDS_log
1	0.5938	116.0723	Runofft_log
1	0.5473	132.7966	Qt_log
1	0.5306	138.8023	BOD_log
1	0.5274	139.9231	TDS_log
1	0.4938	152.0113	CondI_log
1	0.4809	156.6665	TSS_log
1	0.4788	157.4255	PH_log
1	0.4013	185.2806	VSS_log
1	0.3377	208.1405	Turb_log
1	0.3175	215.4298	Alcal_log
1	0.3024	220.8287	Red_log
1	0.1216	285.8579	FLOW_log
1	0.0227	321.4138	Temp_log
1	0.0213	321.9232	Dryh_log
2	0.8358	31.0451	VDS_log COD_log
2	0.8149	38.5764	TDS_log COD_log
2	0.7922	46.7090	Qt_log COD_log
2	0.7831	49.9773	VDS_log Temp_log
2	0.7763	52.4335	VDS_log Red_log
2	0.7615	57.7751	COD_log Dryh_log
2	0.7584	58.8922	COD_log Alcal_log
2	0.7572	59.3213	FLOW_log COD_log
2	0.7514	61.4052	COD_log CondI_log
2	0.7487	62.3758	VDS_log PH_log
2	0.7398	65.5511	COD_log PH_log
2	0.7377	66.3253	Runofft_log COD_log
2	0.7327	68.1193	COD_log BOD_log
2	0.7269	70.1962	Qt_log Temp_log
2	0.7249	70.9246	COD_log Temp_log
2	0.7242	71.1776	Qt_log PH_log
3	0.8725	19.8290	TSS_log Temp_log Dryh_log
3	0.8558	25.8588	VDS_log COD_log PH_log
3	0.8523	27.1056	VDS_log COD_log Temp_log
3	0.8513	27.4862	PH_log Turb_log Dryh_log
3	0.8484	28.5018	COD_log PH_log Dryh_log
3	0.8478	28.7392	TSS_log Red_log Dryh_log
3	0.8474	28.8678	Qt_log Temp_log Dryh_log
3	0.8460	29.3871	VDS_log COD_log Red_log

The REG Procedure
Model: MODEL1
Dependent Variable: Fe_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.8390	31.8983	VDS_log COD_log Turb_log
3	0.8376	32.3887	Qt_log VDS_log COD_log
3	0.8372	32.5395	VDS_log VSS_log COD_log
3	0.8366	32.7378	VDS_log COD_log Alcal_log
3	0.8366	32.7597	TSS_log VDS_log COD_log
3	0.8362	32.9121	Runofft_log VDS_log COD_log
3	0.8362	32.9148	VDS_log COD_log Dryh_log
3	0.8360	32.9717	FLOW_log VDS_log COD_log
4	0.8894	15.7699	FLOW_log TSS_log Temp_log Dryh_log
4	0.8891	15.8938	TSS_log Temp_log CondI_log Dryh_log
4	0.8888	15.9854	Qt_log TSS_log Temp_log Dryh_log
4	0.8873	16.5411	PH_log Turb_log CondI_log Dryh_log
4	0.8871	16.5905	PH_log Turb_log Temp_log Dryh_log
4	0.8867	16.7240	TSS_log Temp_log Alcal_log Dryh_log

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4     0.8831   18.0476  TSS_log VDS_log Temp_log Dryh_log
4     0.8825   18.2388  TSS_log TDS_log Temp_log Dryh_log
4     0.8824   18.2979  TSS_log Turb_log Temp_log Dryh_log
4     0.8809   18.8421  TSS_log BOD_log Temp_log Dryh_log
4     0.8808   18.8683  TSS_log Red_log Temp_log Dryh_log
4     0.8807   18.8810  TSS_log COD_log Temp_log Dryh_log
4     0.8780   19.8597  Turb_log Temp_log CondI_log Dryh_log
4     0.8779   19.9032  TSS_log PH_log Temp_log Dryh_log
4     0.8766   20.3647  Qt_log Turb_log Temp_log Dryh_log
4     0.8756   20.7335  Qt_log COD_log Temp_log Dryh_log
-------------------------------------------------------------------
5     0.9047   12.2714  TSS_log PH_log Turb_log Temp_log Dryh_log
5     0.9027   12.9915  PH_log Red_log Turb_log Temp_log Dryh_log
5     0.9021   13.2134  TSS_log Turb_log Temp_log CondI_log Dryh_log
5     0.9012   13.5441  TSS_log PH_log Turb_log CondI_log Dryh_log
5     0.9007   13.7199  Qt_log PH_log Turb_log CondI_log Dryh_log
5     0.8996   14.0899  FLOW_log TSS_log Turb_log Temp_log Dryh_log
5     0.8985   14.5152  TSS_log TDS_log Turb_log Temp_log Dryh_log
5     0.8978   14.7457  Qt_log PH_log Turb_log Temp_log Dryh_log
5     0.8974   14.8810  Qt_log TSS_log Turb_log Temp_log Dryh_log
5     0.8966   15.1741  PH_log Red_log Turb_log CondI_log Dryh_log
5     0.8965   15.2066  FLOW_log TSS_log COD_log Temp_log Dryh_log
5     0.8961   15.3732  TSS_log Turb_log Temp_log Alcal_log Dryh_log
5     0.8956   15.5534  TSS_log COD_log Temp_log Alcal_log Dryh_log
5     0.8953   15.6449  Qt_log TDS_log Turb_log Temp_log Dryh_log
5     0.8953   15.6520  TSS_log VDS_log Turb_log Temp_log Dryh_log
5     0.8950   15.7570  TSS_log PH_log Temp_log CondI_log Dryh_log
```

The REG Procedure
Model: MODEL1
Dependent Variable: Fe_log

R-Square Selection Method

```
    R-Square      C(p)  Variables in Model

6     0.9132   11.2238  Qt_log PH_log Red_log Turb_log Temp_log Dryh_log
6     0.9128   11.3578  Runofft_log Qt_log TSS_log Turb_log Temp_log Dryh_log
6     0.9112   11.9448  TSS_log PH_log Red_log Turb_log Temp_log Dryh_log
6     0.9097   12.4711  VDS_log PH_log Red_log Turb_log Temp_log Dryh_log
6     0.9093   12.6288  Qt_log VDS_log PH_log Red_log Turb_log CondI_log
6     0.9092   12.6606  Qt_log PH_log Red_log Turb_log CondI_log Dryh_log
6     0.9089   12.7652  Runofft_log TSS_log PH_log Turb_log Temp_log Dryh_log
6     0.9074   13.3146  FLOW_log TSS_log TDS_log Turb_log Temp_log Dryh_log
6     0.9073   13.3485  Qt_log TSS_log PH_log Turb_log Temp_log Dryh_log
6     0.9070   13.4517  Runofft_log TSS_log Turb_log Temp_log CondI_log Dryh_log
6     0.9069   13.4864  TSS_log VSS_log PH_log Turb_log Temp_log Dryh_log
6     0.9067   13.5376  Qt_log TSS_log TDS_log Turb_log Temp_log Dryh_log
6     0.9064   13.6704  FLOW_log TSS_log PH_log Turb_log Temp_log Dryh_log
6     0.9060   13.8116  Qt_log TSS_log PH_log Turb_log CondI_log Dryh_log
6     0.9058   13.8580  TSS_log PH_log Turb_log Temp_log Alcal_log Dryh_log
6     0.9057   13.9183  TSS_log VDS_log PH_log Turb_log Temp_log Dryh_log
-------------------------------------------------------------------------------------
7     0.9243    9.2321  Runofft_log Qt_log VDS_log PH_log Red_log Turb_log CondI_log
7     0.9221    9.9994  Runofft_log Qt_log TSS_log VDS_log Turb_log Temp_log Dryh_log
7     0.9205   10.6035  Runofft_log Qt_log TSS_log PH_log Turb_log Temp_log Dryh_log
7     0.9204   10.6052  Runofft_log Qt_log TSS_log TDS_log Turb_log Temp_log Dryh_log
7     0.9187   11.2232  Qt_log VDS_log PH_log Red_log Turb_log Temp_log Dryh_log
7     0.9186   11.2739  Runofft_log Qt_log TSS_log Turb_log Temp_log Alcal_log Dryh_log
7     0.9181   11.4473  Runofft_log Qt_log TSS_log Turb_log Temp_log CondI_log Dryh_log
7     0.9173   11.7376  Runofft_log Qt_log TSS_log PH_log Turb_log CondI_log Dryh_log
7     0.9171   11.7939  Runofft_log Qt_log PH_log Red_log Turb_log Temp_log Dryh_log
7     0.9165   12.0296  Runofft_log Qt_log VDS_log PH_log Turb_log CondI_log Alcal_log
7     0.9161   12.1687  Qt_log PH_log Red_log BOD_log Turb_log Temp_log Dryh_log
7     0.9161   12.1866  Qt_log VDS_log PH_log Red_log Turb_log CondI_log Dryh_log
7     0.9158   12.2632  Runofft_log Qt_log TSS_log BOD_log Turb_log Temp_log Dryh_log
7     0.9157   12.3269  Qt_log TSS_log PH_log Red_log Turb_log Temp_log Dryh_log
7     0.9153   12.4701  Qt_log TDS_log PH_log Red_log Turb_log Temp_log Dryh_log
7     0.9145   12.7476  Qt_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
-------------------------------------------------------------------------------------
8     0.9354    7.2192  FLOW_log Runofft_log Qt_log VDS_log PH_log Turb_log CondI_log
                        Alcal_log
8     0.9303    9.0609  Runofft_log Qt_log VDS_log PH_log Red_log Turb_log CondI_log
                        Alcal_log
8     0.9286    9.6646  Runofft_log Qt_log VDS_log COD_log PH_log Red_log Turb_log
                        CondI_log
8     0.9270   10.2564  Runofft_log Qt_log VDS_log PH_log Red_log Turb_log Temp_log
```

Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Fe_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
8	0.9268	10.3140	FLOW_log Runofft_log Qt_log VDS_log Turb_log Temp_log Alcal_log Dryh_log
8	0.9263	10.4900	FLOW_log Runofft_log Qt_log PH_log Turb_log CondI_log Alcal_log Dryh_log
8	0.9263	10.5035	Runofft_log Qt_log VDS_log PH_log Red_log Turb_log CondI_log Dryh_log
8	0.9261	10.5814	FLOW_log Runofft_log Qt_log VDS_log PH_log Red_log Turb_log CondI_log
8	0.9259	10.6308	Runofft_log Qt_log VDS_log COD_log PH_log Turb_log CondI_log Alcal_log
8	0.9259	10.6476	Runofft_log Qt_log TSS_log PH_log Red_log Turb_log Temp_log Dryh_log
8	0.9256	10.7374	Runofft_log Qt_log TSS_log VDS_log Turb_log Temp_log Alcal_log Dryh_log
8	0.9256	10.7657	Runofft_log Qt_log VDS_log PH_log Red_log BOD_log Turb_log CondI_log
8	0.9253	10.8678	Runofft_log Qt_log TSS_log TDS_log VSS_log Turb_log Temp_log Dryh_log
8	0.9245	11.1361	Runofft_log Qt_log VDS_log PH_log Red_log Turb_log Temp_log CondI_log
8	0.9245	11.1554	Runofft_log Qt_log VDS_log VSS_log PH_log Red_log Turb_log CondI_log
8	0.9244	11.1761	Runofft_log Qt_log VDS_log TDS_log PH_log Red_log Turb_log CondI_log
9	0.9429	6.5269	FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log Turb_log CondI_log Alcal_log
9	0.9401	7.5425	FLOW_log Runofft_log Qt_log VDS_log PH_log Turb_log CondI_log Alcal_log Dryh_log
9	0.9400	7.5677	FLOW_log Runofft_log Qt_log VDS_log PH_log Red_log Turb_log CondI_log Alcal_log
9	0.9385	8.1227	FLOW_log Runofft_log Qt_log VDS_log PH_log Turb_log Temp_log CondI_log Alcal_log
9	0.9373	8.5297	Runofft_log Qt_log VDS_log COD_log PH_log Red_log Turb_log CondI_log Alcal_log
9	0.9368	8.7186	FLOW_log Runofft_log Qt_log VDS_log PH_log BOD_log Turb_log CondI_log Alcal_log
9	0.9363	8.9017	FLOW_log Runofft_log Qt_log VDS_log VSS_log PH_log Turb_log CondI_log Alcal_log
9	0.9358	9.1013	FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log Turb_log CondI_log Alcal_log

The REG Procedure
Model: MODEL1
Dependent Variable: Fe_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
9	0.9355	9.2033	FLOW_log Runofft_log Qt_log TSS_log VDS_log PH_log Turb_log CondI_log Alcal_log
9	0.9325	10.2678	FLOW_log Runofft_log Qt_log TSS_log VDS_log Turb_log Temp_log Alcal_log Dryh_log
9	0.9321	10.4242	Runofft_log Qt_log TSS_log VDS_log PH_log Red_log Turb_log Temp_log Dryh_log
9	0.9317	10.5743	Runofft_log Qt_log VDS_log PH_log Red_log BOD_log Turb_log CondI_log Alcal_log
9	0.9312	10.7214	Runofft_log Qt_log VDS_log PH_log Red_log Turb_log CondI_log Alcal_log Dryh_log
9	0.9311	10.7750	Runofft_log Qt_log TSS_log VDS_log COD_log PH_log Turb_log CondI_log Alcal_log
9	0.9311	10.7789	Runofft_log Qt_log VDS_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
9	0.9307	10.9364	Runofft_log Qt_log TSS_log VDS_log PH_log Red_log Turb_log

CondI_log Alcal_log

10	0.9465	7.2383	FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log Red_log Turb_log CondI_log Alcal_log
10	0.9451	7.7519	FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log Turb_log Temp_log CondI_log Alcal_log
10	0.9450	7.7948	FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log BOD_log Turb_log CondI_log Alcal_log
10	0.9438	8.2181	FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log Turb_log CondI_log Alcal_log Dryh_log
10	0.9436	8.2948	FLOW_log Runofft_log Qt_log VDS_log VSS_log COD_log PH_log Turb_log CondI_log Alcal_log
10	0.9433	8.3748	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log Turb_log CondI_log Alcal_log
10	0.9431	8.4506	FLOW_log Runofft_log Qt_log TSS_log VDS_log COD_log PH_log Turb_log CondI_log Alcal_log
10	0.9424	8.7035	FLOW_log Runofft_log Qt_log VDS_log PH_log Red_log BOD_log Turb_log CondI_log Alcal_log
10	0.9421	8.8075	FLOW_log Runofft_log Qt_log VDS_log PH_log Red_log Turb_log CondI_log Alcal_log Dryh_log
10	0.9420	8.8583	FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log Turb_log CondI_log Alcal_log Dryh_log
10	0.9413	9.0952	FLOW_log Runofft_log Qt_log VDS_log VSS_log PH_log Red_log Turb_log CondI_log Alcal_log
10	0.9413	9.0988	FLOW_log Runofft_log Qt_log VDS_log PH_log BOD_log Turb_log CondI_log Alcal_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Fe_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
10	0.9412	9.1524	FLOW_log Runofft_log Qt_log TSS_log VDS_log PH_log Turb_log CondI_log Alcal_log Dryh_log
10	0.9407	9.3384	FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log Red_log Turb_log CondI_log Alcal_log
10	0.9403	9.4613	FLOW_log Runofft_log Qt_log TSS_log VDS_log PH_log Red_log Turb_log CondI_log Alcal_log
10	0.9403	9.4657	FLOW_log Runofft_log Qt_log VDS_log PH_log Red_log Turb_log Temp_log CondI_log Alcal_log
11	0.9495	8.1449	FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log Red_log BOD_log Turb_log CondI_log Alcal_log
11	0.9475	8.8813	FLOW_log Runofft_log Qt_log VDS_log VSS_log COD_log PH_log Red_log Turb_log CondI_log Alcal_log
11	0.9472	8.9680	FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log PH_log Turb_log CondI_log Alcal_log
11	0.9472	8.9808	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log Red_log Turb_log CondI_log Alcal_log
11	0.9470	9.0426	FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log
11	0.9466	9.1855	FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Alcal_log
11	0.9465	9.2219	FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log Red_log Turb_log CondI_log Alcal_log Dryh_log
11	0.9465	9.2333	FLOW_log Runofft_log Qt_log TSS_log VDS_log COD_log PH_log Red_log Turb_log CondI_log Alcal_log
11	0.9463	9.3131	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log Turb_log Temp_log CondI_log Alcal_log
11	0.9456	9.5620	FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
11	0.9456	9.5701	FLOW_log Runofft_log Qt_log VDS_log VSS_log COD_log PH_log BOD_log Turb_log CondI_log Alcal_log
11	0.9455	9.6068	FLOW_log Runofft_log Qt_log TSS_log VDS_log COD_log PH_log Turb_log Temp_log CondI_log Alcal_log
11	0.9453	9.6546	FLOW_log Runofft_log Qt_log VDS_log VSS_log COD_log PH_log Turb_log Temp_log CondI_log Alcal_log
11	0.9453	9.6585	FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9451	9.7383	FLOW_log Runofft_log Qt_log TSS_log VDS_log COD_log PH_log BOD_log Turb_log CondI_log Alcal_log
11	0.9451	9.7391	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log BOD_log Turb_log CondI_log Alcal_log

```
                                  The REG Procedure
                                   Model: MODEL1
                             Dependent Variable: Fe_log

                              R-Square Selection Method


     R-Square      C(p)  Variables in Model

12     0.9506    9.7796  FLOW_log Runofft_log Qt_log VDS_log VSS_log COD_log PH_log
                         Red_log BOD_log Turb_log CondI_log Alcal_log
12     0.9501    9.9610  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                         PH_log Red_log Turb_log CondI_log Alcal_log
12     0.9498   10.0342  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                         Red_log BOD_log Turb_log CondI_log Alcal_log
12     0.9496   10.1384  FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log Red_log
                         BOD_log Turb_log Temp_log CondI_log Alcal_log
12     0.9495   10.1431  FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log Red_log
                         BOD_log Turb_log CondI_log Alcal_log Dryh_log
12     0.9495   10.1448  FLOW_log Runofft_log Qt_log TSS_log VDS_log COD_log PH_log
                         Red_log BOD_log Turb_log CondI_log Alcal_log
12     0.9488   10.4060  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                         PH_log BOD_log Turb_log CondI_log Alcal_log
12     0.9487   10.4541  FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log
                         PH_log Red_log Turb_log CondI_log Alcal_log
12     0.9486   10.4679  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                         PH_log Turb_log Temp_log CondI_log Alcal_log
12     0.9481   10.6530  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                         PH_log Turb_log CondI_log Alcal_log Dryh_log
12     0.9478   10.7861  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                         BOD_log Turb_log Temp_log CondI_log Alcal_log
12     0.9477   10.8209  FLOW_log Runofft_log Qt_log VDS_log VSS_log COD_log PH_log
                         Red_log Turb_log CondI_log Alcal_log Dryh_log
12     0.9476   10.8321  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                         Red_log Turb_log Temp_log CondI_log Alcal_log
12     0.9475   10.8651  FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log BOD_log
                         Turb_log Temp_log CondI_log Alcal_log Dryh_log
12     0.9475   10.8689  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                         Red_log Turb_log CondI_log Alcal_log Dryh_log
12     0.9475   10.8803  FLOW_log Runofft_log Qt_log VDS_log VSS_log COD_log PH_log
                         Red_log Turb_log Temp_log CondI_log Alcal_log
------------------------------------------------------------------------------------------
13     0.9525   11.0773  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                         PH_log Red_log BOD_log Turb_log CondI_log Alcal_log
13     0.9512   11.5514  FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log
                         PH_log Red_log BOD_log Turb_log CondI_log Alcal_log
13     0.9512   11.5637  FLOW_log Runofft_log Qt_log VDS_log VSS_log COD_log PH_log
                         Red_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
13     0.9506   11.7624  FLOW_log Runofft_log Qt_log VDS_log VSS_log COD_log PH_log
                         Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                                                  11:56 Tuesday, November 25, 2003   8

                                  The REG Procedure
                                   Model: MODEL1
                             Dependent Variable: Fe_log

                              R-Square Selection Method


     R-Square      C(p)  Variables in Model

13     0.9502   11.8984  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                         COD_log PH_log Red_log Turb_log CondI_log Alcal_log
13     0.9502   11.9127  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                         PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log
13     0.9501   11.9558  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                         PH_log Red_log Turb_log Temp_log CondI_log Alcal_log
13     0.9501   11.9602  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                         PH_log Red_log Turb_log CondI_log Alcal_log Dryh_log
13     0.9500   11.9969  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                         Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
13     0.9499   12.0067  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                         PH_log Red_log BOD_log Turb_log CondI_log Alcal_log
13     0.9499   12.0242  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                         Red_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
13     0.9496   12.1057  FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log Red_log
                         BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
13     0.9496   12.1381  FLOW_log Runofft_log Qt_log TSS_log VDS_log COD_log PH_log
```

```
                           Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
13       0.9495   12.1413  FLOW_log Runofft_log Qt_log TSS_log VDS_log COD_log PH_log
                           Red_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
13       0.9495   12.1746  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                           PH_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
13       0.9488   12.3949  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                           COD_log PH_log BOD_log Turb_log CondI_log Alcal_log
-------------------------------------------------------------------------------------------
14       0.9526   13.0335  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                           PH_log Red_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
14       0.9526   13.0619  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                           COD_log PH_log Red_log BOD_log Turb_log CondI_log Alcal_log
14       0.9525   13.0709  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                           PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
14       0.9516   13.4129  FLOW_log Runofft_log Qt_log VDS_log VSS_log COD_log PH_log
                           Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14       0.9515   13.4490  FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log
                           PH_log Red_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
14       0.9512   13.5514  FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log
                           PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
14       0.9504   13.8303  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                           PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14       0.9503   13.8808  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                           COD_log PH_log Red_log Turb_log Temp_log CondI_log Alcal_log
                                                     11:56 Tuesday, November 25, 2003

                                 The REG Procedure
                                  Model: MODEL1
                            Dependent Variable: Fe_log

