# WATER RESOURCES DATA SYSTEM

# USER'S GUIDE

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# CHAPTER I

## INTRODUCTION

The Water Resources Data System (WRDS) is a computerized database with flexible methods for the retrieval and analysis of Wyoming water resources data. The computerization process began in 1965, when encoding was started for all regularly reported streamflow data. All regularly reported surface and ground water quality data, climatological, water well level, and snow course data were added later. In addition, data not easily available elsewhere have been added to the system as they have been identified. As the database expanded, a number of programs were developed to retrieve and analyze the data. Presently, WRDS is the most extensive database of Wyoming water resources available. It provides many kinds of analytical output, and is a fast, effective way to obtain large or small amounts of information.

To utilize WRDS efficiently, users must be informed about its two basic types of data and about the types of output produced by its computer programs. The first type of data stored on the system characterizes the data collection sites themselves; some examples are station number and name, location in terms of latitude-longitude and township-range, and source organization. Since information of this type is often displayed in computer output headings, it will be referred to as "header data". WRDS programs allow retrieval by one or more header parameters, so a description of specific header data elements and their codes is provided in Chapter 2 for reference purposes.

The second type of data stored on WRDS is that which is collected at the sites described in the headers. Since the values for these parameters change over time, they are referred to as "temporal data" in this guide. These parameters are stored in one of five major WRDS databases: Surface Water Quantity, Water Quality (surface and ground), Climate, Water Well Levels, and Snow Course. Temporal parameters within each database are grouped according to the frequency with which the data are collected (see Figure 1). Each temporal parameter is usually specific to a particular database; for example, end of the month reservoir contents reside in the surface water database, and daily mean air temperature is found in the climate database. A list of the temporal parameters associated with each database is presented in Chapter 3. Before making a WRDS request, the user should review the temporal data available for the database of interest to determine if the desired information resides in the system.

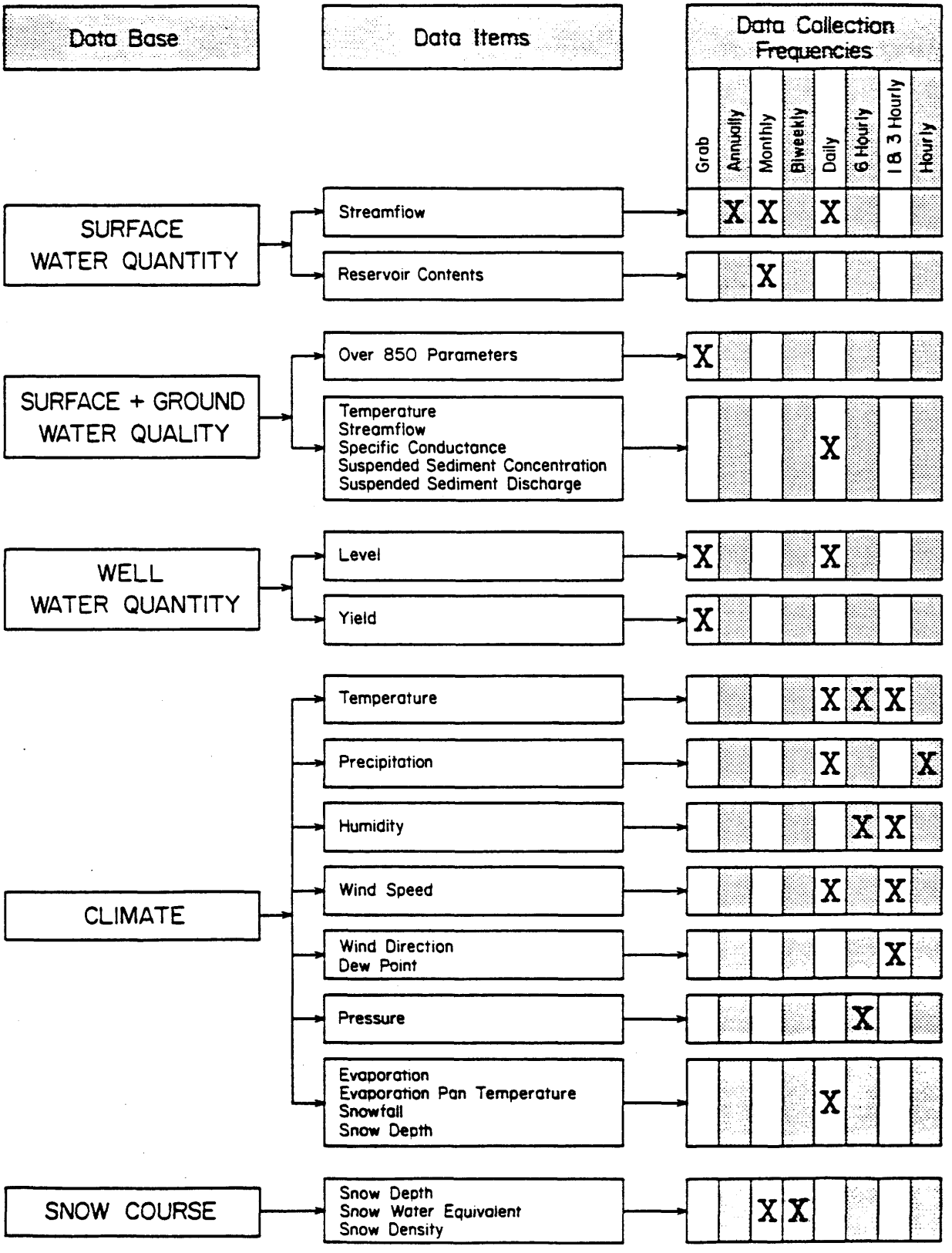
The computer programs available for retrieval and analysis of the temporal data in each database are also described in Chapter 3. The following information is provided for each program:

- a short description of the program's purpose and any analytical methods used;
- a list of header data elements that can be used for primary or secondary retrieval;
- a set of program options requiring user specification; and
- the output from a sample run.