                             R-Square Selection Method


     R-Square       C(p)  Variables in Model

14       0.9502   13.8921  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                           COD_log PH_log Red_log Turb_log CondI_log Alcal_log Dryh_log
14       0.9502   13.8972  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                           COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log
14       0.9501   13.9529  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                           PH_log Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14       0.9500   13.9803  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                           PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
14       0.9500   13.9900  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                           Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14       0.9499   14.0065  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                           PH_log Red_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
14       0.9497   14.0888  FLOW_log Runofft_log Qt_log TSS_log VDS_log COD_log PH_log
                           Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14       0.9495   14.1727  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                           COD_log PH_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
------------------------------------------------------------------------------------------
15       0.9527   15.0087  FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                           PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                           Dryh_log
15       0.9526   15.0277  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                           COD_log PH_log Red_log BOD_log Turb_log CondI_log Alcal_log
                           Dryh_log
15       0.9526   15.0595  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                           COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log
                           Alcal_log
15       0.9519   15.3054  FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log
                           PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                           Dryh_log
15       0.9504   15.8186  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                           COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                           Dryh_log
15       0.9503   15.8784  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                           COD_log PH_log Red_log Turb_log Temp_log CondI_log Alcal_log
                           Dryh_log
15       0.9501   15.9388  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                           PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                           Dryh_log
15       0.9487   16.4454  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                           COD_log PH_log Red_log BOD_log Turb_log Temp_log Alcal_log
                           Dryh_log


                                 The REG Procedure
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fe all.lst
Model: MODEL1
Dependent Variable: Fe_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
15	0.9471	17.0261	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9444	17.9854	Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9434	18.3700	FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9426	18.6550	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9408	19.2735	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
15	0.9347	21.4913	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9315	22.6252	FLOW_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9287	23.6210	FLOW_log Runofft_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
16	0.9527	17.0000	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Fe_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
1	0.4826	57.5129	Runofft_log
1	0.4735	59.3361	Qt_log
1	0.4595	62.1356	PH_log
1	0.4501	64.0185	CondI_log
1	0.2210	109.8639	Red_log
1	0.0183	150.4179	Temp_log
1	0.0026	153.5687	Dryh_log
1	0.0011	153.8611	FLOW_log
2	0.6995	16.1178	Qt_log PH_log
2	0.6753	20.9570	Runofft_log PH_log
2	0.6126	33.5013	Qt_log Red_log
2	0.6034	35.3596	FLOW_log Qt_log
2	0.5780	40.4235	PH_log Temp_log
2	0.5572	44.6000	CondI_log PH_log
2	0.5498	46.0750	CondI_log FLOW_log
2	0.5461	46.8137	CondI_log Runofft_log
2	0.5446	47.1200	Dryh_log Qt_log
2	0.5375	48.5335	Runofft_log Red_log
2	0.5163	52.7699	Runofft_log Qt_log
2	0.5124	53.5490	Dryh_log PH_log
2	0.5083	54.3828	CondI_log Qt_log
2	0.4958	56.8803	Runofft_log Temp_log
2	0.4911	57.8160	FLOW_log Runofft_log
2	0.4898	58.0743	Dryh_log Runofft_log
2	0.4891	58.2251	CondI_log Red_log
2	0.4854	58.9532	PH_log Red_log
2	0.4737	61.3021	Qt_log Temp_log
2	0.4634	63.3655	FLOW_log PH_log
2	0.4560	64.8526	CondI_log Temp_log
2	0.4532	65.4075	CondI_log Dryh_log
2	0.4324	69.5683	Red_log Temp_log
2	0.2464	106.7823	Dryh_log Red_log
2	0.2256	110.9484	FLOW_log Red_log
2	0.0257	150.9453	Dryh_log Temp_log
2	0.0202	152.0423	FLOW_log Temp_log
2	0.0026	155.5563	Dryh_log FLOW_log
3	0.7495	8.1193	Runofft_log PH_log Temp_log
3	0.7460	8.8274	FLOW_log Qt_log PH_log
3	0.7345	11.1195	Qt_log PH_log Temp_log
3	0.7298	12.0691	CondI_log Qt_log PH_log

The REG Procedure
Model: MODEL1
Dependent Variable: Fe_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.7127	15.4838	Runofft_log PH_log Red_log
3	0.7101	16.0065	Runofft_log Qt_log PH_log
3	0.7014	17.7500	Qt_log PH_log Red_log
3	0.6997	18.0912	Dryh_log Qt_log PH_log
3	0.6904	19.9513	Dryh_log Runofft_log PH_log
3	0.6796	22.1083	FLOW_log Qt_log Red_log
3	0.6780	22.4294	Qt_log Red_log Temp_log
3	0.6756	22.9093	CondI_log Runofft_log PH_log
3	0.6754	22.9393	FLOW_log Runofft_log PH_log
3	0.6483	28.3709	CondI_log FLOW_log Qt_log
3	0.6350	31.0319	Runofft_log Red_log Temp_log
3	0.6221	33.5999	Dryh_log Qt_log Red_log
3	0.6185	34.3396	CondI_log PH_log Temp_log
3	0.6166	34.7185	Dryh_log FLOW_log Qt_log
3	0.6143	35.1734	Runofft_log Qt_log Red_log

3	0.6133	35.3697	CondI_log Qt_log Red_log
3	0.6108	35.8678	Dryh_log PH_log Temp_log
3	0.6037	37.2824	FLOW_log Qt_log Temp_log
3	0.6034	37.3520	FLOW_log Runofft_log Qt_log
3	0.6017	37.6954	CondI_log FLOW_log Runofft_log
3	0.5848	41.0694	CondI_log FLOW_log PH_log
3	0.5805	41.9387	FLOW_log PH_log Temp_log
3	0.5794	42.1494	PH_log Red_log Temp_log
3	0.5758	42.8803	CondI_log Runofft_log Red_log
3	0.5735	43.3277	CondI_log Dryh_log PH_log
3	0.5714	43.7444	CondI_log Dryh_log FLOW_log
3	0.5672	44.5877	CondI_log PH_log Red_log
3	0.5593	46.1832	CondI_log Red_log Temp_log
3	0.5580	46.4313	CondI_log FLOW_log Temp_log
3	0.5562	46.8015	Dryh_log Runofft_log Qt_log
3	0.5544	47.1549	CondI_log Runofft_log Temp_log
3	0.5534	47.3548	CondI_log FLOW_log Red_log
3	0.5517	47.6925	CondI_log Dryh_log Runofft_log
3	0.5508	47.8680	CondI_log Dryh_log Qt_log
3	0.5482	48.4012	CondI_log Runofft_log Qt_log
3	0.5461	48.8217	Dryh_log Qt_log Temp_log
3	0.5386	50.3250	FLOW_log Runofft_log Red_log
3	0.5383	50.3824	Dryh_log Runofft_log Red_log
3	0.5270	52.6366	Dryh_log PH_log Red_log
3	0.5190	54.2374	Runofft_log Qt_log Temp_log
3	0.5166	54.7164	Dryh_log FLOW_log PH_log
3	0.5092	56.1952	Dryh_log Runofft_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Fe_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.5086	56.3282	CondI_log Qt_log Temp_log
3	0.5059	56.8491	FLOW_log Runofft_log Temp_log
3	0.4930	59.4406	Dryh_log FLOW_log Runofft_log
3	0.4908	59.8831	CondI_log Dryh_log Red_log
3	0.4867	60.7094	FLOW_log PH_log Red_log
3	0.4617	65.6961	CondI_log Dryh_log Temp_log
3	0.4544	67.1726	Dryh_log Red_log Temp_log
3	0.4403	69.9880	FLOW_log Red_log Temp_log
3	0.2465	108.7565	Dryh_log FLOW_log Red_log
3	0.0257	152.9449	Dryh_log FLOW_log Temp_log
4	0.7760	4.8093	CondI_log Qt_log PH_log Temp_log
4	0.7693	6.1565	FLOW_log Qt_log PH_log Temp_log
4	0.7580	8.4222	Dryh_log Runofft_log PH_log Temp_log
4	0.7575	8.5276	Runofft_log Qt_log PH_log Temp_log
4	0.7564	8.7335	CondI_log Runofft_log PH_log Temp_log
4	0.7548	9.0687	CondI_log FLOW_log Qt_log PH_log
4	0.7515	9.7276	Runofft_log PH_log Red_log Temp_log
4	0.7506	9.9000	Dryh_log FLOW_log Qt_log PH_log
4	0.7497	10.0863	FLOW_log Runofft_log PH_log Temp_log
4	0.7490	10.2118	FLOW_log Qt_log PH_log Red_log
4	0.7464	10.7364	FLOW_log Runofft_log Qt_log PH_log
4	0.7385	12.3128	Qt_log PH_log Red_log Temp_log
4	0.7357	12.8735	CondI_log Runofft_log Qt_log PH_log
4	0.7346	13.1101	Dryh_log Qt_log PH_log Temp_log
4	0.7315	13.7152	CondI_log Qt_log PH_log Red_log
4	0.7308	13.8674	CondI_log Dryh_log Qt_log PH_log
4	0.7221	15.6031	Runofft_log Qt_log PH_log Red_log
4	0.7198	16.0588	Dryh_log Runofft_log PH_log Red_log
4	0.7178	16.4572	FLOW_log Qt_log Red_log Temp_log
4	0.7151	16.9943	CondI_log Runofft_log PH_log Red_log
4	0.7148	17.0615	FLOW_log Runofft_log PH_log Red_log
4	0.7108	17.8720	Dryh_log Runofft_log Qt_log PH_log
4	0.7016	19.7058	Dryh_log Qt_log PH_log Red_log
4	0.6968	20.6555	Dryh_log FLOW_log Runofft_log PH_log
4	0.6925	21.5193	FLOW_log Runofft_log Qt_log Red_log
4	0.6907	21.8857	CondI_log Dryh_log Runofft_log PH_log
4	0.6867	22.6754	CondI_log Qt_log Red_log Temp_log
4	0.6826	23.4954	CondI_log FLOW_log Qt_log Red_log
4	0.6820	23.6201	Dryh_log Qt_log Red_log Temp_log
4	0.6806	23.8979	Runofft_log Qt_log Red_log Temp_log

4	0.6796	24.1075	Dryh_log FLOW_log Qt_log Red_log

The REG Procedure
Model: MODEL1
Dependent Variable: Fe_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
4	0.6763	24.7572	CondI_log FLOW_log Runofft_log PH_log
4	0.6490	30.2208	CondI_log FLOW_log Runofft_log Qt_log
4	0.6485	30.3332	CondI_log FLOW_log Qt_log Temp_log
4	0.6483	30.3658	CondI_log Dryh_log FLOW_log Qt_log
4	0.6447	31.0902	CondI_log Runofft_log Red_log Temp_log
4	0.6367	32.6803	Dryh_log Runofft_log Red_log Temp_log
4	0.6350	33.0319	FLOW_log Runofft_log Red_log Temp_log
4	0.6334	33.3454	CondI_log Dryh_log PH_log Temp_log
4	0.6298	34.0676	CondI_log FLOW_log PH_log Temp_log
4	0.6295	34.1226	CondI_log Dryh_log FLOW_log PH_log
4	0.6245	35.1300	CondI_log Dryh_log Qt_log Red_log
4	0.6225	35.5363	Dryh_log Runofft_log Qt_log Red_log
4	0.6198	36.0729	CondI_log PH_log Red_log Temp_log
4	0.6174	36.5507	Dryh_log FLOW_log Runofft_log Qt_log
4	0.6166	36.7106	Dryh_log FLOW_log Qt_log Temp_log
4	0.6145	37.1316	CondI_log Runofft_log Qt_log Red_log
4	0.6144	37.1508	Dryh_log PH_log Red_log Temp_log
4	0.6134	37.3595	Dryh_log FLOW_log PH_log Temp_log
4	0.6114	37.7416	CondI_log FLOW_log Runofft_log Temp_log
4	0.6090	38.2267	CondI_log Dryh_log FLOW_log Runofft_log
4	0.6071	38.6176	CondI_log FLOW_log Runofft_log Red_log
4	0.6040	39.2380	FLOW_log Runofft_log Qt_log Temp_log
4	0.5971	40.6108	CondI_log FLOW_log PH_log Red_log
4	0.5878	42.4734	CondI_log FLOW_log Red_log Temp_log
4	0.5827	43.4857	CondI_log Dryh_log FLOW_log Red_log
4	0.5827	43.5013	FLOW_log PH_log Red_log Temp_log
4	0.5808	43.8775	CondI_log Dryh_log PH_log Red_log
4	0.5758	44.8690	CondI_log Dryh_log Runofft_log Red_log
4	0.5744	45.1629	CondI_log Dryh_log FLOW_log Temp_log
4	0.5658	46.8680	CondI_log Dryh_log Runofft_log Qt_log
4	0.5645	47.1401	CondI_log Dryh_log Runofft_log Temp_log
4	0.5633	47.3729	CondI_log Dryh_log Red_log Temp_log
4	0.5607	47.8898	Dryh_log Runofft_log Qt_log Temp_log
4	0.5545	49.1275	CondI_log Runofft_log Qt_log Temp_log
4	0.5529	49.4542	CondI_log Dryh_log Qt_log Temp_log
4	0.5409	51.8638	Dryh_log FLOW_log Runofft_log Red_log
4	0.5328	53.4829	Dryh_log FLOW_log PH_log Red_log
4	0.5115	57.7403	Dryh_log FLOW_log Runofft_log Temp_log
4	0.4547	69.1012	Dryh_log FLOW_log Red_log Temp_log
5	0.7924	3.5420	CondI_log Runofft_log Qt_log PH_log Temp_log
5	0.7875	4.5266	CondI_log FLOW_log Qt_log PH_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Fe_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
5	0.7830	5.4123	CondI_log Qt_log PH_log Red_log Temp_log
5	0.7769	6.6295	CondI_log Dryh_log Qt_log PH_log Temp_log
5	0.7732	7.3750	Dryh_log FLOW_log Qt_log PH_log Temp_log
5	0.7713	7.7587	FLOW_log Runofft_log Qt_log PH_log Temp_log
5	0.7703	7.9557	FLOW_log Qt_log PH_log Red_log Temp_log
5	0.7699	8.0372	CondI_log Dryh_log Runofft_log PH_log Temp_log
5	0.7625	9.5133	Dryh_log FLOW_log Runofft_log PH_log Temp_log
5	0.7613	9.7667	CondI_log FLOW_log Runofft_log PH_log Temp_log
5	0.7602	9.9842	Dryh_log Runofft_log Qt_log PH_log Temp_log
5	0.7598	10.0498	CondI_log Runofft_log PH_log Red_log Temp_log
5	0.7588	10.2578	Dryh_log Runofft_log PH_log Red_log Temp_log
5	0.7575	10.5160	CondI_log FLOW_log Qt_log PH_log Red_log
5	0.7575	10.5186	Runofft_log Qt_log PH_log Red_log Temp_log
5	0.7565	10.7210	CondI_log Dryh_log FLOW_log Qt_log PH_log

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5	0.7549	11.0411	CondI_log FLOW_log Runofft_log Qt_log PH_log
5	0.7532	11.3701	Dryh_log FLOW_log Qt_log PH_log Red_log
5	0.7520	11.6215	FLOW_log Runofft_log PH_log Red_log Temp_log
5	0.7507	11.8871	Dryh_log FLOW_log Runofft_log Qt_log PH_log
5	0.7492	12.1805	FLOW_log Runofft_log Qt_log PH_log Red_log
5	0.7447	13.0740	CondI_log Runofft_log Qt_log PH_log Red_log
5	0.7385	14.3128	Dryh_log Qt_log PH_log Red_log Temp_log
5	0.7357	14.8715	CondI_log Dryh_log Runofft_log Qt_log PH_log
5	0.7328	15.4691	CondI_log Dryh_log Qt_log PH_log Red_log
5	0.7293	16.1521	Dryh_log FLOW_log Runofft_log PH_log Red_log
5	0.7246	17.0924	CondI_log Dryh_log Runofft_log PH_log Red_log
5	0.7237	17.2882	Dryh_log Runofft_log Qt_log PH_log Red_log
5	0.7231	17.3995	FLOW_log Runofft_log Qt_log Red_log Temp_log
5	0.7181	18.4043	CondI_log FLOW_log Qt_log Red_log Temp_log
5	0.7179	18.4485	Dryh_log FLOW_log Qt_log Red_log Temp_log
5	0.7154	18.9363	CondI_log FLOW_log Runofft_log PH_log Red_log
5	0.6991	22.2132	CondI_log Dryh_log FLOW_log Runofft_log PH_log
5	0.6939	23.2412	CondI_log FLOW_log Runofft_log Qt_log Red_log
5	0.6937	23.2798	CondI_log Dryh_log Qt_log Red_log Temp_log
5	0.6926	23.5061	Dryh_log FLOW_log Runofft_log Qt_log Red_log
5	0.6874	24.5467	CondI_log Runofft_log Qt_log Red_log Temp_log
5	0.6834	25.3457	Dryh_log Runofft_log Qt_log Red_log Temp_log
5	0.6831	25.4129	CondI_log Dryh_log FLOW_log Qt_log Red_log
5	0.6635	29.3248	CondI_log Dryh_log FLOW_log PH_log Temp_log
5	0.6518	31.6700	CondI_log FLOW_log Runofft_log Red_log Temp_log
5	0.6491	32.2019	CondI_log Dryh_log FLOW_log Runofft_log Qt_log
5	0.6490	32.2181	CondI_log FLOW_log Runofft_log Qt_log Temp_log
5	0.6485	32.3222	CondI_log Dryh_log FLOW_log Qt_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Fe_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
5	0.6456	32.9113	CondI_log Dryh_log Runofft_log Red_log Temp_log
5	0.6374	34.5537	CondI_log Dryh_log FLOW_log PH_log Red_log
5	0.6372	34.5803	Dryh_log FLOW_log Runofft_log Red_log Temp_log
5	0.6362	34.7817	CondI_log Dryh_log PH_log Red_log Temp_log
5	0.6299	36.0428	CondI_log FLOW_log PH_log Red_log Temp_log
5	0.6245	37.1300	CondI_log Dryh_log Runofft_log Qt_log Red_log
5	0.6193	38.1676	CondI_log Dryh_log FLOW_log Runofft_log Red_log
5	0.6174	38.5469	Dryh_log FLOW_log Runofft_log Qt_log Temp_log
5	0.6162	38.7897	Dryh_log FLOW_log PH_log Red_log Temp_log
5	0.6150	39.0205	CondI_log Dryh_log FLOW_log Runofft_log Temp_log
5	0.6117	39.6821	CondI_log Dryh_log FLOW_log Red_log Temp_log
5	0.5724	47.5499	CondI_log Dryh_log Runofft_log Qt_log Temp_log
6	0.7934	5.3357	CondI_log FLOW_log Runofft_log Qt_log PH_log Temp_log
6	0.7930	5.4084	CondI_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.7928	5.4562	CondI_log Dryh_log Runofft_log Qt_log PH_log Temp_log
6	0.7910	5.8205	CondI_log FLOW_log Qt_log PH_log Red_log Temp_log
6	0.7879	6.4438	CondI_log Dryh_log FLOW_log Qt_log PH_log Temp_log
6	0.7835	7.3143	CondI_log Dryh_log Qt_log PH_log Red_log Temp_log
6	0.7766	8.6956	Dryh_log FLOW_log Runofft_log Qt_log PH_log Temp_log
6	0.7744	9.1339	Dryh_log FLOW_log Qt_log PH_log Red_log Temp_log
6	0.7717	9.6744	CondI_log Dryh_log Runofft_log PH_log Red_log Temp_log
6	0.7715	9.7261	FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.7702	9.9854	CondI_log Dryh_log FLOW_log Runofft_log PH_log Temp_log
6	0.7641	11.2015	Dryh_log FLOW_log Runofft_log PH_log Red_log Temp_log
6	0.7636	11.2918	CondI_log FLOW_log Runofft_log PH_log Red_log Temp_log
6	0.7603	11.9612	Dryh_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.7590	12.2126	CondI_log Dryh_log FLOW_log Qt_log PH_log Red_log
6	0.7580	12.4178	CondI_log FLOW_log Runofft_log Qt_log PH_log Red_log
6	0.7565	12.7170	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log
6	0.7539	13.2354	Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log
6	0.7448	15.0519	CondI_log Dryh_log Runofft_log Qt_log PH_log Red_log
6	0.7294	18.1446	CondI_log Dryh_log FLOW_log Runofft_log PH_log Red_log
6	0.7236	19.2929	CondI_log FLOW_log Runofft_log Qt_log Red_log Temp_log
6	0.7231	19.3988	Dryh_log FLOW_log Runofft_log Qt_log Red_log Temp_log
6	0.7181	20.4043	CondI_log Dryh_log FLOW_log Qt_log Red_log Temp_log
6	0.6940	25.2314	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Red_log
6	0.6937	25.2792	CondI_log Dryh_log Runofft_log Qt_log Red_log Temp_log
6	0.6638	31.2628	CondI_log Dryh_log FLOW_log PH_log Red_log Temp_log
6	0.6589	32.2531	CondI_log Dryh_log FLOW_log Runofft_log Red_log Temp_log

6	0.6492	34.1972	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Fe_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
7	0.7944	7.1399	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Temp_log
7	0.7942	7.1674	CondI_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
7	0.7934	7.3434	CondI_log Dryh_log Runofft_log Qt_log PH_log Red_log Temp_log
7	0.7914	7.7455	CondI_log Dryh_log FLOW_log Qt_log PH_log Red_log Temp_log
7	0.7767	10.6788	Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
7	0.7719	11.6447	CondI_log Dryh_log FLOW_log Runofft_log PH_log Red_log Temp_log
7	0.7599	14.0382	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log
7	0.7237	21.2805	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Red_log Temp_log
8	0.7951	9.0000	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Mn_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
1	0.7769	162.7478	TSS_log
1	0.7247	207.9190	VSS_log
1	0.7206	211.4331	BOD_log
1	0.6195	298.7853	PH_log
1	0.6055	310.8626	CondI_log
1	0.5911	323.3466	Red_log
1	0.5486	360.0683	COD_log
1	0.5382	369.0496	Runofft_log
1	0.4731	425.3153	Turb_log
1	0.2810	591.2831	Qt_log
1	0.2698	600.9440	Dryh_log
1	0.2682	602.3581	Alcal_log
1	0.2347	631.2364	TDS_log
1	0.2029	658.7363	Temp_log
1	0.1665	690.2096	VDS_log
1	0.0169	819.4863	FLOW_log
2	0.9236	37.9859	VSS_log Temp_log
2	0.9197	41.3831	VSS_log Red_log
2	0.9050	54.0594	TSS_log Red_log
2	0.8912	66.0306	TSS_log Temp_log
2	0.8889	68.0327	BOD_log Dryh_log
2	0.8880	68.7716	Temp_log CondI_log
2	0.8837	72.4914	CondI_log Dryh_log
2	0.8826	73.4139	TSS_log PH_log
2	0.8730	81.7117	FLOW_log CondI_log
2	0.8710	83.4702	VDS_log Dryh_log
2	0.8700	84.3009	TSS_log Dryh_log
2	0.8677	86.3596	VSS_log PH_log
2	0.8642	89.3377	VSS_log Dryh_log
2	0.8623	90.9978	PH_log Turb_log
2	0.8480	103.3051	BOD_log Temp_log
2	0.8471	104.0751	TDS_log Dryh_log
3	0.9490	18.0860	TSS_log TDS_log Dryh_log
3	0.9440	22.4176	VSS_log Temp_log CondI_log
3	0.9434	22.9007	VSS_log PH_log Dryh_log
3	0.9414	24.6127	COD_log CondI_log Dryh_log
3	0.9394	26.3435	VSS_log BOD_log Temp_log
3	0.9377	27.8732	VSS_log Red_log Dryh_log
3	0.9374	28.0664	TSS_log PH_log Dryh_log
3	0.9360	29.3072	FLOW_log CondI_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Mn_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.9357	29.5670	TSS_log Temp_log CondI_log
3	0.9351	30.0356	Runofft_log TDS_log Dryh_log
3	0.9331	31.7677	VSS_log PH_log Temp_log
3	0.9310	33.6521	VSS_log Red_log Temp_log
3	0.9306	33.9803	TDS_log VSS_log Temp_log
3	0.9286	35.6936	VDS_log VSS_log Red_log
3	0.9284	35.9008	Qt_log VSS_log Red_log
3	0.9279	36.3051	FLOW_log VSS_log Temp_log
4	0.9648	6.4225	TSS_log TDS_log COD_log Dryh_log
4	0.9598	10.7577	TDS_log VSS_log COD_log Dryh_log
4	0.9583	12.0659	VSS_log PH_log Turb_log Dryh_log
4	0.9567	13.4391	VSS_log COD_log PH_log Dryh_log
4	0.9564	13.6901	FLOW_log COD_log CondI_log Dryh_log
4	0.9562	13.8817	TSS_log TDS_log PH_log Dryh_log

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 4     0.9547   15.1502  TSS_log TDS_log Temp_log Dryh_log
 4     0.9546   15.2481  TSS_log TDS_log Red_log Dryh_log
 4     0.9542   15.6131  TDS_log COD_log CondI_log Dryh_log
 4     0.9532   16.4026  TSS_log TDS_log BOD_log Dryh_log
 4     0.9530   16.6512  COD_log PH_log Temp_log Dryh_log
 4     0.9527   16.8721  PH_log Red_log Turb_log Dryh_log
 4     0.9510   18.3352  Qt_log TSS_log Temp_log CondI_log
 4     0.9506   18.6858  TSS_log TDS_log Turb_log Dryh_log
 4     0.9504   18.8928  VSS_log Temp_log CondI_log Dryh_log
 4     0.9501   19.1334  Runofft_log TSS_log TDS_log Dryh_log
----------------------------------------------------------------------
 5     0.9672    6.3231  TSS_log TDS_log COD_log CondI_log Dryh_log
 5     0.9664    7.0296  TSS_log TDS_log COD_log BOD_log Dryh_log
 5     0.9660    7.3621  TSS_log TDS_log COD_log PH_log Dryh_log
 5     0.9659    7.4430  TSS_log VDS_log TDS_log COD_log Dryh_log
 5     0.9655    7.7952  Runofft_log TSS_log TDS_log COD_log Dryh_log
 5     0.9654    7.8761  TSS_log TDS_log COD_log Alcal_log Dryh_log
 5     0.9654    7.8967  TSS_log TDS_log COD_log Red_log Dryh_log
 5     0.9653    7.9466  TSS_log TDS_log COD_log Temp_log Dryh_log
 5     0.9652    8.0396  FLOW_log TSS_log TDS_log COD_log Dryh_log
 5     0.9652    8.0569  TSS_log TDS_log COD_log Turb_log Dryh_log
 5     0.9650    8.2241  TSS_log TDS_log VSS_log COD_log Dryh_log
 5     0.9649    8.3448  Qt_log TSS_log TDS_log COD_log Dryh_log
 5     0.9640    9.1408  TDS_log VSS_log COD_log PH_log Dryh_log
 5     0.9633    9.6825  VSS_log COD_log PH_log Temp_log Dryh_log
 5     0.9632    9.8028  VSS_log PH_log Red_log Turb_log Dryh_log
 5     0.9629   10.0164  TDS_log VSS_log COD_log CondI_log Dryh_log

                         The REG Procedure
                           Model: MODEL1
                    Dependent Variable: Mn_log

                      R-Square Selection Method


     R-Square      C(p)  Variables in Model

 6     0.9746    1.9461  TSS_log TDS_log COD_log PH_log Red_log Dryh_log
 6     0.9729    3.4219  TDS_log COD_log PH_log Red_log Turb_log Dryh_log
 6     0.9717    4.4275  TSS_log TDS_log COD_log PH_log Temp_log Dryh_log
 6     0.9703    5.6758  TDS_log VSS_log COD_log PH_log Red_log Dryh_log
 6     0.9699    6.0220  VDS_log COD_log PH_log Red_log Turb_log Dryh_log
 6     0.9695    6.3466  Runofft_log TDS_log COD_log PH_log Red_log Dryh_log
 6     0.9692    6.5817  Runofft_log TSS_log TDS_log COD_log CondI_log Dryh_log
 6     0.9691    6.6940  VDS_log COD_log PH_log Red_log Temp_log Dryh_log
 6     0.9685    7.1840  TDS_log COD_log PH_log Red_log Temp_log Dryh_log
 6     0.9685    7.2567  VSS_log PH_log Red_log Turb_log Alcal_log Dryh_log
 6     0.9684    7.3277  TSS_log TDS_log COD_log Turb_log CondI_log Dryh_log
 6     0.9684    7.3328  FLOW_log TSS_log TDS_log COD_log CondI_log Dryh_log
 6     0.9684    7.3433  TDS_log VSS_log COD_log PH_log Temp_log Dryh_log
 6     0.9682    7.4884  Qt_log TDS_log COD_log PH_log Red_log Dryh_log
 6     0.9682    7.5193  VSS_log COD_log PH_log Red_log Turb_log Dryh_log
 6     0.9681    7.5913  TSS_log TDS_log COD_log PH_log CondI_log Dryh_log
---------------------------------------------------------------------------------
 7     0.9770    1.8818  TSS_log TDS_log COD_log PH_log Red_log Turb_log Dryh_log
 7     0.9764    2.3909  TSS_log TDS_log COD_log PH_log Red_log Temp_log Dryh_log
 7     0.9757    3.0160  TSS_log TDS_log COD_log PH_log Red_log CondI_log Dryh_log
 7     0.9756    3.0708  TDS_log VSS_log COD_log PH_log Red_log Turb_log Dryh_log
 7     0.9750    3.5908  FLOW_log TSS_log TDS_log COD_log PH_log Red_log Dryh_log
 7     0.9748    3.7609  Qt_log TSS_log TDS_log COD_log PH_log Red_log Dryh_log
 7     0.9748    3.7685  TSS_log TDS_log COD_log PH_log Red_log Alcal_log Dryh_log
 7     0.9748    3.7744  TSS_log TDS_log COD_log PH_log Red_log BOD_log Dryh_log
 7     0.9747    3.8991  Runofft_log TSS_log TDS_log COD_log PH_log Red_log Dryh_log
 7     0.9746    3.9457  TSS_log VDS_log TDS_log COD_log PH_log Red_log Dryh_log
 7     0.9746    3.9460  TSS_log TDS_log VSS_log COD_log PH_log Red_log Dryh_log
 7     0.9743    4.1932  TDS_log COD_log PH_log Red_log Turb_log Temp_log Dryh_log
 7     0.9742    4.2720  VDS_log TDS_log COD_log PH_log Red_log Turb_log Dryh_log
 7     0.9740    4.4384  Runofft_log TDS_log COD_log PH_log Red_log Turb_log Dryh_log
 7     0.9738    4.6680  Qt_log TDS_log COD_log PH_log Red_log Turb_log Dryh_log
 7     0.9736    4.7986  FLOW_log TSS_log TDS_log COD_log PH_log Temp_log Dryh_log
----------------------------------------------------------------------------------------
 8     0.9776    3.3974  TSS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log Dryh_log
 8     0.9774    3.5208  TSS_log TDS_log COD_log PH_log Red_log Turb_log Alcal_log
                         Dryh_log
 8     0.9771    3.7803  Runofft_log TSS_log TDS_log COD_log PH_log Red_log Turb_log
                         Dryh_log
 8     0.9771    3.8210  TSS_log TDS_log COD_log PH_log Red_log BOD_log Turb_log Dryh_log
 8     0.9770    3.8528  FLOW_log TSS_log TDS_log COD_log PH_log Red_log Turb_log Dryh_log
```

```
8     0.9770    3.8608  TSS_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Dryh_log
```


The REG Procedure
Model: MODEL1
Dependent Variable: Mn_log

R-Square Selection Method

```
     R-Square      C(p)  Variables in Model

 8     0.9770    3.8705  Qt_log TSS_log TDS_log COD_log PH_log Red_log Turb_log Dryh_log
 8     0.9770    3.8731  TSS_log TDS_log COD_log PH_log Red_log Turb_log CondI_log
                         Dryh_log
 8     0.9770    3.8807  TSS_log TDS_log VSS_log COD_log PH_log Red_log Turb_log Dryh_log
 8     0.9767    4.1229  TSS_log TDS_log VSS_log COD_log PH_log Red_log Temp_log Dryh_log
 8     0.9767    4.1417  FLOW_log TSS_log TDS_log COD_log PH_log Red_log Temp_log Dryh_log
 8     0.9766    4.2165  FLOW_log VDS_log COD_log PH_log Red_log Turb_log Temp_log
                         Dryh_log
 8     0.9765    4.2867  TSS_log TDS_log COD_log PH_log Red_log Temp_log CondI_log
                         Dryh_log
 8     0.9765    4.3166  Qt_log TSS_log TDS_log COD_log PH_log Red_log Temp_log Dryh_log
 8     0.9765    4.3221  TSS_log TDS_log COD_log PH_log Red_log Temp_log Alcal_log
                         Dryh_log
 8     0.9764    4.3624  TSS_log VDS_log TDS_log COD_log PH_log Red_log Temp_log Dryh_log
-----------------------------------------------------------------------------------------
 9     0.9790    4.1886  TSS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log
                         CondI_log Dryh_log
 9     0.9785    4.5769  TSS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log
                         Alcal_log Dryh_log
 9     0.9784    4.6406  FLOW_log TSS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log
                         Dryh_log
 9     0.9780    4.9908  TDS_log VSS_log COD_log PH_log Red_log Turb_log Temp_log
                         CondI_log Dryh_log
 9     0.9778    5.1835  Qt_log TSS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log
                         Dryh_log
 9     0.9778    5.1930  FLOW_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log
                         Dryh_log
 9     0.9778    5.2077  Runofft_log TSS_log TDS_log COD_log PH_log Red_log Turb_log
                         Temp_log Dryh_log
 9     0.9778    5.2126  TSS_log TDS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log
                         Dryh_log
 9     0.9778    5.2210  TSS_log TDS_log COD_log PH_log Red_log Turb_log CondI_log
                         Alcal_log Dryh_log
 9     0.9777    5.3066  TSS_log TDS_log VSS_log COD_log PH_log Red_log Turb_log Temp_log
                         Dryh_log
 9     0.9776    5.3473  TSS_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log
                         Dryh_log
 9     0.9775    5.4113  VDS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log
                         CondI_log Dryh_log
 9     0.9775    5.4761  TSS_log TDS_log VSS_log COD_log PH_log Red_log Turb_log Alcal_log
                         Dryh_log
```


The REG Procedure
Model: MODEL1
Dependent Variable: Mn_log

R-Square Selection Method

```
     R-Square      C(p)  Variables in Model

 9     0.9775    5.4762  Runofft_log TSS_log TDS_log COD_log PH_log Red_log Turb_log
                         Alcal_log Dryh_log
 9     0.9774    5.4893  TSS_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Alcal_log
                         Dryh_log
 9     0.9774    5.4993  FLOW_log TSS_log TDS_log COD_log PH_log Red_log Turb_log
                         Alcal_log Dryh_log
-----------------------------------------------------------------------------------------
10     0.9791    6.0312  FLOW_log TSS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log
                         CondI_log Dryh_log
10     0.9791    6.0555  TSS_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log
                         CondI_log Dryh_log
10     0.9790    6.1043  TSS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log
                         CondI_log Alcal_log Dryh_log
10     0.9790    6.1445  TSS_log TDS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log
                         CondI_log Dryh_log
```

10	0.9790	6.1531	Runofft_log TSS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
10	0.9790	6.1542	FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log Red_log Turb_log Temp_log Dryh_log
10	0.9790	6.1884	TSS_log TDS_log VSS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
10	0.9790	6.1885	Qt_log TSS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
10	0.9789	6.2470	FLOW_log TSS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log Alcal_log Dryh_log
10	0.9787	6.4220	Qt_log TSS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log Alcal_log Dryh_log
10	0.9787	6.4333	FLOW_log Runofft_log TSS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log Dryh_log
10	0.9787	6.4410	FLOW_log TSS_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log Dryh_log
10	0.9786	6.4486	VDS_log TDS_log VSS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
10	0.9786	6.4766	FLOW_log TSS_log TDS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log Dryh_log
10	0.9786	6.4772	TSS_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log Alcal_log Dryh_log
10	0.9786	6.4792	Runofft_log TSS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log Alcal_log Dryh_log
11	0.9794	7.8222	FLOW_log TSS_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log

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The REG Procedure
Model: MODEL1
Dependent Variable: Mn_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
11	0.9793	7.8751	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log Dryh_log
11	0.9792	7.9622	FLOW_log Runofft_log Qt_log VDS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
11	0.9792	7.9650	TSS_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9792	7.9677	FLOW_log Runofft_log TSS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
11	0.9792	7.9702	Runofft_log TSS_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
11	0.9792	7.9707	FLOW_log TSS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
11	0.9792	7.9727	FLOW_log TSS_log TDS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
11	0.9792	7.9768	FLOW_log Qt_log TSS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
11	0.9792	8.0063	FLOW_log Runofft_log Qt_log TSS_log VDS_log COD_log PH_log Red_log Turb_log Temp_log Dryh_log
11	0.9792	8.0084	TSS_log VDS_log TDS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
11	0.9791	8.0297	FLOW_log TSS_log TDS_log VSS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
11	0.9791	8.0409	FLOW_log TSS_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log Alcal_log Dryh_log
11	0.9791	8.0490	TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
11	0.9791	8.0551	Qt_log TSS_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
11	0.9791	8.0576	FLOW_log Runofft_log Qt_log VDS_log VSS_log COD_log PH_log Red_log Turb_log Temp_log Dryh_log
12	0.9799	9.4034	FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
12	0.9798	9.4775	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log Dryh_log
12	0.9796	9.6563	FLOW_log Runofft_log TSS_log VDS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
12	0.9795	9.6715	FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
12	0.9795	9.7552	FLOW_log TSS_log VDS_log TDS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log

```
                         The REG Procedure
                          Model: MODEL1
                    Dependent Variable: Mn_log

                     R-Square Selection Method

     R-Square       C(p)  Variables in Model

12     0.9794     9.7605  FLOW_log TSS_log VDS_log TDS_log COD_log PH_log Red_log Turb_log
                          Temp_log CondI_log Alcal_log Dryh_log
12     0.9794     9.7609  FLOW_log Qt_log TSS_log VDS_log TDS_log COD_log PH_log Red_log
                          Turb_log Temp_log CondI_log Dryh_log
12     0.9794     9.7748  FLOW_log Runofft_log TSS_log VDS_log TDS_log COD_log PH_log
                          Red_log Turb_log Temp_log Alcal_log Dryh_log
12     0.9794     9.7899  FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log
                          PH_log Red_log Turb_log Temp_log Dryh_log
12     0.9794     9.7970  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                          Red_log BOD_log Turb_log Temp_log Dryh_log
12     0.9794     9.7978  FLOW_log Runofft_log Qt_log VDS_log VSS_log COD_log PH_log
                          Red_log Turb_log Temp_log CondI_log Dryh_log
12     0.9794     9.8211  FLOW_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log
                          Turb_log Temp_log CondI_log Dryh_log
12     0.9793     9.8687  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                          Red_log Turb_log Temp_log Alcal_log Dryh_log
12     0.9793     9.8699  FLOW_log Qt_log VDS_log TDS_log VSS_log COD_log PH_log Red_log
                          Turb_log Temp_log CondI_log Dryh_log
12     0.9793     9.8711  FLOW_log Runofft_log Qt_log TSS_log VDS_log COD_log PH_log
                          Red_log Turb_log Temp_log CondI_log Dryh_log
12     0.9793     9.8778  Runofft_log TSS_log VDS_log TDS_log COD_log PH_log Red_log
                          Turb_log Temp_log CondI_log Alcal_log Dryh_log
-----------------------------------------------------------------------------------------
13     0.9803    11.0635  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                          PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
13     0.9801    11.2120  FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log
                          PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
13     0.9800    11.2691  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                          Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
13     0.9799    11.3731  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                          Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
13     0.9798    11.4274  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                          COD_log PH_log Red_log Turb_log Temp_log Dryh_log
13     0.9798    11.4328  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                          PH_log Red_log Turb_log Temp_log Alcal_log Dryh_log
13     0.9798    11.4368  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                          PH_log Red_log BOD_log Turb_log Temp_log Dryh_log
13     0.9796    11.5974  FLOW_log Runofft_log TSS_log VDS_log TDS_log COD_log PH_log
                          Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
13     0.9796    11.6284  FLOW_log Runofft_log TSS_log VDS_log TDS_log COD_log PH_log
                          Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
                                                     11:56 Tuesday, November 25, 2003

                         The REG Procedure
                          Model: MODEL1
                    Dependent Variable: Mn_log

                     R-Square Selection Method

     R-Square       C(p)  Variables in Model

13     0.9796    11.6477  FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log
                          Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
13     0.9796    11.6543  FLOW_log Runofft_log TSS_log VDS_log TDS_log VSS_log COD_log
                          PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
13     0.9796    11.6649  FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log
                          PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
13     0.9796    11.6698  FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log
                          Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
13     0.9795    11.6771  FLOW_log Qt_log TSS_log VDS_log TDS_log COD_log PH_log Red_log
                          BOD_log Turb_log Temp_log CondI_log Dryh_log
13     0.9795    11.7135  FLOW_log TSS_log VDS_log TDS_log COD_log PH_log Red_log BOD_log
                          Turb_log Temp_log CondI_log Alcal_log Dryh_log
13     0.9795    11.7205  FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log
                          PH_log Red_log BOD_log Turb_log Temp_log Dryh_log
-----------------------------------------------------------------------------------------
14     0.9803    13.0213  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
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```
                                PH_log Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14      0.9803   13.0520   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                                PH_log Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
14      0.9803   13.0634   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                COD_log PH_log Red_log Turb_log Temp_log CondI_log Dryh_log
14      0.9802   13.1260   FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log
                                PH_log Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14      0.9801   13.1937   FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log
                                PH_log Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
14      0.9801   13.2192   FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                                Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14      0.9799   13.3907   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                COD_log PH_log Red_log BOD_log Turb_log Temp_log Dryh_log
14      0.9799   13.3961   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                COD_log PH_log Red_log Turb_log Temp_log Alcal_log Dryh_log
14      0.9799   13.4077   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                                PH_log Red_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
14      0.9797   13.5820   FLOW_log Runofft_log TSS_log VDS_log TDS_log COD_log PH_log
                                Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14      0.9796   13.5951   FLOW_log Runofft_log TSS_log VDS_log TDS_log VSS_log COD_log
                                PH_log Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14      0.9796   13.6265   FLOW_log Runofft_log TSS_log VDS_log TDS_log VSS_log COD_log
                                PH_log Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
14      0.9796   13.6411   FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log
                                PH_log Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
                                                   11:56 Tuesday, November 25, 2003

                                     The REG Procedure
                                      Model: MODEL1
                                Dependent Variable: Mn_log