This information should help the user select the program that best suits his output requirements.

FIgure 1

# WATER RESOURCES DATA SYSTEM
# WRDS



When preparing requests, the user should:

- examine the temporal data lists in Chapter 3 to determine if the parameters of interest are available and in which database they are stored;
- from among the program descriptions for that database in Chapter 3, select the program that will meet his requirements;
- decide which header parameters should be used for primary or secondary retrieval, by selecting from the list of retrieval options for the requested program; obtain the codes for these parameters from the lists in Chapter 2; and
- examine the remaining program options and decide what is required for the request.

All of this information should be determined before the user initiates a request.

Previous publications describe earlier versions of the system (Embree and Cole, 1970; Embree and Larson, 1970; Smith, 1974; Smith, Pelton, and Bender, 1976; Pelton and Smith, 1977; Pelton, 1979; Shea and Baumgardner, 1981; Drury and Travis, 1983). A loose-leaf format has been chosen for this report to facilitate updates in the future. As new programs are written and old ones are modified, revisions to the manual will be sent to subscribers. We hope that this will make WRDS more adaptive to the water resources needs of the State of Wyoming.

# CHAPTER 2

## HEADER DATA AND RETRIEVAL CODES

Header data elements describe the data collection sites primarily by location and source of data, although other characteristics are included if appropriate for the database. The term "header" is derived from the frequent presence of this type of information in the headings of computer output tables. WRDS programs allow data retrieval by one or more of the following header data elements, depending on the database and the type of program: aquifer number and geologic unit code, county-state name, drainage basin, latitude-longitude, site type, station number, source organization, source organization station number, testing laboratory, township-range, use, and well depth. There are also a number of informational header items that may be available depending on the database; these would be printed on header reports. They are: city name, drainage area, elevation, original water treatment, NPDES discharge permit number, storage coefficient, transmissivity, well permit number, x and y coordinates, and zone.

This chapter provides a detailed description of each retrieval item, the database(s) with which it is associated, and its codes for reference purposes. Retrieval options available for specific programs are listed under the program descriptions in Chapter 3. It should also be noted that sites may be lacking some header information that is supposed to be available for a certain database. Thus, retrieval on the basis of some characteristics may yield incomplete results.

Informational (non-retrieval) header items are listed with their associated databases at the end of this chapter.

## Aquifer Number, Name, and Geologic Unit Code

Well level and water quality databases store aquifer information which can be used for secondary data retrieval by a number of computer programs. The following sets of codes specify the aquifers that supply water to specific wells. The aquifer number is composed of three digits which specify the Era, System, and Series of the rock unit (see Table 1). The aquifer geologic unit code specifies the rock-stratigraphic unit with one to four characters. An optional fifth character specifies a qualifying term, such as Upper, Middle or Lower (see Table 2). If more than one aquifer is involved for a given well, the one in the most recent formation is stored on WRDS.

The user can specify either the aquifer number or the geologic unit code when using the aquifer for secondary retrieval.

NOTE: Aquifer information is currently available only for sites in the Bighorn, Powder, and North Platte River basins.

Table 1. Numeric Codes for Geologic Age Identification

| Era / System / Series | Aquifer Number |
|---|---|
| UNKNOWN AGE | 000 |
| CENOZOIC | 100 |
| Quaternary | 110 |
| Holocene | 111 |
| Pleistocene | 112 |
| Tertiary | 120 |
| Pliocene | 121 |
| Miocene | 122 |
| Oligocene | 123 |
| Eocene | 124 |
| Paleocene | 125 |
| MESOZOIC | 200 |
| Cretaceous | 210 |
| Upper | 211 |
| Gulfian | 212 |
| Lower | 217 |
| Comanchean | 218 |
| Coahuilan | 219 |
| Jurassic | 220 |
| Upper | 221 |
| Middle | 224 |
| Lower | 227 |
| Triassic | 230 |
| Upper | 231 |
| Middle | 234 |
| Lower | 237 |
| PALEOZOIC | 300 |
| Permian | 310 |
| Upper | 311 |
| Ochoan | 312 |
| Guadalupian | 313 |
| Lower | 317 |
| Leonardian | 318 |
| Wolfcampian | 319 |
| Pennsylvanian | 320 |
| Upper | 321 |
| Virgilian | 322 |
| Missourian | 323 |
| Middle | 324 |
| Des Moinesian | 325 |
| Atokan | 326 |
| Lower | 327 |
| Morrowan | 328 |
| PALEOZOIC (contd.) | |
| Mississippian | 330 |
| Upper | 331 |
| Chesterian | 332 |
| Meramecian | 333 |
| Lower | 337 |
| Osagean | 338 |
| Kinderhookian | 339 |
| Devonian | 340 |
| Upper | 341 |
| Middle | 344 |
| Lower | 347 |
| Silurian | 350 |
| Upper | 351 |
| Cayugan | 352 |
| Middle | 354 |
| Niagaran | 355 |
| Lower | 357 |
| Alexandrian | 358 |
| Ordovician | 360 |
| Upper | 361 |
| Cincinnatian | 362 |
| Middle | 364 |
| Champlainian | 365 |
| Lower | 367 |
| Canadian | 368 |
| Cambrian | 370 |
| Upper | 371 |
| St. Croixan | 372 |
| Middle | 374 |
| Lower | 377 |
| PRECAMBRIAN | 400 |
| Precambrian Z | 410 |
| Precambrian Y | 420 |
| Precambrian X | 430 |
| Precambrian W | 440 |