                                 R-Square Selection Method


        R-Square      C(p)  Variables in Model

14      0.9796   13.6428   FLOW_log Runofft_log Qt_log TSS_log TDS_log COD_log PH_log
                                Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14      0.9796   13.6634   FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log
                                PH_log Red_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14      0.9796   13.6668   FLOW_log Qt_log TSS_log VDS_log TDS_log COD_log PH_log Red_log
                                BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
------------------------------------------------------------------------------------------
15      0.9803   15.0004   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                                PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                                Dryh_log
15      0.9803   15.0209   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                COD_log PH_log Red_log Turb_log Temp_log CondI_log Alcal_log
                                Dryh_log
15      0.9803   15.0520   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log
                                Dryh_log
15      0.9802   15.0934   FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log
                                PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                                Dryh_log
15      0.9799   15.3716   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                COD_log PH_log Red_log BOD_log Turb_log Temp_log Alcal_log
                                Dryh_log
15      0.9797   15.5798   FLOW_log Runofft_log TSS_log VDS_log TDS_log VSS_log COD_log
                                PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                                Dryh_log
15      0.9796   15.6366   FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log
                                PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                                Dryh_log
15      0.9796   15.6630   FLOW_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log
                                Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15      0.9794   15.7648   FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log
                                PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                                Dryh_log
15      0.9793   15.8642   Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log
                                Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15      0.9783   16.7640   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                COD_log PH_log Red_log BOD_log Turb_log CondI_log Alcal_log
                                Dryh_log
15      0.9773   17.5910   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                COD_log PH_log Red_log BOD_log Temp_log CondI_log Alcal_log
                                Dryh_log
```

mn all.lst
The REG Procedure
Model: MODEL1
Dependent Variable: Mn_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
15	0.9772	17.6735	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9737	20.6983	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9736	20.7968	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9669	26.6054	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
16	0.9803	17.0000	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Mn_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
1	0.5993	237.0094	PH_log
1	0.5301	285.9265	CondI_log
1	0.5247	289.7430	Red_log
1	0.3492	413.7067	Runofft_log
1	0.2158	507.9565	Dryh_log
1	0.2132	509.7848	Qt_log
1	0.1417	560.2436	Temp_log
1	0.0185	647.2697	FLOW_log
2	0.7507	132.1092	CondI_log Dryh_log
2	0.7346	143.4916	CondI_log Red_log
2	0.7338	144.0467	CondI_log FLOW_log
2	0.7259	149.6240	CondI_log Temp_log
2	0.6955	171.0846	Runofft_log PH_log
2	0.6940	172.1707	CondI_log PH_log
2	0.6537	200.6438	Qt_log Red_log
2	0.6489	204.0348	Runofft_log Red_log
2	0.6458	206.1847	Qt_log PH_log
2	0.6312	216.4849	Dryh_log PH_log
2	0.6253	220.6725	PH_log Temp_log
2	0.6217	223.1889	PH_log Red_log
2	0.6097	231.6588	Dryh_log Qt_log
2	0.6002	238.4330	FLOW_log PH_log
2	0.5934	243.2048	Dryh_log Runofft_log
2	0.5859	248.5305	CondI_log Qt_log
2	0.5569	268.9577	Dryh_log Red_log
2	0.5410	280.2015	CondI_log Runofft_log
2	0.5250	291.5393	FLOW_log Red_log
2	0.5249	291.5845	Red_log Temp_log
2	0.5046	305.9485	Runofft_log Temp_log
2	0.4505	344.1297	Qt_log Temp_log
2	0.3841	391.0617	FLOW_log Runofft_log
2	0.3556	411.1663	Runofft_log Qt_log
2	0.3484	416.2580	FLOW_log Qt_log
2	0.2898	457.6364	Dryh_log Temp_log
2	0.2310	499.1692	Dryh_log FLOW_log
2	0.1534	553.9930	FLOW_log Temp_log
3	0.9124	19.8948	CondI_log FLOW_log Temp_log
3	0.8654	53.0450	CondI_log Dryh_log Temp_log
3	0.8203	84.9052	CondI_log Dryh_log Red_log
3	0.8104	91.9083	CondI_log FLOW_log Red_log

The REG Procedure
Model: MODEL1
Dependent Variable: Mn_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.8022	97.7209	CondI_log Dryh_log FLOW_log
3	0.7882	107.5817	CondI_log Dryh_log PH_log
3	0.7799	113.4843	CondI_log PH_log Temp_log
3	0.7771	115.4475	Dryh_log Qt_log Red_log
3	0.7739	117.6803	CondI_log Red_log Temp_log
3	0.7710	119.7383	CondI_log FLOW_log PH_log
3	0.7687	121.3637	CondI_log Dryh_log Runofft_log
3	0.7632	125.2567	Dryh_log Runofft_log PH_log
3	0.7549	131.1292	CondI_log FLOW_log Qt_log
3	0.7521	133.0896	Dryh_log Qt_log PH_log
3	0.7507	134.1040	CondI_log Dryh_log Qt_log
3	0.7494	134.9977	Dryh_log Qt_log Temp_log
3	0.7427	139.7648	CondI_log Qt_log Temp_log
3	0.7415	140.6105	Runofft_log PH_log Temp_log
3	0.7405	141.2881	CondI_log PH_log Red_log

3	0.7391	142.2997	CondI_log Runofft_log Red_log
3	0.7378	143.2409	CondI_log Qt_log Red_log
3	0.7346	145.4915	CondI_log FLOW_log Runofft_log
3	0.7329	146.6638	CondI_log Runofft_log Temp_log
3	0.7219	154.4206	Dryh_log Runofft_log Red_log
3	0.7152	159.1950	CondI_log Runofft_log PH_log
3	0.7121	161.3873	Runofft_log PH_log Red_log
3	0.7109	162.1830	CondI_log Runofft_log Qt_log
3	0.7086	163.8015	Qt_log PH_log Temp_log
3	0.7014	168.8865	FLOW_log Runofft_log PH_log
3	0.7013	168.9590	Runofft_log Qt_log PH_log
3	0.6995	170.2917	CondI_log Qt_log PH_log
3	0.6893	177.4892	Qt_log PH_log Red_log
3	0.6837	181.4453	FLOW_log Qt_log Red_log
3	0.6738	188.4451	Dryh_log Runofft_log Temp_log
3	0.6713	190.1944	FLOW_log Qt_log PH_log
3	0.6679	192.5998	Qt_log Red_log Temp_log
3	0.6605	197.8437	Runofft_log Qt_log Red_log
3	0.6568	200.4025	Runofft_log Red_log Temp_log
3	0.6510	204.5397	FLOW_log Runofft_log Red_log
3	0.6498	205.3888	Dryh_log PH_log Temp_log
3	0.6453	208.5143	Dryh_log PH_log Red_log
3	0.6365	214.7337	Dryh_log FLOW_log PH_log
3	0.6305	218.9938	PH_log Red_log Temp_log
3	0.6273	221.2927	Dryh_log Runofft_log Qt_log
3	0.6258	222.3127	FLOW_log PH_log Temp_log
3	0.6217	225.1830	FLOW_log PH_log Red_log

The REG Procedure
Model: MODEL1
Dependent Variable: Mn_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.6179	227.8667	Dryh_log FLOW_log Qt_log
3	0.6000	240.5374	Dryh_log FLOW_log Runofft_log
3	0.5925	245.8695	FLOW_log Qt_log Temp_log
3	0.5712	260.8731	Dryh_log FLOW_log Red_log
3	0.5573	270.6931	Dryh_log Red_log Temp_log
3	0.5297	290.2309	FLOW_log Runofft_log Temp_log
3	0.5252	293.3634	FLOW_log Red_log Temp_log
3	0.5091	304.7280	Runofft_log Qt_log Temp_log
3	0.3881	390.2179	FLOW_log Runofft_log Qt_log
3	0.3013	451.5226	Dryh_log FLOW_log Temp_log
4	0.9367	4.6804	CondI_log Dryh_log FLOW_log Temp_log
4	0.9142	20.5812	CondI_log FLOW_log Runofft_log Temp_log
4	0.9142	20.6207	CondI_log FLOW_log Qt_log Temp_log
4	0.9131	21.4148	CondI_log FLOW_log Red_log Temp_log
4	0.9128	21.6030	CondI_log FLOW_log PH_log Temp_log
4	0.8782	46.0675	CondI_log Dryh_log Runofft_log Temp_log
4	0.8703	51.5876	CondI_log Dryh_log Red_log Temp_log
4	0.8702	51.7011	CondI_log Dryh_log PH_log Temp_log
4	0.8685	52.9173	CondI_log Dryh_log Qt_log Temp_log
4	0.8468	68.2290	CondI_log Dryh_log FLOW_log Red_log
4	0.8307	79.6156	CondI_log Dryh_log Runofft_log Red_log
4	0.8244	84.0224	CondI_log Dryh_log Qt_log Red_log
4	0.8203	86.9003	CondI_log Dryh_log PH_log Red_log
4	0.8192	87.7298	Dryh_log Qt_log PH_log Temp_log
4	0.8170	89.2979	CondI_log Dryh_log FLOW_log PH_log
4	0.8128	92.2153	CondI_log FLOW_log Qt_log Red_log
4	0.8108	93.6765	CondI_log Dryh_log Runofft_log PH_log
4	0.8106	93.8039	CondI_log FLOW_log PH_log Red_log
4	0.8106	93.8080	CondI_log FLOW_log Runofft_log Red_log
4	0.8054	97.4732	Dryh_log Qt_log Red_log Temp_log
4	0.8046	98.0497	CondI_log Dryh_log FLOW_log Runofft_log
4	0.8035	98.7771	CondI_log Runofft_log Qt_log Temp_log
4	0.8027	99.3869	CondI_log Dryh_log FLOW_log Qt_log
4	0.7978	102.8349	Dryh_log Runofft_log PH_log Temp_log
4	0.7934	105.9538	CondI_log Runofft_log PH_log Temp_log
4	0.7903	108.1181	CondI_log Dryh_log Qt_log PH_log
4	0.7896	108.6199	CondI_log Dryh_log Runofft_log Qt_log
4	0.7860	111.1650	Dryh_log Qt_log PH_log Red_log
4	0.7849	111.9051	CondI_log PH_log Red_log Temp_log
4	0.7825	113.6533	CondI_log Qt_log PH_log Temp_log

4	0.7793	115.9050	Dryh_log FLOW_log Qt_log Red_log

The REG Procedure
Model: MODEL1
Dependent Variable: Mn_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
4	0.7787	116.3331	CondI_log Runofft_log Red_log Temp_log
4	0.7775	117.1493	CondI_log Qt_log Red_log Temp_log
4	0.7774	117.2626	CondI_log FLOW_log Qt_log PH_log
4	0.7771	117.4467	Dryh_log Runofft_log Qt_log Red_log
4	0.7745	119.3170	CondI_log Runofft_log Qt_log PH_log
4	0.7735	119.9635	CondI_log FLOW_log Runofft_log Qt_log
4	0.7722	120.8814	CondI_log FLOW_log Runofft_log PH_log
4	0.7691	123.1249	Dryh_log Runofft_log PH_log Red_log
4	0.7690	123.1379	Dryh_log Runofft_log Qt_log PH_log
4	0.7683	123.6406	CondI_log Runofft_log Qt_log Red_log
4	0.7681	123.8017	Dryh_log FLOW_log Qt_log Temp_log
4	0.7667	124.7799	Dryh_log FLOW_log Runofft_log PH_log
4	0.7545	133.4153	Dryh_log FLOW_log Qt_log PH_log
4	0.7511	135.8302	Dryh_log Runofft_log Qt_log Temp_log
4	0.7506	136.1398	FLOW_log Qt_log PH_log Temp_log
4	0.7489	137.3671	CondI_log Runofft_log PH_log Red_log
4	0.7470	138.7020	FLOW_log Runofft_log PH_log Temp_log
4	0.7425	141.9153	CondI_log Qt_log PH_log Red_log
4	0.7415	142.5843	Runofft_log PH_log Red_log Temp_log
4	0.7415	142.5862	Runofft_log Qt_log PH_log Temp_log
4	0.7323	149.0901	Dryh_log Runofft_log Red_log Temp_log
4	0.7300	150.6885	Dryh_log FLOW_log Runofft_log Red_log
4	0.7170	159.8755	Qt_log PH_log Red_log Temp_log
4	0.7150	161.3103	FLOW_log Runofft_log PH_log Red_log
4	0.7124	163.1272	FLOW_log Qt_log Red_log Temp_log
4	0.7121	163.3447	Runofft_log Qt_log PH_log Red_log
4	0.7111	164.0699	FLOW_log Qt_log PH_log Red_log
4	0.7025	170.1586	FLOW_log Runofft_log Qt_log PH_log
4	0.6838	183.3606	FLOW_log Runofft_log Qt_log Red_log
4	0.6778	187.5775	Dryh_log FLOW_log Runofft_log Temp_log
4	0.6739	190.3709	Runofft_log Qt_log Red_log Temp_log
4	0.6599	200.2327	FLOW_log Runofft_log Red_log Temp_log
4	0.6542	204.2373	Dryh_log FLOW_log PH_log Temp_log
4	0.6526	205.3878	Dryh_log PH_log Red_log Temp_log
4	0.6524	205.5108	Dryh_log FLOW_log PH_log Red_log
4	0.6306	220.9288	FLOW_log PH_log Red_log Temp_log
4	0.6281	222.7053	Dryh_log FLOW_log Runofft_log Qt_log
4	0.5926	247.8037	FLOW_log Runofft_log Qt_log Temp_log
4	0.5720	262.3456	Dryh_log FLOW_log Red_log Temp_log
5	0.9394	4.7881	CondI_log Dryh_log FLOW_log PH_log Temp_log
5	0.9392	4.9522	CondI_log Dryh_log FLOW_log Red_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Mn_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
5	0.9377	6.0212	CondI_log Dryh_log FLOW_log Qt_log Temp_log
5	0.9368	6.6640	CondI_log Dryh_log FLOW_log Runofft_log Temp_log
5	0.9158	21.4475	CondI_log FLOW_log Runofft_log PH_log Temp_log
5	0.9157	21.5449	CondI_log FLOW_log Qt_log Red_log Temp_log
5	0.9154	21.7885	CondI_log FLOW_log Qt_log PH_log Temp_log
5	0.9152	21.8889	CondI_log FLOW_log Runofft_log Red_log Temp_log
5	0.9144	22.4682	CondI_log FLOW_log Runofft_log Qt_log Temp_log
5	0.9131	23.3930	CondI_log FLOW_log PH_log Red_log Temp_log
5	0.8849	43.3186	CondI_log Dryh_log Runofft_log PH_log Temp_log
5	0.8815	45.7099	CondI_log Dryh_log Runofft_log Red_log Temp_log
5	0.8804	46.4487	CondI_log Dryh_log Runofft_log Qt_log Temp_log
5	0.8749	50.3495	CondI_log Dryh_log Qt_log Red_log Temp_log
5	0.8748	50.4615	CondI_log Dryh_log Qt_log PH_log Temp_log
5	0.8712	52.9824	CondI_log Dryh_log PH_log Red_log Temp_log

5	0.8487	68.8993	CondI_log Dryh_log FLOW_log Runofft_log Red_log
5	0.8482	69.2253	CondI_log Dryh_log FLOW_log PH_log Red_log
5	0.8480	69.3387	CondI_log Dryh_log FLOW_log Qt_log Red_log
5	0.8315	81.0160	CondI_log Dryh_log Runofft_log PH_log Red_log
5	0.8315	81.0491	CondI_log Dryh_log Runofft_log Qt_log Red_log
5	0.8290	82.7806	CondI_log Runofft_log Qt_log PH_log Temp_log
5	0.8281	83.4361	Dryh_log FLOW_log Qt_log PH_log Temp_log
5	0.8245	85.9820	CondI_log Dryh_log Qt_log PH_log Red_log
5	0.8237	86.5284	CondI_log Dryh_log FLOW_log Runofft_log PH_log
5	0.8233	86.8134	Dryh_log Runofft_log Qt_log PH_log Temp_log
5	0.8224	87.4316	Dryh_log Qt_log PH_log Red_log Temp_log
5	0.8206	88.7368	CondI_log Dryh_log Runofft_log Qt_log PH_log
5	0.8171	91.2001	CondI_log Dryh_log FLOW_log Qt_log PH_log
5	0.8152	92.5634	CondI_log FLOW_log Runofft_log Qt_log Red_log
5	0.8133	93.9123	CondI_log FLOW_log Qt_log PH_log Red_log
5	0.8130	94.1120	CondI_log Dryh_log FLOW_log Runofft_log Qt_log
5	0.8129	94.1358	Dryh_log FLOW_log Qt_log Red_log Temp_log
5	0.8109	95.5672	CondI_log FLOW_log Runofft_log PH_log Red_log
5	0.8105	95.8279	CondI_log Runofft_log Qt_log Red_log Temp_log
5	0.8056	99.3293	Dryh_log Runofft_log Qt_log Red_log Temp_log
5	0.8003	103.0784	Dryh_log FLOW_log Runofft_log PH_log Temp_log
5	0.7991	103.9325	Dryh_log Runofft_log PH_log Red_log Temp_log
5	0.7981	104.6390	CondI_log FLOW_log Runofft_log Qt_log PH_log
5	0.7953	106.6199	CondI_log Runofft_log PH_log Red_log Temp_log
5	0.7878	111.8859	Dryh_log FLOW_log Qt_log PH_log Red_log
5	0.7878	111.9226	Dryh_log Runofft_log Qt_log PH_log Red_log
5	0.7868	112.6067	CondI_log Qt_log PH_log Red_log Temp_log
5	0.7806	116.9609	CondI_log Runofft_log Qt_log PH_log Red_log

The REG Procedure
Model: MODEL1
Dependent Variable: Mn_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
5	0.7800	117.3711	Dryh_log FLOW_log Runofft_log Qt_log Red_log
5	0.7735	121.9571	Dryh_log FLOW_log Runofft_log PH_log Red_log
5	0.7698	124.6395	Dryh_log FLOW_log Runofft_log Qt_log Temp_log
5	0.7694	124.8969	Dryh_log FLOW_log Runofft_log Qt_log PH_log
5	0.7553	134.8682	FLOW_log Runofft_log Qt_log PH_log Temp_log
5	0.7539	135.8466	FLOW_log Qt_log PH_log Red_log Temp_log
5	0.7471	140.6264	FLOW_log Runofft_log PH_log Red_log Temp_log
5	0.7416	144.5224	Runofft_log Qt_log PH_log Red_log Temp_log
5	0.7389	146.4419	Dryh_log FLOW_log Runofft_log Red_log Temp_log
5	0.7170	161.9266	FLOW_log Runofft_log Qt_log PH_log Red_log
5	0.7149	163.4122	FLOW_log Runofft_log Qt_log Red_log Temp_log
5	0.6582	203.4216	Dryh_log FLOW_log PH_log Red_log Temp_log
6	0.9400	6.4147	CondI_log Dryh_log FLOW_log PH_log Red_log Temp_log
6	0.9398	6.5362	CondI_log Dryh_log FLOW_log Qt_log PH_log Temp_log
6	0.9396	6.6468	CondI_log Dryh_log FLOW_log Runofft_log PH_log Temp_log
6	0.9396	6.6806	CondI_log Dryh_log FLOW_log Qt_log Red_log Temp_log
6	0.9392	6.9514	CondI_log Dryh_log FLOW_log Runofft_log Red_log Temp_log
6	0.9387	7.2875	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Temp_log
6	0.9160	23.3600	CondI_log FLOW_log Runofft_log Qt_log PH_log Temp_log
6	0.9159	23.3978	CondI_log FLOW_log Qt_log PH_log Red_log Temp_log
6	0.9159	23.3985	CondI_log FLOW_log Runofft_log PH_log Red_log Temp_log
6	0.9158	23.5047	CondI_log FLOW_log Runofft_log Qt_log Red_log Temp_log
6	0.8863	44.3406	CondI_log Dryh_log Runofft_log Qt_log PH_log Temp_log
6	0.8849	45.3179	CondI_log Dryh_log Runofft_log PH_log Red_log Temp_log
6	0.8822	47.1842	CondI_log Dryh_log Runofft_log Qt_log Red_log Temp_log
6	0.8761	51.4965	CondI_log Dryh_log Qt_log PH_log Red_log Temp_log
6	0.8492	70.5296	CondI_log Dryh_log FLOW_log Runofft_log PH_log Red_log
6	0.8492	70.5455	CondI_log Dryh_log FLOW_log Qt_log PH_log Red_log
6	0.8487	70.8982	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Red_log
6	0.8328	82.1361	CondI_log Dryh_log Runofft_log Qt_log PH_log Red_log
6	0.8308	83.5293	CondI_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.8300	84.0877	Dryh_log FLOW_log Qt_log PH_log Red_log Temp_log
6	0.8293	84.5594	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log
6	0.8282	85.3231	Dryh_log FLOW_log Runofft_log Qt_log PH_log Temp_log
6	0.8243	88.1225	Dryh_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.8178	92.6824	Dryh_log FLOW_log Runofft_log Qt_log Red_log Temp_log
6	0.8152	94.5613	CondI_log FLOW_log Runofft_log Qt_log PH_log Red_log
6	0.8011	104.5077	Dryh_log FLOW_log Runofft_log PH_log Red_log Temp_log
6	0.7883	113.5475	Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log

6	0.7561	136.2678	FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Mn_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
7	0.9420	7.0003	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Temp_log
7	0.9402	8.2267	CondI_log Dryh_log FLOW_log Qt_log PH_log Red_log Temp_log
7	0.9402	8.2526	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Red_log Temp_log
7	0.9401	8.3411	CondI_log Dryh_log FLOW_log Runofft_log PH_log Red_log Temp_log
7	0.9162	25.2154	CondI_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
7	0.8865	46.1530	CondI_log Dryh_log Runofft_log Qt_log PH_log Red_log Temp_log
7	0.8493	72.4699	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log
7	0.8301	86.0405	Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
8	0.9420	9.0000	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Ni_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
1	0.7330	42.3684	BOD_log
1	0.7190	46.1655	CondI_log
1	0.7065	49.5577	PH_log
1	0.6578	62.7530	Runofft_log
1	0.6448	66.2771	COD_log
1	0.6212	72.6632	TSS_log
1	0.5867	82.0136	VSS_log
1	0.5519	91.4426	Qt_log
1	0.5299	97.4181	TDS_log
1	0.5119	102.2996	Red_log
1	0.4681	114.1546	VDS_log
1	0.3633	142.5646	Alcal_log
1	0.3605	143.3260	Turb_log
1	0.1432	202.2222	FLOW_log
1	0.0722	221.4796	Temp_log
1	0.0146	237.0849	Dryh_log
2	0.8956	0.2987	Qt_log Red_log
2	0.8950	0.4505	Runofft_log PH_log
2	0.8916	1.3749	Qt_log PH_log
2	0.8655	8.4443	Red_log CondI_log
2	0.8634	9.0331	PH_log CondI_log
2	0.8562	10.9836	PH_log Turb_log
2	0.8547	11.3949	Qt_log Temp_log
2	0.8456	13.8508	Temp_log CondI_log
2	0.8360	16.4392	VSS_log PH_log
2	0.8357	16.5352	COD_log CondI_log
2	0.8339	17.0248	TSS_log PH_log
2	0.8336	17.1129	PH_log BOD_log
2	0.8306	17.9039	TDS_log Red_log
2	0.8260	19.1525	Red_log Temp_log
2	0.8226	20.0724	VDS_log Red_log
2	0.8204	20.6772	Runofft_log Red_log
3	0.9188	-3.9786	Qt_log PH_log Turb_log
3	0.9166	-3.4046	Qt_log TDS_log Red_log
3	0.9147	-2.8682	Qt_log COD_log PH_log
3	0.9130	-2.4150	Qt_log TDS_log Temp_log
3	0.9117	-2.0675	Qt_log PH_log Red_log
3	0.9093	-1.4031	Temp_log CondI_log Dryh_log
3	0.9067	-0.7046	Runofft_log Qt_log PH_log
3	0.9054	-0.3608	Runofft_log TDS_log PH_log

The REG Procedure
Model: MODEL1
Dependent Variable: Ni_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.9053	-0.3450	COD_log PH_log CondI_log
3	0.9044	-0.0797	Qt_log PH_log Temp_log
3	0.9042	-0.0241	PH_log Turb_log Dryh_log
3	0.9041	-0.0191	TDS_log PH_log Turb_log
3	0.9038	0.0831	Qt_log Red_log CondI_log
3	0.9030	0.2962	FLOW_log Runofft_log PH_log
3	0.9026	0.3989	Qt_log VDS_log Red_log
3	0.9022	0.5143	PH_log Turb_log Temp_log
4	0.9230	-3.1414	Qt_log PH_log Turb_log Alcal_log
4	0.9224	-2.9671	Qt_log TSS_log PH_log Turb_log
4	0.9224	-2.9562	Qt_log TDS_log Temp_log CondI_log
4	0.9221	-2.8844	Qt_log Temp_log CondI_log Dryh_log
4	0.9219	-2.8318	Qt_log TDS_log PH_log Turb_log
4	0.9214	-2.7034	Qt_log COD_log PH_log Turb_log

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 4     0.9205   -2.4597  Qt_log PH_log Turb_log Dryh_log
 4     0.9205   -2.4564  Qt_log VDS_log TDS_log Red_log
 4     0.9203   -2.3888  Qt_log PH_log BOD_log Turb_log
 4     0.9200   -2.3158  Qt_log VSS_log PH_log Turb_log
 4     0.9196   -2.2007  Qt_log VDS_log PH_log Turb_log
 4     0.9195   -2.1912  Qt_log TDS_log Red_log Temp_log
 4     0.9193   -2.1269  Qt_log PH_log Red_log Turb_log
 4     0.9193   -2.1160  FLOW_log Qt_log PH_log Turb_log
 4     0.9192   -2.0886  Qt_log TDS_log PH_log Red_log
 4     0.9191   -2.0765  Qt_log PH_log Turb_log CondI_log
--------------------------------------------------------------------------------
 5     0.9295   -2.8785  Qt_log Temp_log CondI_log Alcal_log Dryh_log
 5     0.9273   -2.3080  Qt_log TDS_log PH_log Turb_log Alcal_log
 5     0.9259   -1.9274  Qt_log TDS_log PH_log Turb_log Temp_log
 5     0.9257   -1.8607  Qt_log TSS_log PH_log Turb_log Alcal_log
 5     0.9256   -1.8428  Qt_log TDS_log Temp_log CondI_log Dryh_log
 5     0.9254   -1.7671  Qt_log TDS_log PH_log BOD_log Turb_log
 5     0.9249   -1.6491  Runofft_log Temp_log CondI_log Alcal_log Dryh_log
 5     0.9248   -1.6073  Qt_log TDS_log PH_log Red_log Turb_log
 5     0.9246   -1.5658  Qt_log TDS_log Temp_log CondI_log Alcal_log
 5     0.9246   -1.5568  Qt_log PH_log Turb_log Alcal_log Dryh_log
 5     0.9244   -1.5103  Qt_log TSS_log TDS_log PH_log Turb_log
 5     0.9243   -1.4916  FLOW_log Qt_log TSS_log PH_log Turb_log
 5     0.9243   -1.4731  Qt_log PH_log Turb_log CondI_log Alcal_log
 5     0.9242   -1.4438  Qt_log VDS_log TDS_log COD_log Red_log
 5     0.9241   -1.4337  Qt_log TDS_log BOD_log Temp_log CondI_log
 5     0.9240   -1.4073  Qt_log TDS_log COD_log Temp_log CondI_log
```