TABLE 2

Aquifer Names and Geologic Unit Codes for Wyoming

| | |
|---|---|
| CENOZOIC ERA | 100CNZC |
| Quaternary Period | |
| Quaternary System | 110QRNR |
| Holocene Epoch | |
| Alluvium | 111ALVM |
| Eolian Deposits | 111EOLN |
| Holocene Series | 111HLCN |
| Hydrothermal Deposits | 111HTML |
| Kaycee Formation | 111KYCE |
| Lacustrine Deposits | 111LCTN |
| Landslide Deposits | 111LDLD |
| Lighting Formation | 111LGNG |
| Sand Dune Deposits | 111SNDD |
| Terrace Deposits | 111TRRC |
| Ucross Formation | 111UCRS |
| Pleistocene Epoch | |
| Arvada Formation | 112ARVD |
| Bull Lake Drift | 112BLLK |
| Basalt Flows | 112BSLT |
| Bivouac Formation | 112BVUC |
| Cedar Ridge Till | 112CDRG |
| Dinwoody Lake Till | 112DDLK |
| Eolian Deposits | 112EOLN |
| Fenton Pass Formation | 112FNPS |
| Glacial Deposits | 112GLCL |
| Pleistocene Series | 112PLSC |
| Pinedale Drift | 112PNDL |
| Rhyolite Flows | 112RYLT |
| Sacagewea Ridge Till | 112SCGR |
| Sedimentary Rocks | 112SDRY |
| Terrace Deposits | 112TRRC |
| Yellowstone Group | 112YLSN |
| Tertiary Period | |
| Basalt | 120BSLT |
| Extrusive Rock | 120EXTV |
| Intrusive Rock | 120INTV |
| Tertiary System | 120TRTR |
| Pliocene Epoch | |
| Burnt Gulch Conglomerate | 121BGLC |
| Browns Park Formation | 121BRPK |
| Canyon Basalt | 121CNYN |
| Camp Davis Formation | 121CPDV |
| Fowkes Formation | 121FWKS |
| Gooseberry Member of Fowkes Formation | 121GSBR |
| Moonstone Formation | 121MNSN |
| North Park Formation | 121NRPK |
| Ogallala Formation | 121OGLL |
| Pliocene Series | 121PLCN |
| Salt Lake Formation | 121SLLK |
| Spoon Butte Beds | 121SPNB |
| Teewinot Formation | 121TWNT |

TABLE 2

Aquifer Names and Geologic Unit Codes for Wyoming (cont.)

| | |
|---|---|
| Miocene Epoch | |
| Arikaree Formation | 122ARKR |
| Bishop Conglomerate | 122BSHP |
| Colter Formation | 122CLTR |
| Miocene Series | 122MOCN |
| Sherman Diorite | 122SRMN |
| Oligocene Epoch | |
| Big Sand Draw Sandstone Lentil of White River Formation | 123BGSD |
| Brule Formation | 123BRUL |
| Beaver Divide Conglomerate Member of White River Formation | 123BVDV |
| Chadron Formation | 123CDRN |
| Caldwell Canyon Volcanics | 123CLDC |
| Hat Creek Beds | 123HCRK |
| Oligocene Series | 123OLGC |
| Sweetwater Member of White River Formation | 123STTR |
| Tateman Mountain Gravel | 123TMNM |
| Wiggins Formation | 123WGNS |
| White River Formation or Group | 123WRVR |
| Yoder Formation | 123YODR |
| Eocene Epoch | |
| Absaroka Volcanic Supergroup | 124ABRK |
| Aycross Formation | 124ACRS |
| Alkali Creek Stratum of Wind River Formation | 124AKCK |
| Angelo Member of Green River Formation | 124ANGL |
| Bulldog Hollow Member of Fowkes Formation | 124BDGH |
| Blacks Fork Member of Bridger Formation | 124BKFK |
| Black Rock Coal Group | 124BKRK |
| Bullpen Member of Wasatch Formation | 124BLPN |
| Bridger Formation | 124BRDG |
| Burnt Fork White Layer | 124BRFK |
| Bates Hole Formation | 124BSHL |
| Battle Spring Formation | 124BSPG |
| Cathedral Bluffs Tongue of Wasatch Formation | 124CDBF |
| Cottonwood Draw Banded Layers of Wind River Formation | 124CDDR |
| Chappo Member of Wasatch Formation | 124CHPP |
| Clear Creek Gravels | 124CLCK |
| Continental Peak Formation | 124CLPK |
| Cottonwood White Layers | 124CNDW |
| Eocene Series | 124EOCN |
| Fontenelle Member of Green River Formation | 124FNNL |
| Fossil Butte Member of Green River Formation | 124FSLB |
| Green Cove Beds | 124GRCV |
| Greenian Series | 124GRNN |
| Green River Formation | 124GRRV |
| Hanna Formation | 124HANN |
| Hoback Formation | 124HBCK |
| Henry Ranch Member of Tepee Trail Formation | 124HRRC |
| Hiawatha Member of Wasatch Formation | 124HWTH |
| Kingsbury Conglomerate Member of Wasatch Formation | 124KGBR |
| LaBarge Member of Wasatch Formation | 124LBRG |
| Laney Shale Member of Green River Formation | 124LNEY |
| Lost Cabin Member of Wind River Formation | 124LSCB |
| Lone Tree Gulch Ash | 124LTGC |

TABLE 2

Aquifer Names and Geologic Unit Codes for Wyoming (cont.)

| | |
|---|---|
| Luman Tongue of Green River Formation | 124LUMN |
| Lysite Member of Wind River Formation | 124LYST |
| Moncrief Member of Wasatch Formation | 124MCRF |
| Newberger Sand (subsurface) | 124NBRG |
| New Fork Tongue of Wasatch Formation | 124NFRK |
| Niland Tongue of Wasatch Formation | 124NLND |
| Pitchfork Formation | 124PCFK |
| Pass Peak Conglomerate | 124PSPK |
| Red Desert Tongue of Wasatch Formation | 124RDDR |
| Ramshorn Volcanic Series | 124RMSR |
| Sillem Member of Fowkes Formation | 124SLLM |
| Twin Buttes Member of Bridger Formation | 124TNBS |
| Tepee Trail Formation | 124TPTL |
| Tipton Shale Member of Green River Formation | 124TPTN |
| Tatman Formation | 124TTMN |
| Tunp Member of Wasatch Formation | 124TUNP |
| Uinta Formation | 124UINT |
| Ulm Coal Group of Wasatch Formation | 124ULM |
| Wind River Formation | 124WDRV |
| Wagon Bed Formation | 124WGBD |
| Wagonhound Member of Uinta Formation | 124WGND |
| Wilkins Peak Member of Green River Formation | 124WKPK |
| Wilson Sand | 124WLSN |
| Willwood Formation | 124WLWD |
| Washakie Formation | 124WSHK |
| Wasatch Formation | 124WSTC |
| Paleocene Epoch | |
| Evanston Formation | 125EVNS |
| Ferris Formation | 125FRRS |
| Fort Union Formation | 125FRUN |
| Hams Fork Conglomerate Member of Evanston Formation | 125HMFK |
| Lobo Shale Member of Fort Union Formation | 125LOBO |
| Mantua Lentil of Polecat Bench Formation | 125MNTU |
| Polecat Bench Formation | 125PCBC |
| Paleocene Series | 125PLCN |
| Pinyon Conglomerate | 125PNYN |
| Rock Bench Quarry Beds of Polecat Bench Formation | 125RKBQ |
| Silver Coulee Beds of Polecat Bench Formation | 125SLVC |
| Shotgun Member of Fort Union Formation | 125STGN |
| Tongue River Member of Fort Union Formation | 125TGRV |
| Tullock Member of Fort Union Formation | 125TULK |
| Waltman Shale Member of Fort Union Formation | 125WLMN |
| MESOZOIC ERA | 200MSZC |
| Cretaceous Period | |
| Cretaceous System | 210CRCS |
| Upper Cretaceous Epoch | |
| Adaville Formation | 211ADVL |
| Almond Formation | 211ALMD |
| Allen Ridge Formation | 211ARDG |
| Black Buttes Coal Group | 211BCKB |
| Bacon Ridge Sandstone | 211BCRG |
| Blind Bull Formation | 211BLDB |

TABLE 2

Aquifer Names and Geologic Unit Codes for Wyoming (cont.)

| | |
|---|---|
| Belle Fourche Shale | 211BLFC |
| Blair Formation | 211BLIR |
| Bow Formation or Group | 211BOW |
| Basin Shale | 211BSIN |
| Baxter Shale | 211BXTR |
| Chimney Rock Tongue of Blair Formation | 211CMRK |
| Cody Shale | 211CODY |
| Upper Cretaceous Series | 211CRCSU |
| Carlile Shale | 211CRLL |
| Dakota Sandstone or Formation | 211DKOT |
| Eagle Sandstone | 211EGLE |
| Elk Basin Sandstone Member of Telegraph Creek Formation | 211ELKB |
| Ericson Sandstone or Formation | 211ERCS |
| Everts Formation | 211EVRS |
| Frontier Formation | 211FRNR |
| Fitzhugh Sand (subsurface) | 211FTZG |
| Fox Hills Sandstone | 211FXHL |
| Gammon Ferruginous Member of Pierre Shale | 211GMMN |
| Greenhorn Limestone | 211GRNR |
| Graneros Shale | 211GRRS |
| Haystack Mountains Formation | 211HCKM |
| Hailey Shale | 211HILY |
| Hilliard Shale or Formation | 211HLRD |
| Harebell Formation | 211HRBL |
| Hygiene Sandstone | 211HYGN |
| Iles Formation | 211ILES |
| Kara Bentonitic Member of Pierre Shale | 211KARA |
| Knobs-Cherokee Coal Group | 211KBCK |
| Kimball Sand (subsurface) | 211KMBL |
| Landslide Creek Formation | 211LDCK |
| Lance Formation | 211LNCE |
| Laramie Formation | 211LRMI |
| Lewis Shale | 211LWIS |
| Lazeart Sandstone Member of Adaville Formation | 211LZRT |
| Medicine Bow Formation | 211MDCB |
| Monument Hill Bentonitic Member of Pierre Shale | 211MMHL |
| Mancos Shale | 211MNCS |
| Mitten Black Shale Member of Pierre Shale | 211MTTN |
| Meeteetse Formation | 211MTTS |
| Mesaverde Formation or Group | 211MVRD |
| Niobrara Formation | 211NBRR |
| Octh Louie Sand (subsurface) | 211OCTL |
| Oyster Ridge Sandstone Member of Frontier Formation | 211ORDG |
| Pedro Bentonite Bed of Pierre Shale | 211PDRO |
| Peay Sandstone Member of Frontier Formation | 211PEAY |
| Piney Formation | 211PINY |
| Pierre Shale | 211PIRR |
| Pool Creek Shale Member of Carlile Shale | 211PLCK |
| Pine Ridge Sandstone | 211PRDG |
| Parkman Sandstone Member of Mesaverde Formation | 211PRKM |
| Quealy Sand (subsurface) | 211QULY |
| Red Bird Silty Member of Pierre Shale | 211RDBD |
| Rock Springs Formation | 211RKSP |