The REG Procedure
Model: MODEL1
Dependent Variable: Ni_log

R-Square Selection Method

```
    R-Square      C(p)  Variables in Model

 6     0.9301   -1.0553  Qt_log TDS_log Temp_log CondI_log Alcal_log Dryh_log
 6     0.9300   -1.0257  Qt_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
 6     0.9298   -0.9706  Qt_log VDS_log Temp_log CondI_log Alcal_log Dryh_log
 6     0.9298   -0.9683  Qt_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
 6     0.9297   -0.9355  Runofft_log Qt_log Temp_log CondI_log Alcal_log Dryh_log
 6     0.9296   -0.9147  Qt_log PH_log Temp_log CondI_log Alcal_log Dryh_log
 6     0.9295   -0.8963  FLOW_log Qt_log Temp_log CondI_log Alcal_log Dryh_log
 6     0.9295   -0.8907  Qt_log COD_log Temp_log CondI_log Alcal_log Dryh_log
 6     0.9295   -0.8838  Qt_log Red_log Temp_log CondI_log Alcal_log Dryh_log
 6     0.9295   -0.8835  Qt_log VSS_log Temp_log CondI_log Alcal_log Dryh_log
 6     0.9295   -0.8786  Qt_log TSS_log Temp_log CondI_log Alcal_log Dryh_log
 6     0.9293   -0.8310  Qt_log VDS_log TDS_log PH_log Turb_log Alcal_log
 6     0.9288   -0.6911  Qt_log TSS_log TDS_log PH_log Turb_log Alcal_log
 6     0.9283   -0.5744  Qt_log TDS_log PH_log BOD_log Turb_log Alcal_log
 6     0.9281   -0.5168  Qt_log VDS_log TDS_log Temp_log CondI_log Dryh_log
 6     0.9281   -0.5144  Qt_log VDS_log TDS_log COD_log PH_log Red_log
------------------------------------------------------------------------------------------
 7     0.9320    0.4276  Qt_log VDS_log TDS_log Temp_log CondI_log Alcal_log Dryh_log
 7     0.9312    0.6458  Qt_log VDS_log TDS_log PH_log BOD_log Turb_log Alcal_log
 7     0.9309    0.7281  Qt_log TSS_log VDS_log TDS_log PH_log Turb_log Alcal_log
 7     0.9308    0.7453  Qt_log VDS_log TDS_log PH_log BOD_log Turb_log Temp_log
 7     0.9308    0.7650  Qt_log TDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
 7     0.9307    0.7784  Qt_log TDS_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
 7     0.9305    0.8294  Qt_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
 7     0.9305    0.8335  Qt_log VDS_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
 7     0.9305    0.8352  Qt_log VDS_log TDS_log VSS_log PH_log Turb_log Alcal_log
 7     0.9305    0.8382  Qt_log COD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
 7     0.9303    0.8833  Qt_log PH_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
 7     0.9303    0.8838  Runofft_log Qt_log VDS_log Temp_log CondI_log Alcal_log Dryh_log
 7     0.9303    0.8892  Qt_log TDS_log PH_log Temp_log CondI_log Alcal_log Dryh_log
 7     0.9303    0.8912  Runofft_log Qt_log TDS_log Temp_log CondI_log Alcal_log Dryh_log
 7     0.9303    0.9049  Qt_log VDS_log TDS_log COD_log PH_log BOD_log Turb_log
 7     0.9302    0.9065  Qt_log TDS_log COD_log Temp_log CondI_log Alcal_log Dryh_log
--------------------------------------------------------------------------------------------
 8     0.9336    1.9869  Qt_log VDS_log TDS_log Turb_log Temp_log CondI_log Alcal_log
                         Dryh_log
 8     0.9335    2.0162  Runofft_log Qt_log VDS_log TDS_log Temp_log CondI_log Alcal_log
                         Dryh_log
 8     0.9331    2.1204  FLOW_log Runofft_log VDS_log TDS_log Temp_log CondI_log Alcal_log
                         Dryh_log
 8     0.9327    2.2403  Qt_log VDS_log TDS_log PH_log Temp_log CondI_log Alcal_log
```

```
                                      Dryh_log
                                                      11:56 Tuesday, November 25, 2003   4

                                             The REG Procedure
                                               Model: MODEL1
                                        Dependent Variable: Ni_log

                                         R-Square Selection Method


         R-Square       C(p)  Variables in Model

    8      0.9326     2.2682  Qt_log VDS_log TDS_log BOD_log Temp_log CondI_log Alcal_log
                              Dryh_log
    8      0.9325     2.2819  Qt_log VDS_log TDS_log COD_log Temp_log CondI_log Alcal_log
                              Dryh_log
    8      0.9322     2.3668  Qt_log TSS_log VDS_log TDS_log Temp_log CondI_log Alcal_log
                              Dryh_log
    8      0.9321     2.3922  Qt_log TSS_log VDS_log TDS_log PH_log BOD_log Turb_log Alcal_log
    8      0.9321     2.4099  FLOW_log Qt_log VDS_log TDS_log Temp_log CondI_log Alcal_log
                              Dryh_log
    8      0.9320     2.4189  Qt_log VDS_log TDS_log Red_log Temp_log CondI_log Alcal_log
                              Dryh_log
    8      0.9320     2.4270  Qt_log VDS_log TDS_log VSS_log Temp_log CondI_log Alcal_log
                              Dryh_log
    8      0.9320     2.4316  Qt_log VDS_log TDS_log PH_log BOD_log Turb_log Temp_log Alcal_log
    8      0.9320     2.4330  Qt_log VDS_log TDS_log COD_log PH_log BOD_log Turb_log Temp_log
    8      0.9319     2.4477  Qt_log VDS_log TDS_log COD_log PH_log BOD_log Turb_log Alcal_log
    8      0.9318     2.4924  Qt_log VDS_log TDS_log VSS_log PH_log BOD_log Turb_log Alcal_log
    8      0.9317     2.5009  Qt_log TDS_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                              Dryh_log
-------------------------------------------------------------------------------------------
    9      0.9351     3.5925  Runofft_log Qt_log VDS_log TDS_log BOD_log Temp_log CondI_log
                              Alcal_log Dryh_log
    9      0.9348     3.6680  Qt_log VDS_log TDS_log BOD_log Turb_log Temp_log CondI_log
                              Alcal_log Dryh_log
    9      0.9345     3.7408  FLOW_log Runofft_log VDS_log TDS_log BOD_log Temp_log CondI_log
                              Alcal_log Dryh_log
    9      0.9345     3.7545  FLOW_log Runofft_log Qt_log VDS_log TDS_log Temp_log CondI_log
                              Alcal_log Dryh_log
    9      0.9339     3.9058  Runofft_log Qt_log VDS_log TDS_log Turb_log Temp_log CondI_log
                              Alcal_log Dryh_log
    9      0.9339     3.9072  Qt_log VDS_log TDS_log PH_log Turb_log Temp_log CondI_log
                              Alcal_log Dryh_log
    9      0.9339     3.9093  Qt_log VDS_log TDS_log COD_log Turb_log Temp_log CondI_log
                              Alcal_log Dryh_log
    9      0.9339     3.9286  FLOW_log Runofft_log TSS_log VDS_log TDS_log Temp_log CondI_log
                              Alcal_log Dryh_log
    9      0.9339     3.9286  Runofft_log Qt_log VDS_log TDS_log VSS_log Temp_log CondI_log
                              Alcal_log Dryh_log
    9      0.9338     3.9377  Qt_log VDS_log TDS_log VSS_log Turb_log Temp_log CondI_log
                              Alcal_log Dryh_log
    9      0.9338     3.9431  FLOW_log Runofft_log VDS_log TDS_log Red_log Temp_log CondI_log
                              Alcal_log Dryh_log
                                                      11:56 Tuesday, November 25, 2003   5

                                             The REG Procedure
                                               Model: MODEL1
                                        Dependent Variable: Ni_log

                                         R-Square Selection Method


         R-Square       C(p)  Variables in Model

    9      0.9337     3.9744  FLOW_log Qt_log VDS_log TDS_log Turb_log Temp_log CondI_log
                              Alcal_log Dryh_log
    9      0.9337     3.9820  Qt_log VDS_log TDS_log COD_log BOD_log Temp_log CondI_log
                              Alcal_log Dryh_log
    9      0.9336     3.9860  Qt_log VDS_log TDS_log Red_log Turb_log Temp_log CondI_log
                              Alcal_log Dryh_log
    9      0.9336     3.9866  Qt_log TSS_log VDS_log TDS_log Turb_log Temp_log CondI_log
                              Alcal_log Dryh_log
    9      0.9336     3.9969  Runofft_log Qt_log VDS_log TDS_log PH_log Temp_log CondI_log
                              Alcal_log Dryh_log
-------------------------------------------------------------------------------------------
   10      0.9359     5.3844  FLOW_log Runofft_log Qt_log VDS_log TDS_log BOD_log Temp_log
                              CondI_log Alcal_log Dryh_log
   10      0.9356     5.4475  FLOW_log Runofft_log VDS_log TDS_log Red_log BOD_log Temp_log
```

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                                  CondI_log Alcal_log Dryh_log
 10      0.9355     5.4730  Runofft_log Qt_log VDS_log TDS_log BOD_log Turb_log Temp_log
                            CondI_log Alcal_log Dryh_log
 10      0.9353     5.5241  Runofft_log Qt_log VDS_log TDS_log VSS_log BOD_log Temp_log
                            CondI_log Alcal_log Dryh_log
 10      0.9353     5.5383  Qt_log VDS_log TDS_log PH_log BOD_log Turb_log Temp_log CondI_log
                            Alcal_log Dryh_log
 10      0.9352     5.5527  FLOW_log Runofft_log TSS_log VDS_log TDS_log BOD_log Temp_log
                            CondI_log Alcal_log Dryh_log
 10      0.9351     5.5792  Runofft_log Qt_log VDS_log TDS_log PH_log BOD_log Temp_log
                            CondI_log Alcal_log Dryh_log
 10      0.9351     5.5848  Runofft_log Qt_log TSS_log VDS_log TDS_log BOD_log Temp_log
                            CondI_log Alcal_log Dryh_log
 10      0.9351     5.5852  Runofft_log Qt_log VDS_log TDS_log COD_log BOD_log Temp_log
                            CondI_log Alcal_log Dryh_log
 10      0.9351     5.5879  Runofft_log Qt_log VDS_log TDS_log Red_log BOD_log Temp_log
                            CondI_log Alcal_log Dryh_log
 10      0.9349     5.6448  Qt_log VDS_log TDS_log COD_log BOD_log Turb_log Temp_log
                            CondI_log Alcal_log Dryh_log
 10      0.9349     5.6451  Qt_log VDS_log TDS_log VSS_log BOD_log Turb_log Temp_log
                            CondI_log Alcal_log Dryh_log
 10      0.9349     5.6576  Qt_log VDS_log TDS_log Red_log BOD_log Turb_log Temp_log
                            CondI_log Alcal_log Dryh_log
 10      0.9348     5.6640  Qt_log TSS_log VDS_log TDS_log BOD_log Turb_log Temp_log
                            CondI_log Alcal_log Dryh_log
 10      0.9348     5.6672  FLOW_log Qt_log VDS_log TDS_log BOD_log Turb_log Temp_log
                            CondI_log Alcal_log Dryh_log
                                                   11:56 Tuesday, November 25, 2003   6

                                    The REG Procedure
                                      Model: MODEL1
                                Dependent Variable: Ni_log

                                 R-Square Selection Method


      R-Square       C(p)  Variables in Model

 10      0.9347     5.7037  FLOW_log Runofft_log Qt_log VDS_log TDS_log Turb_log Temp_log
                            CondI_log Alcal_log Dryh_log
-------------------------------------------------------------------------------------------
 11      0.9362     7.2804  FLOW_log Runofft_log Qt_log VDS_log TDS_log Red_log BOD_log
                            Temp_log CondI_log Alcal_log Dryh_log
 11      0.9361     7.3217  FLOW_log Runofft_log Qt_log VDS_log TDS_log BOD_log Turb_log
                            Temp_log CondI_log Alcal_log Dryh_log
 11      0.9360     7.3491  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log BOD_log
                            Temp_log CondI_log Alcal_log Dryh_log
 11      0.9359     7.3656  FLOW_log Runofft_log TSS_log VDS_log TDS_log Red_log BOD_log
                            Temp_log CondI_log Alcal_log Dryh_log
 11      0.9359     7.3813  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log BOD_log
                            Temp_log CondI_log Alcal_log Dryh_log
 11      0.9359     7.3814  Runofft_log Qt_log VDS_log TDS_log PH_log BOD_log Turb_log
                            Temp_log CondI_log Alcal_log Dryh_log
 11      0.9359     7.3820  FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log BOD_log
                            Temp_log CondI_log Alcal_log Dryh_log
 11      0.9359     7.3835  FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log BOD_log
                            Temp_log CondI_log Alcal_log Dryh_log
 11      0.9359     7.3864  Runofft_log Qt_log VDS_log TDS_log VSS_log BOD_log Turb_log
                            Temp_log CondI_log Alcal_log Dryh_log
 11      0.9357     7.4225  Runofft_log Qt_log VDS_log TDS_log COD_log BOD_log Turb_log
                            Temp_log CondI_log Alcal_log Dryh_log
 11      0.9357     7.4326  FLOW_log Runofft_log VDS_log TDS_log Red_log BOD_log Turb_log
                            Temp_log CondI_log Alcal_log Dryh_log
 11      0.9357     7.4352  FLOW_log Runofft_log VDS_log TDS_log PH_log Red_log BOD_log
                            Temp_log CondI_log Alcal_log Dryh_log
 11      0.9357     7.4354  FLOW_log Runofft_log VDS_log TDS_log COD_log Red_log BOD_log
                            Temp_log CondI_log Alcal_log Dryh_log
 11      0.9356     7.4464  FLOW_log Runofft_log VDS_log TDS_log VSS_log Red_log BOD_log
                            Temp_log CondI_log Alcal_log Dryh_log
 11      0.9356     7.4595  Runofft_log Qt_log TSS_log VDS_log TDS_log BOD_log Turb_log
                            Temp_log CondI_log Alcal_log Dryh_log
 11      0.9356     7.4616  Runofft_log Qt_log VDS_log TDS_log Red_log BOD_log Turb_log
                            Temp_log CondI_log Alcal_log Dryh_log
-------------------------------------------------------------------------------------------
 12      0.9365     9.2165  FLOW_log Runofft_log Qt_log VDS_log TDS_log Red_log BOD_log
                            Turb_log Temp_log CondI_log Alcal_log Dryh_log
 12      0.9364     9.2291  FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log BOD_log
                            Turb_log Temp_log CondI_log Alcal_log Dryh_log
 12      0.9364     9.2385  FLOW_log Runofft_log TSS_log VDS_log TDS_log VSS_log Red_log
```

```
                                   ni all.lst
                    BOD_log Temp_log CondI_log Alcal_log Dryh_log
                                          11:56 Tuesday, November 25, 2003   7

                              The REG Procedure
                                Model: MODEL1
                          Dependent Variable: Ni_log

                           R-Square Selection Method


Model    R-Square      C(p)  Variables in Model

   12      0.9363    9.2594  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log Red_log
                             BOD_log Temp_log CondI_log Alcal_log Dryh_log
   12      0.9363    9.2659  FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log Red_log
                             BOD_log Temp_log CondI_log Alcal_log Dryh_log
   12      0.9363    9.2750  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                             BOD_log Temp_log CondI_log Alcal_log Dryh_log
   12      0.9362    9.2803  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log Red_log
                             BOD_log Temp_log CondI_log Alcal_log Dryh_log
   12      0.9362    9.2804  FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log Red_log
                             BOD_log Temp_log CondI_log Alcal_log Dryh_log
   12      0.9362    9.2807  FLOW_log Runofft_log VDS_log TDS_log PH_log Red_log BOD_log
                             Turb_log Temp_log CondI_log Alcal_log Dryh_log
   12      0.9362    9.2876  Runofft_log Qt_log VDS_log TDS_log VSS_log PH_log BOD_log
                             Turb_log Temp_log CondI_log Alcal_log Dryh_log
   12      0.9362    9.2913  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log BOD_log
                             Turb_log Temp_log CondI_log Alcal_log Dryh_log
   12      0.9362    9.3046  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log BOD_log
                             Turb_log Temp_log CondI_log Alcal_log Dryh_log
   12      0.9361    9.3095  FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log BOD_log
                             Turb_log Temp_log CondI_log Alcal_log Dryh_log
   12      0.9361    9.3252  Runofft_log Qt_log VDS_log TDS_log VSS_log Red_log BOD_log
                             Turb_log Temp_log CondI_log Alcal_log Dryh_log
   12      0.9361    9.3254  Runofft_log Qt_log TSS_log VDS_log TDS_log PH_log BOD_log
                             Turb_log Temp_log CondI_log Alcal_log Dryh_log
   12      0.9360    9.3423  FLOW_log Runofft_log TSS_log VDS_log TDS_log COD_log Red_log
                             BOD_log Temp_log CondI_log Alcal_log Dryh_log
------------------------------------------------------------------------------------------
   13      0.9370   11.0722  FLOW_log Runofft_log Qt_log VDS_log TDS_log PH_log Red_log
                             BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
   13      0.9367   11.1530  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                             Red_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
   13      0.9367   11.1565  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log Red_log
                             BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
   13      0.9366   11.1819  FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log Red_log
                             BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
   13      0.9366   11.1834  Runofft_log Qt_log VDS_log TDS_log VSS_log PH_log Red_log BOD_log
                             Turb_log Temp_log CondI_log Alcal_log Dryh_log
   13      0.9365   11.2093  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log Red_log
                             BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
   13      0.9365   11.2139  FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log PH_log
                             BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
                                          11:56 Tuesday, November 25, 2003   8

                              The REG Procedure
                                Model: MODEL1
                          Dependent Variable: Ni_log

                           R-Square Selection Method


         R-Square      C(p)  Variables in Model

   13      0.9365   11.2150  FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                             BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
   13      0.9365   11.2207  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                             BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
   13      0.9365   11.2209  FLOW_log Runofft_log TSS_log VDS_log TDS_log VSS_log Red_log
                             BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
   13      0.9365   11.2220  FLOW_log Runofft_log VDS_log TDS_log COD_log PH_log Red_log
                             BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
   13      0.9364   11.2277  Runofft_log Qt_log TSS_log VDS_log TDS_log PH_log Red_log BOD_log
                             Turb_log Temp_log CondI_log Alcal_log Dryh_log
   13      0.9364   11.2291  FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log PH_log
                             BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
   13      0.9364   11.2362  FLOW_log Runofft_log TSS_log VDS_log TDS_log VSS_log COD_log
                             Red_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
   13      0.9364   11.2377  FLOW_log Runofft_log TSS_log VDS_log TDS_log VSS_log PH_log
```

```
                                        Red_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
13         0.9364    11.2510   FLOW_log Runofft_log TSS_log VDS_log TDS_log COD_log Red_log
                                        BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
-------------------------------------------------------------------------------------------
14         0.9372    13.0229   FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log PH_log
                                        Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14         0.9371    13.0366   FLOW_log Runofft_log Qt_log VDS_log TDS_log COD_log PH_log
                                        Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14         0.9371    13.0613   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log PH_log
                                        Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14         0.9370    13.0888   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                        Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14         0.9368    13.1407   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                                        Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14         0.9367    13.1442   FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log
                                        Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14         0.9367    13.1447   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                        PH_log Red_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
14         0.9367    13.1488   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                        COD_log Red_log BOD_log Temp_log CondI_log Alcal_log Dryh_log
14         0.9366    13.1728   FLOW_log Runofft_log TSS_log VDS_log TDS_log VSS_log COD_log
                                        Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14         0.9366    13.1778   Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log PH_log Red_log
                                        BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14         0.9366    13.1814   Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log PH_log Red_log
                                        BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
                                                          11:56 Tuesday, November 25, 2003   9

                                   The REG Procedure
                                     Model: MODEL1
                               Dependent Variable: Ni_log