TABLE 2

Aquifer Names and Geologic Unit Codes for Wyoming (cont.)

| | |
|---|---|
| Rawlins Sandstone | 211RLNS |
| Shannon Sandstone Member of Cody Shale | 211SNNN |
| Sussex Sandstone Member of Cody Shale | 211SSSX |
| Steele Shale | 211STEL |
| Torchlight Sandstone Member of Frontier Formation | 211TCLG |
| Telegraph Creek Formation | 211TPCK |
| Teapot Sandstone Member of Mesaverde Formation | 211TPOT |
| Torrington Member of Lance Formation | 211TRNG |
| Turner Sandy Member of Carlile Shale | 211TRNR |
| Wall Creek Sandstone Member of Frontier Formation | 211WLCK |
| Lower Cretaceous Epoch | |
| Aspen Shale or Formation | 217ASPN |
| Bechler Conglomerate | 217BCLR |
| Birdhead Sandstone Member of Cloverly Formation | 217BRDD |
| Barrett Shale | 217BRRT |
| Bear River Formation | 217BRRV |
| Cokeville Formation | 217CKVL |
| Chilson Member of Lakota Formation | 217CLSN |
| Clay Spur Bentonite Bed of Mowry Shale | 217CLSP |
| Cloverly Formation | 217CLVL |
| Lower Cretaceous Series | 217CRCSL |
| Draney Limestone | 217DRNY |
| Ephraim Conglomerate | 217EPRM |
| Fall River Formation | 217FLRV |
| Fuson Member of Lakota Formation | 217FUSN |
| Gannett Group | 217GNNT |
| Greybull Sandstone Member of Cloverly Formation | 217GRBL |
| Hay Creek Formation | 217HCRK |
| Inyan Kara Group | 217INKR |
| Keyhole Sandstone Member of Fall River Formation | 217KYHL |
| Lakota Formation | 217LKOT |
| Muddy Sandstone Member of Thermopolis Shale | 217MDDY |
| Minnewaste Limestone Member of Lakota Formation | 217MNST |
| Mowry Shale | 217MWRY |
| Newcastle Sandstone | 217NCSL |
| Peterson Limestone | 217PRSN |
| Quealy Formation | 217QULY |
| Sublette Formation | 217SBLT |
| Sage Junction Formation | 217SGJC |
| Skull Creek Shale | 217SKCK |
| Smiths Formation | 217SMTS |
| Thomas Fork Formation | 217TMFK |
| Thermopolis Shale | 217TMPL |
| Jurassic Period | |
| Jurassic System | 220JRSC |
| Upper Jurassic Epoch | |
| Carmel Formation | 221CRML |
| Curtis Formation | 221CRTS |
| Canyon Springs Sandstone Member of Sundance Formation | 221CSPG |
| Gypsum Spring Formation | 221GPSP |
| Hulett Sandstone Member of Sundance Formation | 221HLTT |
| Upper Jurassic Series | 221JRSCU |
| Lak Member of Sundance Formation | 221LAK |

TABLE 2

Aquifer Names and Geologic Unit Codes for Wyoming (cont.)

| | |
|---|---|
| Morrison Formation | 221MRSN |
| Preuss Sandstone or Redbeds | 221PRSS |
| Rierdon Formation | 221RRDN |
| Stockade Beaver Shale Member of Sundance Formation | 221SKBV |
| Sundance Formation | 221SNDC |
| Stump Sandstone | 221STMP |
| Swift Formation | 221SWFT |
| Middle Jurassic Epoch | |
| Middle Jurassic Series | 224JRSCM |
| Sawtooth Formation | 224STTH |
| Twin Creek Limestone or Formation | 224TCRK |
| Lower Jurassic Epoch | |
| Lower Jurassic Series | 227JRSCL |
| Nugget Sandstone | 227NGGT |
| Triassic Period | |
| Triassic System | 230TRSC |
| Upper Triassic Epoch | |
| Alcova Limestone | 231ALCV |
| Ankareh Shale, Formation, or Red Beds | 231ANKR |
| Chugwater Formation or Group | 231CGTR |
| Crow Mountain Sandstone Member of Chugwater Formation | 231CRMN |
| Jelm Formation | 231JELM |
| Popo Agie Member of Chugwater Formation | 231PPAG |
| Upper Triassic Series | 231TRSCU |
| Wyopo Formation | 231WYOP |
| Lower Triassic Epoch | |
| Dinwoody Formation | 237DNDY |
| Ervay Member of Goose Egg Formation | 237ERVY |
| Freezeout Shale Member of Goose Egg Formation | 237FRZT |
| Goose Egg Formation | 237GSEG |
| Little Medicine Member of Goose Egg Formation | 237LMDC |
| Red Peak Formation | 237RDPK |
| Spearfish Formation | 237SPRF |
| Lower Triassic Series | 237TRSCL |
| Thaynes Limestone | 237TYNS |
| Woodside Formation | 237WDSD |
| PALEOZOIC ERA | 300PLZC |
| Permian Period | |
| Permian System | 310PRMN |
| Upper Permian Epoch | |
| Difficulty Shale Member of Goose Egg Formation | 311DFCL |
| Franson Member or Tongue of Park City Formation | 311FRNS |
| Freezeout Tongue of Chugwater Formation | 311FRZT |
| Glendo Shale Member of Goose Egg Formation | 311GLND |
| Grandeur Member of Park City Formation | 311GRDR |
| Meade Peak Phosphatic Shale Member of Phosphoria Formation | 311MDPK |
| Park City Formation | 311PRKC |
| Upper Permian Series | 311PRMNU |
| Phosphoria Formation | 311PSPR |
| Retort Phosphatic Shale Member of Phosphoria Formation | 311RTRT |
| Rex Chert Member of Phosphoria Formation | 311RXCR |
| Shedhorn Sandstone | 311SDRN |

TABLE 2

Aquifer Names and Geologic Unit Codes for Wyoming (cont.)

| | |
|---|---|
| Lower Permian Epoch | |
| Casper Formation | 317CSPR |
| Converse Sandstone Bed of Hartville Formation | 317CVRS |
| Fountain Formation | 317FNTN |
| Forelle Limestone Member of Goose Egg Formation | 317FRLL |
| Hartville Formation | 317HRVL |
| Ingleside Formation | 317IGLD |
| Minnekahta Limestone | 317MNKT |
| Minnelusa Formation | 317MNLS |
| Maroon Formation | 317MRON |
| Opeche Shale | 317OPCH |
| Pope Spring Sandstone | 317PPSP |
| Lower Permian Series | 317PRMNL |
| Sybille Tongue of Phosphoria Formation | 317SBLL |
| Satanka Shale | 317STNK |
| Tosi Chert Member or Tongue of Phosphoria Formation | 317TOSI |
| Tensleep Sandstone | 317TSLP |
| Wells Formation | 317WLLS |
| Pennsylvanian Period | |
| Pennsylvanian System | 320PSLV |
| Middle Pennsylvanian Epoch | |
| Morgan Formation | 324MRGN |
| Middle Pennsylvanian Series | 324PSLVM |
| Lower Pennsylvanian Epoch | |
| Amsden Formation | 327AMSD |
| Bell Sand (subsurface) | 327BELL |
| Darwin Sandstone Member of Amsden Formation | 327DRWN |
| Fairbank Formation | 327FRBK |
| Lower Pennsylvanian Series | 327PSLVL |
| Quadrant Quartzite or Formation | 327QDRN |
| Round Valley Limestone | 327RDVL |
| Mississippian Period | |
| Mississippian System | 330MSSP |
| Upper Mississippian Epoch | |
| Madison Formation or Group | 331MDSN |
| Mission Canyon Limestone | 331MSNC |
| Upper Mississippian Series | 331MSSPU |
| Lower Mississippian Epoch | |
| Darby Formation | 337DRBY |
| Guernsey Formation | 337GRNS |
| Lodgepole Limestone | 337LDGP |
| Lower Mississippian Series | 337MSSPL |
| Pahasapa Limestone | 337PHSP |
| Three Forks Limestone or Formation | 337TRFK |
| Devonian Period | |
| Devonian System | 340DVNN |
| Upper Devonian Epoch | |
| Upper Devonian Series | 341DVNNU |
| Jefferson Formation | 341JFRS |
| Lower Devonian Epoch | |
| Beartooth Butte Formation | 347BRTB |
| Lower Devonian Series | 347DVNNL |

TABLE 2

Aquifer Names and Geologic Unit Codes for Wyoming (cont.)

| | |
|---|---|
| Ordovician Period | |
| Ordovician System | 360ODVC |
| Upper Ordovician Epoch | |
| Bighorn Dolomite | 361BGRN |
| Leigh Dolomite Member of Bighorn Dolomite | 361LIGH |
| Lander Sandstone Member of Bighorn Dolomite | 361LNDR |
| Upper Ordovician Series | 361ODVCU |
| Middle Ordovician Epoch | |
| Aladdin Sandstone | 364ALDN |
| Middle Ordovician Series | 364ODVCM |
| Lower Ordovician Epoch | |
| Deadwood Formation | 367DDWD |
| Lower Ordovician Series | 367ODVCL |
| Cambrian Period | |
| Cambrian System | 370CMBR |
| Upper Cambrian Epoch | |
| Buck Spring Formation | 371BKSP |
| Boysen Formation | 371BYSN |
| Upper Cambrian Series | 371CMBRU |
| Gallatin Limestone or Formation | 371GLTN |
| Gros Ventre Formation | 371GRVR |
| Open Door Limestone | 371OPDR |
| Pilgrim Limestone | 371PLGM |
| Snowy Range Formation | 371SNRG |
| Middle Cambrian Epoch | |
| Middle Cambrian Series | 374CMBRM |
| Death Canyon Member of Gros Ventre Formation | 374DCNN |
| Depass Formation | 374DPSS |
| Flathead Quartzite or Sandstone | 374FLTD |
| Meagher Limestone | 374MGHR |
| Park Shale | 374PARK |
| Wolsey Shale | 374WLSY |
| PRECAMBRIAN ERA | 400PCMB |

Source: Rollo et al., 1976.