                               R-Square Selection Method


        R-Square       C(p)    Variables in Model

14         0.9366    13.1884   FLOW_log Runofft_log TSS_log VDS_log TDS_log VSS_log PH_log
                                        Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14         0.9366    13.1911   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                        PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14         0.9366    13.1955   FLOW_log Runofft_log TSS_log VDS_log TDS_log COD_log PH_log
                                        Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14         0.9365    13.2078   FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log
                                        PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
14         0.9365    13.2085   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                        COD_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
-------------------------------------------------------------------------------------------
15         0.9372    15.0089   FLOW_log Runofft_log Qt_log VDS_log TDS_log VSS_log COD_log
                                        PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                                        Dryh_log
15         0.9372    15.0139   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                        PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                                        Dryh_log
15         0.9372    15.0333   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log COD_log
                                        PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                                        Dryh_log
15         0.9370    15.0630   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                        COD_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                                        Dryh_log
15         0.9367    15.1447   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                        COD_log PH_log Red_log BOD_log Temp_log CondI_log Alcal_log
                                        Dryh_log
15         0.9367    15.1484   FLOW_log Runofft_log TSS_log VDS_log TDS_log VSS_log COD_log
                                        PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                                        Dryh_log
15         0.9366    15.1756   Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log
                                        Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15         0.9366    15.1848   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                        COD_log PH_log BOD_log Turb_log Temp_log CondI_log Alcal_log
                                        Dryh_log
15         0.9358    15.4012   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                        COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log
                                        Alcal_log
15         0.9357    15.4247   FLOW_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log
                                        Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15         0.9356    15.4590   FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log
                                        COD_log PH_log Red_log Turb_log Temp_log CondI_log Alcal_log
                                        Dryh_log
```

The REG Procedure
Model: MODEL1
Dependent Variable: Ni_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
15	0.9345	15.7571	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log Alcal_log Dryh_log
15	0.9339	15.9150	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log CondI_log Alcal_log Dryh_log
15	0.9339	15.9268	FLOW_log Runofft_log Qt_log TSS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
15	0.9338	15.9400	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Dryh_log
15	0.9330	16.1713	FLOW_log Runofft_log Qt_log TSS_log VDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log
16	0.9373	17.0000	FLOW_log Runofft_log Qt_log TSS_log VDS_log TDS_log VSS_log COD_log PH_log Red_log BOD_log Turb_log Temp_log CondI_log Alcal_log Dryh_log

The REG Procedure
Model: MODEL1
Dependent Variable: Ni_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
1	0.6610	82.8870	CondI_log
1	0.6218	97.7987	PH_log
1	0.5433	127.6423	Runofft_log
1	0.5149	138.4415	Qt_log
1	0.3321	207.9590	Red_log
1	0.0460	316.7532	Dryh_log
1	0.0009	333.9114	FLOW_log
1	0.0000	334.2503	Temp_log
2	0.8541	11.4773	Qt_log PH_log
2	0.8363	18.2596	Runofft_log PH_log
2	0.7863	37.2462	CondI_log PH_log
2	0.7552	49.0795	CondI_log FLOW_log
2	0.7415	54.2912	Qt_log Red_log
2	0.7218	61.7763	CondI_log Red_log
2	0.7152	64.3144	Dryh_log Qt_log
2	0.7124	65.3724	CondI_log Runofft_log
2	0.7096	66.4357	CondI_log Dryh_log
2	0.6784	78.3039	PH_log Temp_log
2	0.6690	81.8691	CondI_log Qt_log
2	0.6660	82.9936	CondI_log Temp_log
2	0.6534	87.7985	Runofft_log Red_log
2	0.6418	92.2249	FLOW_log PH_log
2	0.6400	92.8877	PH_log Red_log
2	0.6316	96.0999	Dryh_log PH_log
2	0.6078	105.1459	FLOW_log Qt_log
2	0.6064	105.6686	Dryh_log Runofft_log
2	0.5725	118.5459	Runofft_log Qt_log
2	0.5444	129.2391	FLOW_log Runofft_log
2	0.5438	129.4842	Runofft_log Temp_log
2	0.5394	131.1272	Qt_log Temp_log
2	0.4682	158.2360	Red_log Temp_log
2	0.3561	200.8349	FLOW_log Red_log
2	0.3329	209.6696	Dryh_log Red_log
2	0.0735	308.3130	Dryh_log FLOW_log
2	0.0490	317.6011	Dryh_log Temp_log
2	0.0009	335.9112	FLOW_log Temp_log
3	0.8790	4.0073	Dryh_log Qt_log PH_log
3	0.8683	8.0814	FLOW_log Qt_log PH_log
3	0.8666	8.7099	Runofft_log Qt_log PH_log
3	0.8641	9.6578	Runofft_log PH_log Red_log

The REG Procedure
Model: MODEL1
Dependent Variable: Ni_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.8634	9.9541	Runofft_log PH_log Temp_log
3	0.8600	11.2519	Qt_log PH_log Temp_log
3	0.8556	12.9268	CondI_log Runofft_log PH_log
3	0.8544	13.3550	Qt_log PH_log Red_log
3	0.8541	13.4597	CondI_log Qt_log PH_log
3	0.8413	18.3498	FLOW_log Runofft_log PH_log
3	0.8364	20.2013	Dryh_log Runofft_log PH_log
3	0.8056	31.9227	CondI_log FLOW_log PH_log
3	0.8026	33.0600	Dryh_log Qt_log Red_log
3	0.7957	35.6802	CondI_log PH_log Temp_log
3	0.7893	38.1147	CondI_log PH_log Red_log
3	0.7886	38.3800	CondI_log Dryh_log PH_log
3	0.7797	41.7718	CondI_log FLOW_log Qt_log
3	0.7758	43.2590	CondI_log FLOW_log Runofft_log
3	0.7696	45.6244	CondI_log FLOW_log Red_log

3	0.7695	45.6580	FLOW_log Qt_log Red_log
3	0.7676	46.3789	CondI_log Dryh_log Runofft_log
3	0.7650	47.3463	CondI_log Qt_log Red_log
3	0.7650	47.3747	Qt_log Red_log Temp_log
3	0.7646	47.5203	CondI_log Runofft_log Red_log
3	0.7640	47.7467	CondI_log Dryh_log Qt_log
3	0.7586	49.7918	CondI_log Dryh_log FLOW_log
3	0.7584	49.8523	CondI_log FLOW_log Temp_log
3	0.7421	56.0618	Runofft_log Qt_log Red_log
3	0.7360	58.3693	CondI_log Dryh_log Red_log
3	0.7349	58.7937	CondI_log Red_log Temp_log
3	0.7279	61.4521	Dryh_log FLOW_log Qt_log
3	0.7204	64.3246	Dryh_log Qt_log Temp_log
3	0.7195	64.6729	CondI_log Runofft_log Qt_log
3	0.7191	64.7988	Dryh_log Runofft_log Qt_log
3	0.7160	66.0060	CondI_log Runofft_log Temp_log
3	0.7099	68.3164	CondI_log Dryh_log Temp_log
3	0.7001	72.0505	Runofft_log Red_log Temp_log
3	0.6959	73.6430	FLOW_log PH_log Temp_log
3	0.6825	78.7413	Dryh_log PH_log Temp_log
3	0.6784	80.3006	PH_log Red_log Temp_log
3	0.6782	80.3717	CondI_log Qt_log Temp_log
3	0.6653	85.2689	Dryh_log Runofft_log Red_log
3	0.6565	88.6221	FLOW_log Runofft_log Red_log
3	0.6543	89.4350	FLOW_log PH_log Red_log
3	0.6456	92.7438	Dryh_log PH_log Red_log
3	0.6427	93.8626	Dryh_log FLOW_log PH_log

The REG Procedure
Model: MODEL1
Dependent Variable: Ni_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.6341	97.1511	FLOW_log Qt_log Temp_log
3	0.6194	102.7079	Dryh_log FLOW_log Runofft_log
3	0.6134	104.9983	FLOW_log Runofft_log Qt_log
3	0.6081	107.0191	Dryh_log Runofft_log Temp_log
3	0.5804	117.5723	Runofft_log Qt_log Temp_log
3	0.5447	131.1151	FLOW_log Runofft_log Temp_log
3	0.4977	148.9812	FLOW_log Red_log Temp_log
3	0.4685	160.1042	Dryh_log Red_log Temp_log
3	0.3591	201.6968	Dryh_log FLOW_log Red_log
3	0.0777	308.6929	Dryh_log FLOW_log Temp_log
4	0.8843	4.0053	Dryh_log Qt_log PH_log Temp_log
4	0.8837	4.2353	Dryh_log FLOW_log Qt_log PH_log
4	0.8827	4.6048	Dryh_log Runofft_log Qt_log PH_log
4	0.8799	5.6627	Dryh_log Qt_log PH_log Red_log
4	0.8791	5.9576	CondI_log Dryh_log Qt_log PH_log
4	0.8779	6.4261	Runofft_log Qt_log PH_log Temp_log
4	0.8741	7.8898	Runofft_log Qt_log PH_log Red_log
4	0.8722	8.5876	CondI_log Runofft_log PH_log Red_log
4	0.8720	8.6662	CondI_log FLOW_log Qt_log PH_log
4	0.8716	8.8380	FLOW_log Qt_log PH_log Temp_log
4	0.8713	8.9414	FLOW_log Runofft_log Qt_log PH_log
4	0.8711	9.0001	Runofft_log PH_log Red_log Temp_log
4	0.8710	9.0347	CondI_log Runofft_log PH_log Temp_log
4	0.8689	9.8459	FLOW_log Qt_log PH_log Red_log
4	0.8681	10.1546	FLOW_log Runofft_log PH_log Temp_log
4	0.8672	10.4907	CondI_log Runofft_log Qt_log PH_log
4	0.8665	10.7822	Dryh_log Runofft_log PH_log Red_log
4	0.8658	11.0284	FLOW_log Runofft_log PH_log Red_log
4	0.8644	11.5797	Dryh_log Runofft_log PH_log Temp_log
4	0.8606	13.0045	Qt_log PH_log Red_log Temp_log
4	0.8600	13.2440	CondI_log Qt_log PH_log Temp_log
4	0.8582	13.9169	CondI_log Dryh_log Runofft_log PH_log
4	0.8567	14.4906	CondI_log FLOW_log Runofft_log PH_log
4	0.8545	15.3370	CondI_log Qt_log PH_log Red_log
4	0.8443	19.2192	Dryh_log FLOW_log Runofft_log PH_log
4	0.8172	29.5015	Dryh_log Qt_log Red_log Temp_log
4	0.8153	30.2262	CondI_log FLOW_log Qt_log Red_log
4	0.8128	31.1730	CondI_log Dryh_log Qt_log Red_log
4	0.8096	32.3896	CondI_log FLOW_log PH_log Temp_log
4	0.8096	32.3985	CondI_log FLOW_log PH_log Red_log

4	0.8093	32.5231	Dryh_log FLOW_log Qt_log Red_log

The REG Procedure
Model: MODEL1
Dependent Variable: Ni_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
4	0.8057	33.8975	CondI_log Dryh_log FLOW_log PH_log
4	0.8038	34.5889	Dryh_log Runofft_log Qt_log Red_log
4	0.8030	34.9047	CondI_log Dryh_log FLOW_log Qt_log
4	0.7982	36.7323	CondI_log Dryh_log PH_log Temp_log
4	0.7957	37.6748	CondI_log PH_log Red_log Temp_log
4	0.7923	38.9690	CondI_log Dryh_log PH_log Red_log
4	0.7923	38.9944	CondI_log FLOW_log Runofft_log Red_log
4	0.7894	40.0893	CondI_log FLOW_log Qt_log Temp_log
4	0.7865	41.1915	CondI_log Dryh_log FLOW_log Runofft_log
4	0.7853	41.6368	CondI_log Dryh_log Runofft_log Red_log
4	0.7824	42.7254	FLOW_log Qt_log Red_log Temp_log
4	0.7809	43.3298	CondI_log FLOW_log Runofft_log Qt_log
4	0.7790	44.0469	CondI_log Qt_log Red_log Temp_log
4	0.7785	44.2414	CondI_log FLOW_log Runofft_log Temp_log
4	0.7773	44.6825	CondI_log Runofft_log Red_log Temp_log
4	0.7752	45.4953	FLOW_log Runofft_log Qt_log Red_log
4	0.7742	45.8562	CondI_log Dryh_log Runofft_log Qt_log
4	0.7710	47.0845	CondI_log FLOW_log Red_log Temp_log
4	0.7703	47.3432	CondI_log Runofft_log Qt_log Red_log
4	0.7702	47.3838	CondI_log Dryh_log FLOW_log Red_log
4	0.7676	48.3771	CondI_log Dryh_log Runofft_log Temp_log
4	0.7669	48.6453	CondI_log Dryh_log Qt_log Temp_log
4	0.7659	49.0049	Runofft_log Qt_log Red_log Temp_log
4	0.7605	51.0873	CondI_log Dryh_log FLOW_log Temp_log
4	0.7470	56.1851	CondI_log Dryh_log Red_log Temp_log
4	0.7354	60.5987	Dryh_log FLOW_log Qt_log Temp_log
4	0.7280	63.4263	Dryh_log FLOW_log Runofft_log Qt_log
4	0.7226	65.4986	Dryh_log Runofft_log Qt_log Temp_log
4	0.7204	66.3259	CondI_log Runofft_log Qt_log Temp_log
4	0.7099	70.3023	Dryh_log Runofft_log Red_log Temp_log
4	0.7062	71.7306	FLOW_log Runofft_log Red_log Temp_log
4	0.6963	75.4670	FLOW_log PH_log Red_log Temp_log
4	0.6959	75.6365	Dryh_log FLOW_log PH_log Temp_log
4	0.6825	80.7316	Dryh_log PH_log Red_log Temp_log
4	0.6797	81.7759	Dryh_log FLOW_log Runofft_log Red_log
4	0.6547	91.3088	Dryh_log FLOW_log PH_log Red_log
4	0.6342	99.0792	FLOW_log Runofft_log Qt_log Temp_log
4	0.6218	103.8115	Dryh_log FLOW_log Runofft_log Temp_log
4	0.5034	148.8446	Dryh_log FLOW_log Red_log Temp_log
5	0.8911	3.4033	Dryh_log Runofft_log Qt_log PH_log Temp_log
5	0.8878	4.6820	Dryh_log Runofft_log Qt_log PH_log Red_log

The REG Procedure
Model: MODEL1
Dependent Variable: Ni_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
5	0.8875	4.7835	Dryh_log FLOW_log Qt_log PH_log Temp_log
5	0.8848	5.8166	CondI_log Dryh_log Qt_log PH_log Temp_log
5	0.8847	5.8360	Dryh_log FLOW_log Qt_log PH_log Red_log
5	0.8846	5.8731	Dryh_log FLOW_log Runofft_log Qt_log PH_log
5	0.8844	5.9731	Dryh_log Qt_log PH_log Red_log Temp_log
5	0.8843	6.0038	CondI_log Dryh_log FLOW_log Qt_log PH_log
5	0.8827	6.6044	CondI_log Dryh_log Runofft_log Qt_log PH_log
5	0.8800	7.6119	CondI_log Dryh_log Qt_log PH_log Red_log
5	0.8795	7.8041	Runofft_log Qt_log PH_log Red_log Temp_log
5	0.8788	8.0685	FLOW_log Runofft_log Qt_log PH_log Temp_log
5	0.8780	8.3740	CondI_log Runofft_log Qt_log PH_log Temp_log
5	0.8770	8.7663	CondI_log Dryh_log Runofft_log PH_log Red_log
5	0.8767	8.8976	CondI_log Runofft_log PH_log Red_log Temp_log
5	0.8759	9.1710	FLOW_log Runofft_log Qt_log PH_log Red_log

5	0.8751	9.4924	CondI_log Runofft_log Qt_log PH_log Red_log
5	0.8744	9.7630	CondI_log FLOW_log Runofft_log Qt_log PH_log
5	0.8740	9.9028	CondI_log Dryh_log Runofft_log PH_log Temp_log
5	0.8739	9.9390	CondI_log FLOW_log Qt_log PH_log Temp_log
5	0.8738	9.9915	Dryh_log FLOW_log Runofft_log PH_log Temp_log
5	0.8737	10.0174	FLOW_log Runofft_log PH_log Red_log Temp_log
5	0.8734	10.1446	Dryh_log Runofft_log PH_log Red_log Temp_log
5	0.8730	10.3096	CondI_log FLOW_log Runofft_log PH_log Red_log
5	0.8727	10.3930	CondI_log FLOW_log Qt_log PH_log Red_log
5	0.8716	10.8082	Dryh_log FLOW_log Runofft_log PH_log Red_log
5	0.8716	10.8196	FLOW_log Qt_log PH_log Red_log Temp_log
5	0.8711	11.0141	CondI_log FLOW_log Runofft_log PH_log Temp_log
5	0.8607	14.9854	CondI_log Qt_log PH_log Red_log Temp_log
5	0.8584	15.8591	CondI_log Dryh_log FLOW_log Runofft_log PH_log
5	0.8318	25.9669	CondI_log Dryh_log FLOW_log Qt_log Red_log
5	0.8229	29.3559	CondI_log Dryh_log Qt_log Red_log Temp_log
5	0.8203	30.3161	Dryh_log FLOW_log Qt_log Red_log Temp_log
5	0.8179	31.2476	Dryh_log Runofft_log Qt_log Red_log Temp_log
5	0.8170	31.5865	CondI_log FLOW_log Runofft_log Qt_log Red_log
5	0.8169	31.6376	CondI_log FLOW_log Qt_log Red_log Temp_log
5	0.8167	31.6986	Dryh_log FLOW_log Runofft_log Qt_log Red_log
5	0.8128	33.1718	CondI_log Dryh_log Runofft_log Qt_log Red_log
5	0.8107	33.9703	CondI_log FLOW_log PH_log Red_log Temp_log
5	0.8096	34.3894	CondI_log Dryh_log FLOW_log PH_log Temp_log
5	0.8096	34.3979	CondI_log Dryh_log FLOW_log PH_log Red_log
5	0.8084	34.8420	CondI_log Dryh_log FLOW_log Qt_log Temp_log
5	0.8031	36.8757	CondI_log Dryh_log FLOW_log Runofft_log Qt_log
5	0.7983	38.6908	CondI_log Dryh_log PH_log Red_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Ni_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
5	0.7972	39.1153	CondI_log Dryh_log FLOW_log Runofft_log Red_log
5	0.7955	39.7621	CondI_log Dryh_log Runofft_log Red_log Temp_log
5	0.7952	39.8808	CondI_log FLOW_log Runofft_log Red_log Temp_log
5	0.7894	42.0855	CondI_log FLOW_log Runofft_log Qt_log Temp_log
5	0.7870	42.9859	CondI_log Dryh_log FLOW_log Runofft_log Temp_log
5	0.7851	43.7076	FLOW_log Runofft_log Qt_log Red_log Temp_log
5	0.7837	44.2556	CondI_log Runofft_log Qt_log Red_log Temp_log
5	0.7750	47.5626	CondI_log Dryh_log Runofft_log Qt_log Temp_log
5	0.7718	48.7699	CondI_log Dryh_log FLOW_log Red_log Temp_log
5	0.7360	62.3732	Dryh_log FLOW_log Runofft_log Qt_log Temp_log
5	0.7295	64.8427	Dryh_log FLOW_log Runofft_log Red_log Temp_log
5	0.6964	77.4627	Dryh_log FLOW_log PH_log Red_log Temp_log
6	0.8921	5.0183	Dryh_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.8912	5.3527	Dryh_log FLOW_log Runofft_log Qt_log PH_log Temp_log
6	0.8912	5.3795	CondI_log Dryh_log Runofft_log Qt_log PH_log Temp_log
6	0.8883	6.4650	Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log
6	0.8878	6.6464	CondI_log Dryh_log Runofft_log Qt_log PH_log Red_log
6	0.8876	6.7556	CondI_log Dryh_log FLOW_log Qt_log PH_log Temp_log
6	0.8875	6.7832	Dryh_log FLOW_log Qt_log PH_log Red_log Temp_log
6	0.8853	7.5961	CondI_log Dryh_log FLOW_log Qt_log PH_log Red_log
6	0.8852	7.6672	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log
6	0.8849	7.7692	CondI_log Dryh_log Qt_log PH_log Red_log Temp_log
6	0.8810	9.2544	CondI_log Dryh_log Runofft_log PH_log Red_log Temp_log
6	0.8804	9.4908	Dryh_log FLOW_log Runofft_log PH_log Red_log Temp_log
6	0.8801	9.5786	FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.8799	9.6675	CondI_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.8798	9.7251	CondI_log FLOW_log Runofft_log Qt_log PH_log Temp_log
6	0.8788	10.0859	CondI_log FLOW_log Runofft_log Qt_log PH_log Red_log
6	0.8770	10.7571	CondI_log Dryh_log FLOW_log Runofft_log PH_log Red_log
6	0.8767	10.8922	CondI_log FLOW_log Runofft_log PH_log Red_log Temp_log
6	0.8755	11.3539	CondI_log Dryh_log FLOW_log Runofft_log PH_log Temp_log
6	0.8739	11.9363	CondI_log FLOW_log Qt_log PH_log Red_log Temp_log
6	0.8351	26.7054	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Red_log