## County-State Name

Counties within Wyoming and neighboring states can be used for primary data retrieval for all five databases. The user should specify the desired area by name and number from the following list. Counties with consecutive index numbers may be specified as a range.

| | County |
|---|---|
| 1 | Natrona |
| 2 | Laramie |
| 3 | Sheridan |
| 4 | Sweetwater |
| 5 | Albany |
| 6 | Carbon |
| 7 | Goshen |
| 8 | Platte |
| 9 | Big Horn |
| 10 | Fremont |
| 11 | Park |
| 12 | Lincoln |
| 13 | Converse |
| 14 | Niobrara |
| 15 | Hot Springs |
| 16 | Johnson |
| 17 | Campbell |
| 18 | Crook |
| 19 | Uinta |
| 20 | Washakie |
| 21 | Weston |
| 22 | Teton |
| 23 | Sublette |
| 24 | Yellowstone National Park |
| | **State** |
| 25 | Montana |
| 26 | North Dakota |
| 27 | South Dakota |
| 28 | Nebraska |
| 29 | Colorado |
| 30 | Utah |
| 31 | Idaho |

NOTE: Data are not available for all locations on all databases.

## Drainage Basin

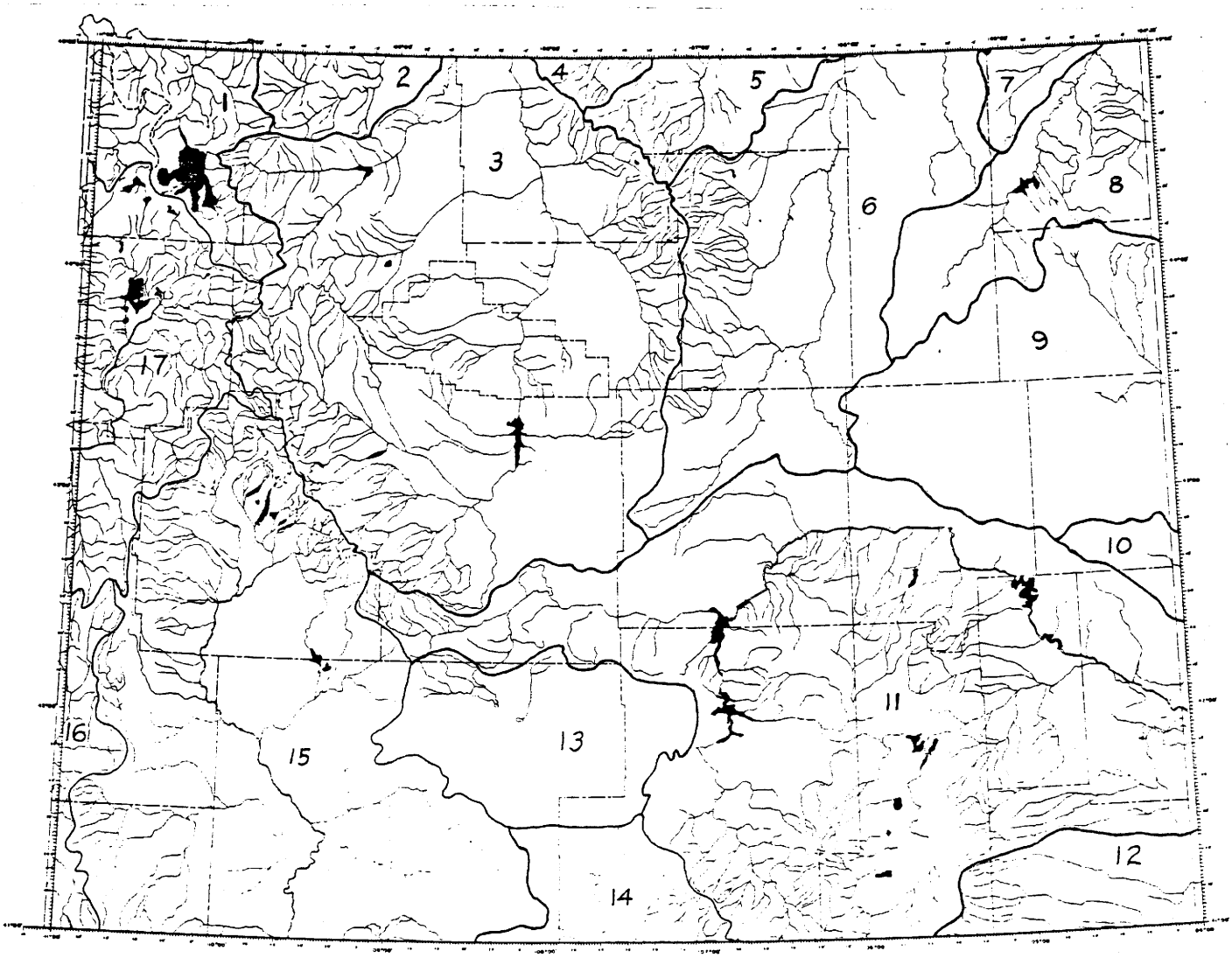
Drainage basin information is stored for data residing in all of the databases. WRDS categorizes basins on the following five hierarchical levels:

| | |
|---|---|
| Primary | (2 digit code) |
| Secondary | (2 digit code) |
| Tertiary | (2 digit code) |
| Fourth Degree | (1 digit code) |
| Fifth Degree | (1 digit code) |

On the next page, Figure 2 presents the geographic location, name, and retrieval code of the primary drainage basins in Wyoming. WRDS staff will assist the user when more refined basin retrieval is desired. The WRDS drainage basin boundaries closely resemble USGS hydrologic units (U.S. Geological Survey, 1974). Corresponding codes for each classification system are shown in Table 3.