6	0.8346	26.8885	CondI_log Dryh_log FLOW_log Qt_log Red_log Temp_log
6	0.8245	30.7361	Dryh_log FLOW_log Runofft_log Qt_log Red_log Temp_log
6	0.8229	31.3555	CondI_log Dryh_log Runofft_log Qt_log Red_log Temp_log
6	0.8181	33.1797	CondI_log FLOW_log Runofft_log Qt_log Red_log Temp_log
6	0.8107	35.9689	CondI_log Dryh_log FLOW_log PH_log Red_log Temp_log
6	0.8088	36.7064	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Temp_log

6	0.8013	39.5729	CondI_log Dryh_log FLOW_log Runofft_log Red_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Ni_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
7	0.8922	7.0011	Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
7	0.8921	7.0168	CondI_log Dryh_log Runofft_log Qt_log PH_log Red_log Temp_log
7	0.8913	7.3508	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Temp_log
7	0.8888	8.2752	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log
7	0.8876	8.7554	CondI_log Dryh_log FLOW_log Qt_log PH_log Red_log Temp_log
7	0.8819	10.9035	CondI_log Dryh_log FLOW_log Runofft_log PH_log Red_log Temp_log
7	0.8813	11.1355	CondI_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
7	0.8371	27.9535	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Red_log Temp_log
8	0.8922	9.0000	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Zn

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
1	0.7273	36.0988	CondI
1	0.5461	99.9557	COD
1	0.5036	114.9283	BOD
1	0.4595	130.4951	Alcal
1	0.2746	195.6494	Dryh
1	0.1089	254.0491	FLOW
1	0.0942	259.2252	Qt
1	0.0882	261.3269	VDS
1	0.0705	267.5644	TDS
1	0.0477	275.5915	VSS
1	0.0451	276.5210	TSS
1	0.0351	280.0317	Turb
1	0.0161	286.7262	Redox
1	0.0138	287.5640	PH
1	0.0001	292.3724	Runofft
1	0.0000	292.4014	Temp
2	0.7614	26.0692	VDS CondI
2	0.7461	31.4664	TSS CondI
2	0.7418	33.0071	BOD CondI
2	0.7407	33.3873	VSS CondI
2	0.7382	34.2602	Runofft CondI
2	0.7376	34.4564	CondI Alcal
2	0.7330	36.0977	FLOW CondI
2	0.7325	36.2782	Turb CondI
2	0.7316	36.5839	Qt CondI
2	0.7297	37.2601	TDS CondI
2	0.7292	37.4238	COD CondI
2	0.7287	37.6029	Temp CondI
2	0.7287	37.6031	Dryh CondI
2	0.7286	37.6544	PH CondI
2	0.7281	37.8188	Redox CondI
2	0.6310	72.0588	TSS BOD
3	0.8199	7.4552	VDS TDS CondI
3	0.7898	18.0928	VDS Turb CondI
3	0.7833	20.3727	FLOW VDS CondI
3	0.7823	20.7369	Qt VDS CondI
3	0.7819	20.8591	VDS CondI Alcal
3	0.7709	24.7338	Dryh VDS CondI
3	0.7659	26.4866	TSS VDS CondI
3	0.7648	26.8952	VDS VSS CondI

The REG Procedure
Model: MODEL1
Dependent Variable: Zn

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.7631	27.5040	VDS Temp CondI
3	0.7626	27.6574	VDS COD CondI
3	0.7623	27.7537	VDS BOD CondI
3	0.7619	27.9008	Runofft VDS CondI
3	0.7616	28.0148	VDS Redox CondI
3	0.7615	28.0583	VDS PH CondI
3	0.7557	30.1124	TSS Turb CondI
3	0.7538	30.7683	TSS TDS CondI
4	0.8400	2.3857	VDS TDS CondI Alcal
4	0.8320	5.1901	VDS TDS Temp CondI
4	0.8283	6.4983	FLOW VDS TDS CondI
4	0.8277	6.7109	Qt VDS TDS CondI
4	0.8234	8.2410	TSS VDS TDS CondI
4	0.8230	8.3611	VDS TDS VSS CondI

4	0.8212	9.0127	VDS TDS BOD CondI
4	0.8211	9.0484	Dryh VDS TDS CondI
4	0.8206	9.2405	VDS TDS Turb CondI
4	0.8205	9.2599	VDS TDS Redox CondI
4	0.8203	9.3338	VDS TDS PH CondI
4	0.8199	9.4549	Runofft VDS TDS CondI
4	0.8199	9.4552	VDS TDS COD CondI
4	0.8061	14.3262	VDS Turb CondI Alcal
4	0.8035	15.2622	FLOW VDS Turb CondI
4	0.8030	15.4098	Dryh VDS Turb CondI
5	0.8448	2.6865	VDS TDS PH CondI Alcal
5	0.8448	2.7044	VDS TDS Redox CondI Alcal
5	0.8443	2.8877	VDS TDS Temp CondI Alcal
5	0.8412	3.9730	Dryh VDS TDS CondI Alcal
5	0.8411	4.0133	Qt VDS TDS CondI Alcal
5	0.8405	4.1946	FLOW VDS TDS CondI Alcal
5	0.8404	4.2560	Runofft VDS TDS CondI Alcal
5	0.8404	4.2589	TSS VDS TDS CondI Alcal
5	0.8404	4.2594	VDS TDS VSS CondI Alcal
5	0.8403	4.2901	VDS TDS COD CondI Alcal
5	0.8401	4.3592	VDS TDS BOD CondI Alcal
5	0.8401	4.3594	VDS TDS Turb CondI Alcal
5	0.8358	5.8749	TSS VDS TDS Temp CondI
5	0.8354	6.0230	VDS TDS VSS Temp CondI
5	0.8348	6.2014	FLOW VDS TDS Temp CondI
5	0.8341	6.4671	Qt VDS TDS Temp CondI

The REG Procedure
Model: MODEL1
Dependent Variable: Zn

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
6	0.8513	2.3985	TSS VDS TDS PH CondI Alcal
6	0.8509	2.5570	TSS VDS TDS Redox CondI Alcal
6	0.8495	3.0296	VDS TDS VSS PH CondI Alcal
6	0.8491	3.1645	VDS TDS VSS Redox CondI Alcal
6	0.8476	3.7123	VDS TDS PH Temp CondI Alcal
6	0.8472	3.8391	VDS TDS Redox Temp CondI Alcal
6	0.8471	3.9014	VDS TDS PH BOD CondI Alcal
6	0.8468	4.0035	VDS TDS Redox BOD CondI Alcal
6	0.8463	4.1792	FLOW VDS TDS PH CondI Alcal
6	0.8461	4.2491	FLOW VDS TDS Redox CondI Alcal
6	0.8454	4.4771	Qt VDS TDS PH CondI Alcal
6	0.8453	4.5163	Qt VDS TDS Redox CondI Alcal
6	0.8453	4.5283	Dryh VDS TDS PH CondI Alcal
6	0.8452	4.5612	VDS TDS PH Turb CondI Alcal
6	0.8452	4.5675	Dryh VDS TDS Redox CondI Alcal
6	0.8451	4.5819	VDS TDS Redox Turb CondI Alcal
7	0.8571	2.3710	Dryh TSS VDS TDS PH Temp CondI
7	0.8543	3.3330	Dryh TSS VDS TDS Redox Temp CondI
7	0.8542	3.3843	TSS VDS TDS PH Temp CondI Alcal
7	0.8538	3.5372	FLOW TSS VDS TDS PH CondI Alcal
7	0.8531	3.7604	TSS VDS TDS Redox Temp CondI Alcal
7	0.8529	3.8462	FLOW TSS VDS TDS Redox CondI Alcal
7	0.8526	3.9607	TSS VDS TDS PH Turb CondI Alcal
7	0.8525	3.9914	Dryh TSS VDS TDS PH CondI Alcal
7	0.8524	4.0218	VDS TDS VSS PH Temp CondI Alcal
7	0.8523	4.0429	Qt TSS VDS TDS PH CondI Alcal
7	0.8521	4.1175	Dryh TSS VDS TDS Redox CondI Alcal
7	0.8520	4.1510	TSS VDS TDS Redox Turb CondI Alcal
7	0.8520	4.1664	TSS VDS TDS PH BOD CondI Alcal
7	0.8519	4.2083	VDS TDS VSS PH Turb CondI Alcal
7	0.8517	4.2590	Qt TSS VDS TDS Redox CondI Alcal
7	0.8517	4.2676	FLOW VDS TDS VSS PH CondI Alcal
8	0.8633	2.1797	Dryh TSS VDS TDS PH Temp CondI Alcal
8	0.8605	3.1475	Dryh TSS VDS TDS Redox Temp CondI Alcal
8	0.8593	3.5772	Dryh Qt TSS VDS TDS PH Temp CondI
8	0.8590	3.6951	Dryh TSS VDS TDS PH Redox Temp CondI
8	0.8585	3.8807	Dryh FLOW TSS VDS TDS PH Temp CondI
8	0.8582	3.9632	Dryh VDS TDS VSS PH Temp CondI Alcal
8	0.8576	4.1971	Dryh Runofft TSS VDS TDS PH Temp CondI

8	0.8572	4.3160	Dryh TSS VDS TDS COD PH Temp CondI

The REG Procedure
Model: MODEL1
Dependent Variable: Zn

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
8	0.8571	4.3528	Dryh TSS VDS TDS PH Turb Temp CondI
8	0.8571	4.3603	Dryh TSS VDS TDS PH BOD Temp CondI
8	0.8571	4.3710	Dryh TSS VDS TDS VSS PH Temp CondI
8	0.8564	4.5988	Dryh Qt TSS VDS TDS Redox Temp CondI
8	0.8563	4.6527	Dryh VDS TDS VSS Redox Temp CondI Alcal
8	0.8557	4.8589	TSS VDS TDS PH Turb Temp CondI Alcal
8	0.8555	4.9068	Dryh FLOW TSS VDS TDS Redox Temp CondI
8	0.8554	4.9738	FLOW TSS VDS TDS PH Temp CondI Alcal
9	0.8653	3.4682	Dryh TSS VDS TDS PH Redox Temp CondI Alcal
9	0.8638	3.9937	Dryh Qt TSS VDS TDS PH Temp CondI Alcal
9	0.8637	4.0315	Dryh Runofft TSS VDS TDS PH Temp CondI Alcal
9	0.8635	4.0898	Dryh FLOW TSS VDS TDS PH Temp CondI Alcal
9	0.8635	4.0995	Dryh TSS VDS TDS COD PH Temp CondI Alcal
9	0.8635	4.1206	Dryh TSS VDS TDS PH BOD Temp CondI Alcal
9	0.8634	4.1558	Dryh TSS VDS TDS PH Turb Temp CondI Alcal
9	0.8633	4.1761	Dryh TSS VDS TDS VSS PH Temp CondI Alcal
9	0.8615	4.8220	Dryh Qt TSS VDS TDS PH Redox Temp CondI
9	0.8610	4.9812	Dryh Runofft TSS VDS TDS Redox Temp CondI Alcal
9	0.8610	4.9905	Dryh Qt TSS VDS TDS Redox Temp CondI Alcal
9	0.8609	5.0212	Dryh TSS VDS TDS Redox BOD Temp CondI Alcal
9	0.8608	5.0448	Dryh TSS VDS TDS COD Redox Temp CondI Alcal
9	0.8607	5.0843	Dryh FLOW TSS VDS TDS Redox Temp CondI Alcal
9	0.8606	5.1234	Dryh TSS VDS TDS Redox Turb Temp CondI Alcal
9	0.8606	5.1377	Dryh TSS VDS TDS VSS Redox Temp CondI Alcal
10	0.8659	5.2441	Dryh Qt TSS VDS TDS PH Redox Temp CondI Alcal
10	0.8656	5.3573	Dryh FLOW TSS VDS TDS PH Redox Temp CondI Alcal
10	0.8656	5.3620	Dryh Runofft TSS VDS TDS PH Redox Temp CondI Alcal
10	0.8654	5.4356	Dryh TSS VDS TDS PH Redox BOD Temp CondI Alcal
10	0.8654	5.4378	Dryh TSS VDS TDS COD PH Redox Temp CondI Alcal
10	0.8654	5.4428	Dryh TSS VDS TDS PH Redox Turb Temp CondI Alcal
10	0.8653	5.4661	Dryh TSS VDS TDS VSS PH Redox Temp CondI Alcal
10	0.8643	5.8288	Dryh Runofft Qt TSS VDS TDS PH Temp CondI Alcal
10	0.8640	5.9116	Dryh FLOW Runofft TSS VDS TDS PH Temp CondI Alcal
10	0.8640	5.9132	Dryh Runofft TSS VDS TDS PH BOD Temp CondI Alcal
10	0.8640	5.9431	Dryh Runofft TSS VDS TDS COD PH Temp CondI Alcal
10	0.8639	5.9583	Dryh Qt TSS VDS TDS PH BOD Temp CondI Alcal
10	0.8639	5.9745	Dryh Qt TSS VDS TDS COD PH Temp CondI Alcal
10	0.8639	5.9763	Dryh FLOW Qt TSS VDS TDS PH Temp CondI Alcal
10	0.8638	5.9926	Dryh Qt TSS VDS TDS PH Turb Temp CondI Alcal
10	0.8638	5.9933	Dryh Qt TSS VDS TDS VSS PH Temp CondI Alcal

The REG Procedure
Model: MODEL1
Dependent Variable: Zn

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
11	0.8663	7.1234	Dryh Runofft Qt TSS VDS TDS PH Redox Temp CondI Alcal
11	0.8660	7.2217	Dryh FLOW Qt TSS VDS TDS PH Redox Temp CondI Alcal
11	0.8660	7.2237	Dryh FLOW Runofft TSS VDS TDS PH Redox Temp CondI Alcal
11	0.8660	7.2244	Dryh Qt TSS VDS TDS VSS PH Redox Temp CondI Alcal
11	0.8660	7.2302	Dryh Qt TSS VDS TDS PH Redox BOD Temp CondI Alcal
11	0.8659	7.2434	Dryh Qt TSS VDS TDS PH Redox Turb Temp CondI Alcal
11	0.8659	7.2441	Dryh Qt TSS VDS TDS COD PH Redox Temp CondI Alcal
11	0.8658	7.2901	Dryh Runofft TSS VDS TDS PH Redox BOD Temp CondI Alcal
11	0.8657	7.3187	Dryh FLOW TSS VDS TDS PH Redox Turb Temp CondI Alcal
11	0.8657	7.3260	Dryh Runofft TSS VDS TDS COD PH Redox Temp CondI Alcal
11	0.8657	7.3316	Dryh FLOW TSS VDS TDS COD PH Redox Temp CondI Alcal
11	0.8657	7.3399	Dryh Runofft TSS VDS TDS VSS PH Redox Temp CondI Alcal
11	0.8656	7.3525	Dryh FLOW TSS VDS TDS PH Redox BOD Temp CondI Alcal
11	0.8656	7.3560	Dryh FLOW TSS VDS TDS VSS PH Redox Temp CondI Alcal

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11      0.8656    7.3572  Dryh Runofft TSS VDS TDS PH Redox Turb Temp CondI Alcal
11      0.8655    7.4021  Dryh TSS VDS TDS PH Redox BOD Turb Temp CondI Alcal
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12      0.8665    9.0561  Dryh Runofft Qt TSS VDS TDS VSS PH Redox Temp CondI Alcal
12      0.8664    9.0805  Dryh Runofft Qt TSS VDS TDS PH Redox BOD Temp CondI Alcal
12      0.8664    9.0887  Dryh FLOW Runofft Qt TSS VDS TDS PH Redox Temp CondI Alcal
12      0.8663    9.1160  Dryh Runofft Qt TSS VDS TDS PH Redox Turb Temp CondI Alcal
12      0.8663    9.1233  Dryh Runofft Qt TSS VDS TDS COD PH Redox Temp CondI Alcal
12      0.8661    9.1928  Dryh FLOW Runofft TSS VDS TDS COD PH Redox Temp CondI Alcal
12      0.8661    9.2002  Dryh FLOW Runofft TSS VDS TDS PH Redox BOD Temp CondI Alcal
12      0.8661    9.2014  Dryh FLOW Runofft TSS VDS TDS VSS PH Redox Temp CondI Alcal
12      0.8660    9.2067  Dryh FLOW Qt TSS VDS TDS VSS PH Redox Temp CondI Alcal
12      0.8660    9.2131  Dryh Qt TSS VDS TDS VSS PH Redox Turb Temp CondI Alcal
12      0.8660    9.2138  Dryh FLOW Runofft TSS VDS TDS PH Redox Turb Temp CondI Alcal
12      0.8660    9.2157  Dryh Qt TSS VDS TDS VSS PH Redox BOD Temp CondI Alcal
12      0.8660    9.2163  Dryh FLOW Qt TSS VDS TDS PH Redox BOD Temp CondI Alcal
12      0.8660    9.2172  Dryh FLOW Qt TSS VDS TDS PH Redox Turb Temp CondI Alcal
12      0.8660    9.2203  Dryh Qt TSS VDS TDS VSS COD PH Redox Temp CondI Alcal
12      0.8660    9.2213  Dryh FLOW Qt TSS VDS TDS COD PH Redox Temp CondI Alcal
------------------------------------------------------------------------------------------
13      0.8666   11.0246  Dryh Runofft Qt TSS VDS TDS VSS PH Redox BOD Temp CondI Alcal
13      0.8665   11.0300  Dryh FLOW Runofft Qt TSS VDS TDS VSS PH Redox Temp CondI Alcal
13      0.8665   11.0362  Dryh Runofft Qt TSS VDS TDS VSS COD PH Redox Temp CondI Alcal
13      0.8665   11.0554  Dryh Runofft Qt TSS VDS TDS VSS PH Redox Turb Temp CondI Alcal
13      0.8665   11.0640  Dryh FLOW Runofft Qt TSS VDS TDS PH Redox BOD Temp CondI Alcal
13      0.8664   11.0763  Dryh Runofft Qt TSS VDS TDS PH Redox BOD Turb Temp CondI Alcal
13      0.8664   11.0776  Dryh Runofft Qt TSS VDS TDS COD PH Redox BOD Temp CondI Alcal
13      0.8664   11.0869  Dryh FLOW Runofft Qt TSS VDS TDS PH Redox Turb Temp CondI Alcal
                                                      11:35 Saturday, November 8, 2003   6

                                       The REG Procedure
                                         Model: MODEL1
                                    Dependent Variable: Zn

                                    R-Square Selection Method


     R-Square      C(p)  Variables in Model

13      0.8664   11.0873  Dryh FLOW Runofft Qt TSS VDS TDS COD PH Redox Temp CondI Alcal
13      0.8663   11.1108  Dryh Runofft Qt TSS VDS TDS COD PH Redox Turb Temp CondI Alcal
13      0.8663   11.1221  Dryh FLOW Runofft TSS VDS TDS VSS COD PH Redox Temp CondI Alcal
13      0.8662   11.1653  Dryh FLOW Runofft TSS VDS TDS VSS PH Redox Turb Temp CondI Alcal
13      0.8661   11.1818  Dryh FLOW Runofft TSS VDS TDS VSS PH Redox BOD Temp CondI Alcal
13      0.8661   11.1829  Dryh FLOW Runofft TSS VDS TDS COD PH Redox BOD Temp CondI Alcal
13      0.8661   11.1869  Dryh FLOW Qt TSS VDS TDS VSS PH Redox Turb Temp CondI Alcal
13      0.8661   11.1893  Dryh FLOW Runofft TSS VDS TDS PH Redox BOD Turb Temp CondI Alcal
------------------------------------------------------------------------------------------
14      0.8666   13.0050  Dryh FLOW Runofft Qt TSS VDS TDS VSS COD PH Redox Temp CondI
                          Alcal
14      0.8666   13.0118  Dryh FLOW Runofft Qt TSS VDS TDS VSS PH Redox BOD Temp CondI
                          Alcal
14      0.8666   13.0190  Dryh Runofft Qt TSS VDS TDS VSS COD PH Redox BOD Temp CondI Alcal
14      0.8666   13.0233  Dryh Runofft Qt TSS VDS TDS VSS PH Redox BOD Turb Temp CondI
                          Alcal
14      0.8666   13.0259  Dryh FLOW Runofft Qt TSS VDS TDS VSS PH Redox Turb Temp CondI
                          Alcal
14      0.8665   13.0345  Dryh Runofft Qt TSS VDS TDS VSS COD PH Redox Turb Temp CondI
                          Alcal
14      0.8665   13.0626  Dryh FLOW Runofft Qt TSS VDS TDS PH Redox BOD Turb Temp CondI
                          Alcal
14      0.8665   13.0635  Dryh FLOW Runofft Qt TSS VDS TDS COD PH Redox BOD Temp CondI
                          Alcal
14      0.8664   13.0760  Dryh Runofft Qt TSS VDS TDS COD PH Redox BOD Turb Temp CondI
                          Alcal
14      0.8664   13.0817  Dryh FLOW Runofft Qt TSS VDS TDS COD PH Redox Turb Temp CondI
                          Alcal
14      0.8663   13.1187  Dryh FLOW Runofft TSS VDS TDS VSS COD PH Redox Turb Temp CondI
                          Alcal
14      0.8663   13.1218  Dryh FLOW Runofft TSS VDS TDS VSS COD PH Redox BOD Temp CondI
                          Alcal
14      0.8662   13.1464  Dryh FLOW Runofft TSS VDS TDS VSS PH Redox BOD Turb Temp CondI
                          Alcal
14      0.8661   13.1824  Dryh FLOW Runofft TSS VDS TDS COD PH Redox BOD Turb Temp CondI
                          Alcal
14      0.8661   13.1835  Dryh FLOW Qt TSS VDS TDS VSS PH Redox BOD Turb Temp CondI Alcal
14      0.8661   13.1864  Dryh FLOW Qt TSS VDS TDS VSS COD PH Redox Turb Temp CondI Alcal
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15      0.8666   15.0001  Dryh FLOW Runofft Qt TSS VDS TDS VSS COD PH Redox BOD Temp CondI
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Alcal

The REG Procedure
Model: MODEL1
Dependent Variable: Zn

R-Square Selection Method

	R-Square	C(p)	Variables in Model
15	0.8666	15.0050	Dryh FLOW Runofft Qt TSS VDS TDS VSS COD PH Redox Turb Temp CondI Alcal
15	0.8666	15.0078	Dryh FLOW Runofft Qt TSS VDS TDS VSS PH Redox BOD Turb Temp CondI Alcal
15	0.8666	15.0190	Dryh Runofft Qt TSS VDS TDS VSS COD PH Redox BOD Turb Temp CondI Alcal
15	0.8665	15.0626	Dryh FLOW Runofft Qt TSS VDS TDS COD PH Redox BOD Turb Temp CondI Alcal
15	0.8663	15.1176	Dryh FLOW Runofft TSS VDS TDS VSS COD PH Redox BOD Turb Temp CondI Alcal
15	0.8661	15.1834	Dryh FLOW Qt TSS VDS TDS VSS COD PH Redox BOD Turb Temp CondI Alcal
15	0.8647	15.6851	Dryh FLOW Runofft Qt TSS VDS TDS VSS COD PH BOD Turb Temp CondI Alcal
15	0.8641	15.8981	Dryh FLOW Runofft Qt VDS TDS VSS COD PH Redox BOD Turb Temp CondI Alcal
15	0.8627	16.3731	Dryh FLOW Runofft Qt TSS VDS TDS VSS COD PH Redox BOD Turb Temp CondI
15	0.8621	16.6029	Dryh FLOW Runofft Qt TSS VDS TDS VSS COD Redox BOD Turb Temp CondI Alcal
15	0.8611	16.9343	FLOW Runofft Qt TSS VDS TDS VSS COD PH Redox BOD Turb Temp CondI Alcal
15	0.8564	18.5938	Dryh FLOW Runofft Qt TSS VDS TDS VSS COD PH Redox BOD Turb CondI Alcal
15	0.8453	22.5196	Dryh FLOW Runofft Qt TSS VDS VSS COD PH Redox BOD Turb Temp CondI Alcal
15	0.8347	26.2657	Dryh FLOW Runofft Qt TSS TDS VSS COD PH Redox BOD Turb Temp CondI Alcal
15	0.8135	33.7382	Dryh FLOW Runofft Qt TSS VDS TDS VSS COD PH Redox BOD Turb Temp Alcal
16	0.8666	17.0000	Dryh FLOW Runofft Qt TSS VDS TDS VSS COD PH Redox BOD Turb Temp CondI Alcal

The REG Procedure
Model: MODEL1
Dependent Variable: Zn_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
1	0.4205	116.3443	CondI_log
1	0.3890	125.1519	Qt_log
1	0.3486	136.4867	Temp_log
1	0.2661	159.5804	Runofft_log
1	0.1678	187.1258	PH_log
1	0.0292	225.9571	Dryh_log
1	0.0061	232.4106	FLOW_log
1	0.0053	232.6428	Red_log
2	0.7139	36.1472	PH_log Temp_log
2	0.7069	38.0970	CondI_log Temp_log
2	0.6073	66.0147	Qt_log Temp_log
2	0.5971	68.8571	Runofft_log Temp_log
2	0.5622	78.6260	Red_log Temp_log
2	0.4749	103.1046	CondI_log Red_log
2	0.4550	108.6755	CondI_log FLOW_log
2	0.4481	110.6090	CondI_log Dryh_log
2	0.4463	111.0978	CondI_log Qt_log
2	0.4346	114.3709	Qt_log PH_log
2	0.4319	115.1435	FLOW_log Qt_log
2	0.4266	116.6257	CondI_log Runofft_log
2	0.4205	118.3441	CondI_log PH_log
2	0.3915	126.4428	PH_log Red_log
2	0.3899	126.8987	Runofft_log Qt_log
2	0.3894	127.0492	Qt_log Red_log
2	0.3892	127.0900	Dryh_log Qt_log
2	0.3497	138.1658	FLOW_log Temp_log
2	0.3494	138.2553	Dryh_log Temp_log
2	0.3162	147.5383	Runofft_log PH_log
2	0.2955	153.3609	Dryh_log PH_log
2	0.2873	155.6456	Dryh_log Runofft_log
2	0.2811	157.3756	Runofft_log Red_log
2	0.2673	161.2423	FLOW_log Runofft_log
2	0.1865	183.8955	FLOW_log PH_log
2	0.0541	220.9588	Dryh_log Red_log
2	0.0293	227.9140	Dryh_log FLOW_log
2	0.0145	232.0752	FLOW_log Red_log
3	0.7919	16.3068	Qt_log PH_log Temp_log
3	0.7861	17.9250	Runofft_log PH_log Temp_log
3	0.7769	20.4945	CondI_log PH_log Temp_log
3	0.7767	20.5583	Dryh_log PH_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Zn_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.7511	27.7333	CondI_log FLOW_log Temp_log
3	0.7277	34.2805	CondI_log Red_log Temp_log
3	0.7258	34.8101	FLOW_log PH_log Temp_log
3	0.7194	36.6084	PH_log Red_log Temp_log
3	0.7177	37.0853	CondI_log Runofft_log Temp_log
3	0.7083	39.7012	CondI_log Dryh_log Temp_log
3	0.7077	39.8804	CondI_log Qt_log Temp_log
3	0.7075	39.9245	Qt_log Red_log Temp_log
3	0.6684	50.8985	Runofft_log Red_log Temp_log
3	0.6467	56.9762	FLOW_log Qt_log Temp_log
3	0.6207	64.2579	Runofft_log Qt_log Temp_log
3	0.6185	64.8617	Dryh_log Qt_log Temp_log
3	0.6034	69.0915	Dryh_log Red_log Temp_log
3	0.5972	70.8419	FLOW_log Runofft_log Temp_log
3	0.5972	70.8429	Dryh_log Runofft_log Temp_log

3	0.5826	74.9197	CondI_log FLOW_log Red_log
3	0.5792	75.8780	FLOW_log Red_log Temp_log
3	0.5669	79.3237	Runofft_log PH_log Red_log
3	0.5648	79.9121	CondI_log PH_log Red_log
3	0.5628	80.4758	Qt_log PH_log Red_log
3	0.5616	80.8027	CondI_log Dryh_log FLOW_log
3	0.4966	99.0154	CondI_log FLOW_log Qt_log
3	0.4845	102.4113	CondI_log Runofft_log Red_log
3	0.4800	103.6579	CondI_log Qt_log Red_log
3	0.4791	103.9175	CondI_log Dryh_log Red_log
3	0.4691	106.7077	CondI_log FLOW_log PH_log
3	0.4671	107.2707	FLOW_log Runofft_log Qt_log
3	0.4671	107.2710	Dryh_log PH_log Red_log
3	0.4574	110.0036	CondI_log Dryh_log PH_log
3	0.4559	110.4027	CondI_log Dryh_log Qt_log
3	0.4556	110.4957	CondI_log FLOW_log Runofft_log
3	0.4556	110.5098	FLOW_log Qt_log PH_log
3	0.4527	111.3126	CondI_log Dryh_log Runofft_log
3	0.4516	111.6134	CondI_log Qt_log PH_log
3	0.4489	112.3718	Dryh_log Qt_log PH_log
3	0.4479	112.6603	CondI_log Runofft_log Qt_log
3	0.4411	114.5732	Runofft_log Qt_log PH_log
3	0.4399	114.9056	Dryh_log FLOW_log Qt_log
3	0.4394	115.0453	FLOW_log Qt_log Red_log
3	0.4266	118.6122	CondI_log Runofft_log PH_log
3	0.3947	127.5579	FLOW_log PH_log Red_log
3	0.3909	128.6369	Dryh_log Runofft_log PH_log

The REG Procedure
Model: MODEL1
Dependent Variable: Zn_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
3	0.3908	128.6517	Dryh_log Runofft_log Qt_log
3	0.3901	128.8349	Dryh_log Qt_log Red_log
3	0.3900	128.8884	Runofft_log Qt_log Red_log
3	0.3499	140.1179	Dryh_log FLOW_log Temp_log
3	0.3224	147.8160	FLOW_log Runofft_log PH_log
3	0.2983	154.5633	Dryh_log FLOW_log PH_log
3	0.2911	156.5744	Dryh_log Runofft_log Red_log
3	0.2896	157.0094	Dryh_log FLOW_log Runofft_log
3	0.2811	159.3731	FLOW_log Runofft_log Red_log
3	0.0543	222.9076	Dryh_log FLOW_log Red_log
4	0.8246	9.1380	Dryh_log Runofft_log PH_log Temp_log
4	0.8100	13.2367	Dryh_log Qt_log PH_log Temp_log
4	0.8088	13.5490	CondI_log Dryh_log PH_log Temp_log
4	0.8027	15.2815	Runofft_log PH_log Red_log Temp_log
4	0.7967	16.9567	CondI_log Runofft_log PH_log Temp_log
4	0.7959	17.1698	Runofft_log Qt_log PH_log Temp_log
4	0.7950	17.4394	Qt_log PH_log Red_log Temp_log
4	0.7938	17.7586	FLOW_log Qt_log PH_log Temp_log
4	0.7936	17.8051	CondI_log Qt_log PH_log Temp_log
4	0.7909	18.5624	FLOW_log Runofft_log PH_log Temp_log
4	0.7873	19.5773	CondI_log Dryh_log FLOW_log Temp_log
4	0.7825	20.9295	CondI_log PH_log Red_log Temp_log
4	0.7819	21.1037	CondI_log FLOW_log PH_log Temp_log
4	0.7786	22.0293	Dryh_log PH_log Red_log Temp_log
4	0.7772	22.4218	Dryh_log FLOW_log PH_log Temp_log
4	0.7563	28.2760	CondI_log FLOW_log Qt_log Temp_log
4	0.7531	29.1721	CondI_log FLOW_log Runofft_log Temp_log
4	0.7521	29.4385	CondI_log FLOW_log Red_log Temp_log
4	0.7392	33.0512	CondI_log Dryh_log Red_log Temp_log
4	0.7365	33.8068	CondI_log Runofft_log Red_log Temp_log
4	0.7342	34.4652	CondI_log Qt_log Red_log Temp_log
4	0.7288	35.9572	FLOW_log PH_log Red_log Temp_log
4	0.7217	37.9469	CondI_log Runofft_log Qt_log Temp_log
4	0.7186	38.8376	CondI_log Dryh_log Runofft_log Temp_log
4	0.7141	40.0863	FLOW_log Qt_log Red_log Temp_log
4	0.7099	41.2561	Dryh_log Qt_log Red_log Temp_log
4	0.7085	41.6656	CondI_log Dryh_log Qt_log Temp_log
4	0.7075	41.9245	Runofft_log Qt_log Red_log Temp_log
4	0.6850	48.2486	Dryh_log Runofft_log Red_log Temp_log
4	0.6728	51.6437	FLOW_log Runofft_log Red_log Temp_log

4	0.6469	58.9141	Dryh_log FLOW_log Qt_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Zn_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
4	0.6468	58.9485	FLOW_log Runofft_log Qt_log Temp_log
4	0.6377	61.5030	CondI_log Dryh_log FLOW_log Red_log
4	0.6253	64.9737	Dryh_log Runofft_log Qt_log Temp_log
4	0.6247	65.1306	CondI_log FLOW_log PH_log Red_log
4	0.6047	70.7361	Dryh_log FLOW_log Red_log Temp_log
4	0.5995	72.1895	CondI_log Runofft_log PH_log Red_log
4	0.5973	72.7960	Dryh_log FLOW_log Runofft_log Temp_log
4	0.5969	72.9126	Dryh_log Runofft_log PH_log Red_log
4	0.5902	74.7854	FLOW_log Qt_log PH_log Red_log
4	0.5892	75.0888	CondI_log FLOW_log Qt_log Red_log
4	0.5862	75.9159	CondI_log Dryh_log PH_log Red_log
4	0.5826	76.9139	CondI_log FLOW_log Runofft_log Red_log
4	0.5802	77.5946	CondI_log Qt_log PH_log Red_log
4	0.5763	78.6946	Runofft_log Qt_log PH_log Red_log
4	0.5713	80.0868	Dryh_log Qt_log PH_log Red_log
4	0.5671	81.2652	FLOW_log Runofft_log PH_log Red_log
4	0.5666	81.3981	CondI_log Dryh_log FLOW_log Runofft_log
4	0.5644	82.0177	CondI_log Dryh_log FLOW_log Qt_log
4	0.5622	82.6401	CondI_log Dryh_log FLOW_log PH_log
4	0.5424	88.1760	CondI_log FLOW_log Runofft_log Qt_log
4	0.4988	100.3994	CondI_log FLOW_log Qt_log PH_log
4	0.4932	101.9611	FLOW_log Runofft_log Qt_log PH_log
4	0.4885	103.2823	Dryh_log FLOW_log Qt_log PH_log
4	0.4874	103.5890	CondI_log Dryh_log Runofft_log Red_log
4	0.4845	104.4004	CondI_log Runofft_log Qt_log Red_log
4	0.4816	105.2083	CondI_log Dryh_log Qt_log Red_log
4	0.4756	106.9063	Dryh_log FLOW_log PH_log Red_log
4	0.4701	108.4515	Dryh_log FLOW_log Runofft_log Qt_log
4	0.4700	108.4800	CondI_log Dryh_log Qt_log PH_log
4	0.4693	108.6604	CondI_log FLOW_log Runofft_log PH_log
4	0.4675	109.1588	FLOW_log Runofft_log Qt_log Red_log
4	0.4631	110.3915	CondI_log Dryh_log Runofft_log PH_log
4	0.4560	112.3996	CondI_log Dryh_log Runofft_log Qt_log
4	0.4554	112.5679	CondI_log Runofft_log Qt_log PH_log
4	0.4506	113.9009	Dryh_log Runofft_log Qt_log PH_log
4	0.4429	116.0658	Dryh_log FLOW_log Qt_log Red_log
4	0.3951	129.4514	Dryh_log FLOW_log Runofft_log PH_log
4	0.3911	130.5581	Dryh_log Runofft_log Qt_log Red_log
4	0.2935	157.8968	Dryh_log FLOW_log Runofft_log Red_log
5	0.8343	8.4100	CondI_log Dryh_log FLOW_log PH_log Temp_log
5	0.8338	8.5522	Dryh_log Runofft_log PH_log Red_log Temp_log

The REG Procedure
Model: MODEL1
Dependent Variable: Zn_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
5	0.8278	10.2443	CondI_log Dryh_log Runofft_log PH_log Temp_log
5	0.8256	10.8555	Dryh_log FLOW_log Runofft_log PH_log Temp_log
5	0.8247	11.1184	Dryh_log Runofft_log Qt_log PH_log Temp_log
5	0.8195	12.5697	Dryh_log FLOW_log Qt_log PH_log Temp_log
5	0.8133	14.2997	CondI_log Dryh_log Qt_log PH_log Temp_log
5	0.8117	14.7481	Dryh_log Qt_log PH_log Red_log Temp_log
5	0.8115	14.8012	CondI_log Dryh_log PH_log Red_log Temp_log
5	0.8096	15.3409	CondI_log Runofft_log PH_log Red_log Temp_log
5	0.8050	16.6149	Runofft_log Qt_log PH_log Red_log Temp_log
5	0.8045	16.7693	FLOW_log Runofft_log PH_log Red_log Temp_log
5	0.7986	18.4110	CondI_log FLOW_log Qt_log PH_log Temp_log
5	0.7985	18.4584	CondI_log Runofft_log Qt_log PH_log Temp_log
5	0.7979	18.6013	FLOW_log Qt_log PH_log Red_log Temp_log
5	0.7972	18.7962	CondI_log Qt_log PH_log Red_log Temp_log

5	0.7967	18.9410	CondI_log FLOW_log Runofft_log PH_log Temp_log
5	0.7959	19.1610	FLOW_log Runofft_log Qt_log PH_log Temp_log
5	0.7910	20.5356	CondI_log Dryh_log FLOW_log Red_log Temp_log
5	0.7908	20.6007	CondI_log FLOW_log PH_log Red_log Temp_log
5	0.7875	21.5181	CondI_log Dryh_log FLOW_log Qt_log Temp_log
5	0.7875	21.5214	CondI_log Dryh_log FLOW_log Runofft_log Temp_log
5	0.7794	23.8035	Dryh_log FLOW_log PH_log Red_log Temp_log
5	0.7592	29.4596	CondI_log FLOW_log Qt_log Red_log Temp_log
5	0.7569	30.1125	CondI_log FLOW_log Runofft_log Qt_log Temp_log
5	0.7545	30.7694	CondI_log FLOW_log Runofft_log Red_log Temp_log
5	0.7460	33.1649	CondI_log Dryh_log Runofft_log Red_log Temp_log
5	0.7410	34.5658	CondI_log Dryh_log Qt_log Red_log Temp_log
5	0.7367	35.7643	CondI_log Runofft_log Qt_log Red_log Temp_log
5	0.7289	37.9504	CondI_log Dryh_log Runofft_log Qt_log Temp_log
5	0.7209	40.1859	Dryh_log FLOW_log Qt_log Red_log Temp_log
5	0.7171	41.2585	FLOW_log Runofft_log Qt_log Red_log Temp_log
5	0.7101	43.2107	Dryh_log Runofft_log Qt_log Red_log Temp_log
5	0.6944	47.6016	CondI_log Dryh_log FLOW_log PH_log Red_log
5	0.6850	50.2300	Dryh_log FLOW_log Runofft_log Red_log Temp_log
5	0.6470	60.8752	Dryh_log FLOW_log Runofft_log Qt_log Temp_log
5	0.6417	62.3572	CondI_log Dryh_log FLOW_log Runofft_log Red_log
5	0.6384	63.2875	CondI_log FLOW_log Qt_log PH_log Red_log
5	0.6381	63.3805	CondI_log Dryh_log FLOW_log Qt_log Red_log
5	0.6336	64.6316	CondI_log FLOW_log Runofft_log PH_log Red_log
5	0.6183	68.9115	CondI_log Dryh_log Runofft_log PH_log Red_log
5	0.6157	69.6408	Dryh_log FLOW_log Qt_log PH_log Red_log
5	0.6090	71.5412	Dryh_log FLOW_log Runofft_log PH_log Red_log
5	0.6004	73.9389	CondI_log FLOW_log Runofft_log Qt_log Red_log

The REG Procedure
Model: MODEL1
Dependent Variable: Zn_log

R-Square Selection Method

Number in Model	R-Square	C(p)	Variables in Model
5	0.6004	73.9509	CondI_log Runofft_log Qt_log PH_log Red_log
5	0.5970	74.8961	Dryh_log Runofft_log Qt_log PH_log Red_log
5	0.5944	75.6269	CondI_log Dryh_log FLOW_log Runofft_log Qt_log
5	0.5919	76.3122	CondI_log Dryh_log Qt_log PH_log Red_log
5	0.5906	76.6918	FLOW_log Runofft_log Qt_log PH_log Red_log
5	0.5685	82.8682	CondI_log Dryh_log FLOW_log Runofft_log PH_log
5	0.5645	83.9893	CondI_log Dryh_log FLOW_log Qt_log PH_log
5	0.5457	89.2583	CondI_log FLOW_log Runofft_log Qt_log PH_log
5	0.5145	97.9876	Dryh_log FLOW_log Runofft_log Qt_log PH_log
5	0.4888	105.2047	CondI_log Dryh_log Runofft_log Qt_log Red_log
5	0.4701	110.4435	CondI_log Dryh_log Runofft_log Qt_log PH_log
5	0.4701	110.4515	Dryh_log FLOW_log Runofft_log Qt_log Red_log
6	0.8418	8.3125	CondI_log Dryh_log FLOW_log PH_log Red_log Temp_log
6	0.8386	9.1993	CondI_log Dryh_log FLOW_log Runofft_log PH_log Temp_log
6	0.8365	9.8106	Dryh_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.8360	9.9317	Dryh_log FLOW_log Runofft_log PH_log Red_log Temp_log
6	0.8358	9.9882	CondI_log Dryh_log Runofft_log PH_log Red_log Temp_log
6	0.8357	10.0137	CondI_log Dryh_log FLOW_log Qt_log PH_log Temp_log
6	0.8311	11.3111	CondI_log Dryh_log Runofft_log Qt_log PH_log Temp_log
6	0.8259	12.7838	Dryh_log FLOW_log Runofft_log Qt_log PH_log Temp_log
6	0.8227	13.6703	Dryh_log FLOW_log Qt_log PH_log Red_log Temp_log
6	0.8155	15.6836	CondI_log Dryh_log Qt_log PH_log Red_log Temp_log
6	0.8102	17.1721	CondI_log FLOW_log Runofft_log PH_log Red_log Temp_log
6	0.8096	17.3248	CondI_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.8051	18.5857	FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
6	0.8049	18.6399	CondI_log FLOW_log Qt_log PH_log Red_log Temp_log
6	0.7996	20.1370	CondI_log FLOW_log Runofft_log Qt_log PH_log Temp_log
6	0.7911	22.5103	CondI_log Dryh_log FLOW_log Runofft_log Red_log Temp_log
6	0.7910	22.5355	CondI_log Dryh_log FLOW_log Qt_log Red_log Temp_log
6	0.7875	23.5131	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Temp_log
6	0.7604	31.1194	CondI_log FLOW_log Runofft_log Qt_log Red_log Temp_log
6	0.7475	34.7304	CondI_log Dryh_log Runofft_log Qt_log Red_log Temp_log
6	0.7233	41.5095	Dryh_log FLOW_log Runofft_log Qt_log Red_log Temp_log
6	0.6953	49.3642	CondI_log Dryh_log FLOW_log Runofft_log PH_log Red_log
6	0.6945	49.5788	CondI_log Dryh_log FLOW_log Qt_log PH_log Red_log
6	0.6443	63.6382	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Red_log
6	0.6384	65.2819	CondI_log FLOW_log Runofft_log Qt_log PH_log Red_log
6	0.6319	67.1188	CondI_log Dryh_log Runofft_log Qt_log PH_log Red_log
6	0.6184	70.9095	Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log

6	0.5949	77.4809	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log

The REG Procedure
Model: MODEL1
Dependent Variable: Zn_log

R-Square Selection Method

	R-Square	C(p)	Variables in Model
7	0.8486	8.4064	CondI_log Dryh_log FLOW_log Runofft_log PH_log Red_log Temp_log
7	0.8470	8.8598	CondI_log Dryh_log Runofft_log Qt_log PH_log Red_log Temp_log
7	0.8426	10.0972	CondI_log Dryh_log FLOW_log Qt_log PH_log Red_log Temp_log
7	0.8391	11.0582	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Temp_log
7	0.8368	11.7194	Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
7	0.8102	19.1635	CondI_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log
7	0.7913	24.4691	CondI_log Dryh_log FLOW_log Runofft_log Qt_log Red_log Temp_log
7	0.6959	51.1733	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log
8	0.8536	9.0000	CondI_log Dryh_log FLOW_log Runofft_log Qt_log PH_log Red_log Temp_log

VITA

The author Ruben Erlacher was born in Innsbruck (Austria), to Peter Erlacher and Christine Unterberger on December 16, 1975. He graduated from “Wissenschaftliches Lyzeum J. Philipp Fallmerayer” High School of Brixen (South Tyrol, Italy) in 1995. He took part of several courses and summer schools in Oxford and Cambridge to improve his knowledge of the English language and received his degree in “Cambridge First Certificate” in 1995.

The author began his studies in the field of Civil and Environmental Engineering at the “Leopold-Franzens-University” of Innsbruck in Austria where he achieved his “Vordiplom” in 1999.

He also participated at courses for “Engineering Mechanics” at the Technical University of Vienna, Austria, which where offered in English.

During the time studying at Universities, the author worked for technical and engineering offices as well as for construction-companies in order to obtain practical experience and knowledge in the engineering field.

He entered the Graduate Program at University of New Orleans in August, 2000 and conducted research on “Water and Wastewater Quality Monitoring Techniques” until November, 2001. On July 31, 2001, he finished his class work for the degree in “Master of Science in Engineering” at the Department of Civil and Environmental Engineering at the University of New Orleans.

On December 31, 2001, he finished his class work for the degree in Civil Engineering at the “Leopold-Franzens-University” of Innsbruck. Finally, he conducted research on “Determination of the authoritative Groundwater Temperature in Pore-Groundwater-Streams” for the University of Innsbruck until June 31, 2002, in partial fulfillment of the requirements for the Master’s program in Civil Engineering, and received his academic degree of “Diplom-Ingenieur” (D.I.) at the Department of Umwelttechnik-Wasserbau at the “Leopold-Franzens-University” of Innsbruck in June 2002.

The author attended the training instruction program for the “Safety Coordinator in the Construction Field” in Bozen (South Tyrol, Italy) and obtained his degree in May 2002. Moreover he took part of several courses and seminars in order to get further vocational training.

The author started his class work for the degree in Ph.D. of Applied Sciences at the Department of Civil and Environmental Engineering at the University of New Orleans in the fall 2002 and finished it in the fall of 2003.

In October 2003 he finished his last examination of the “Practical Engineering State Exam” in Italy, received his Engineering Licence, and became a member of the Italian Engineering Association.

Between January and April 2004 the author attended several courses and training instruction programs for the projection and construction of Low-Energy- and Passive-Houses, passed the final examination and obtained his degree in “KlimaHaus Expert” in April 2004.

Finally, the author conducted research on "Storm Water Runoff Characteristics" at the University of New Orleans and graduated with the degree of "Doctor of Philosophy in Applied Sciences" in May 2004.