Figure 2

Wyoming Drainage Basins




1 Madison-Yellowstone
2 Clarks Fork
3 Big Horn
4 Little Big Horn
5 Tongue
6 Powder
7 Little Missouri
8 Belle Fourche
9 Cheyenne
10 Niobrara
11 North Platte
12 South Platte
13 Great Divide
14 Little Snake
15 Green
16 Bear
17 Snake
21 Rosebud - Yellowstone

Table 3. Comparison of WRDS and USGS Drainage Basin Codes.

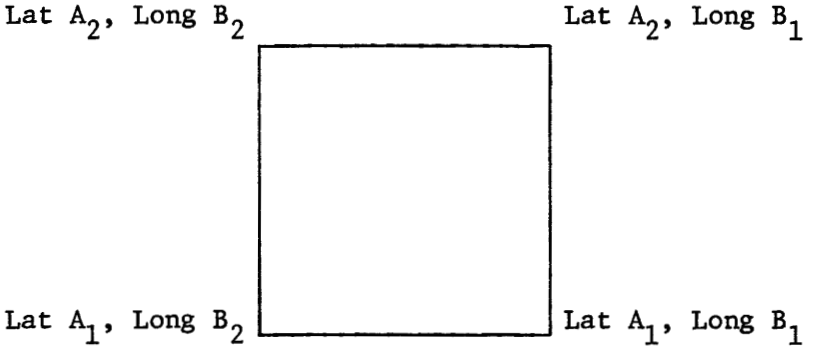
| WRDS | USGS |
|---|---|
| 01 | 10020007-10020008, 10070001-10070002,1007005,1007008 |
| 02 | 10070006 |
| 03 | 10080001-10080015 |
| 04 | 10080016 |
| 05 | 10090101-10090102 |
| 06 | 10090201-10090208 |
| 07 | 10110201-10110202 |
| 08 | 10120201-10120203 |
| 09 | 10120101-10120108, 10120110 |
| 10 | 10150002 |
| 11 | 10180001-10180013 |
| 12 | 10190007-10190009, 10190012, 10190015-10190017 |
| 13 | 14040200 |
| 14 | 14050003-14050004 |
| 15 | 14040101-14040109 |
| 16 | 16010101-16010102, 16020101 |
| 17 | 17040101-17040105, 17040202-17040204 |
| 21 | 10100003 |

Sources: Pelton, 1979, and U.S. Geological Survey, 1974.

## Latitude-Longitude

Single or multiple data collection sites can be retrieved through latitude-longitude specification. This option is available for all databases and almost all computer programs, and is particularly valuable when a geographic area of interest is known but specific data collection sites are unknown. To retrieve by a single location, the user supplies only latitude and longitude readings for the point of interest in degrees, minutes, and seconds. To define an area, the user must supply the lower right-hand and upper left-hand corner readings for the area of interest.

For example, to define the area below:




the user would specify Lat $A_1$, Long $B_1$, and Lat $A_2$, Long $B_2$ to retrieve data for sites within the entire area. As with retrieval of a single site, all readings are to be given in degrees, minutes, and seconds.

## Site Type

Water quality information is characterized by type of site and can be retrieved on that basis. The WRDS user should select a site type option from the list below. Note that certain data reside on the system for which the site type is unknown.

| | | |
|---|---|---|
| | 0 | Unknown |
| GW | 1 | Well |
| (groundwater) | 2 | Spring |
| | 3 | Well or spring (actual type unspecified) |
| | 4 | Stream/river/creek |
| | 5 | Lake, reservoir, pond, or pit |
| | 6 | Ditch |
| | 7 | Pipe or tap |
| | 8 | Retort water |
| | 9 | Hauled water |
| | 10 | Snowfall |
| | 11 | Snowpack |
| | 12 | Rainfall |
| | 13 | Graupel shower |

## Station Number

All sites for all databases are identified by a WRDS designated station number. The WRDS station number is often, but not always, the original identification number used by the source organization. If retrieval by station number is desired, the user should supply a list to the WRDS staff when making a request. If specific station numbers are unknown, it is suggested that the user request retrieval by geographic location. Because WRDS uses a number of data sources, it is possible that pertinent information may be overlooked by the user if station numbers are used for retrieval without knowledge of all collection sites residing on the system.

## Source Organization

Data source can be used as a basis for secondary retrieval for all databases and a substantial number of programs. If no source organizations are specified by the user, all data sources will be retrieved. The user should refer to the following lists to select data from specific sources. Note that the Surface Water database source codes differ from those for the other databases.

Surface Water:

| | |
|---|---|
| 0 | Unknown |
| 1 | U.S. Geological Survey (USGS) |
| 2 | Wyoming Water Research Center (WWRC) (formerly Water Resources Research Institute) |
| 5 | Wyoming State Water Commissioners |
| 10 | Shell Oil Company |
| 11 | U.S. Bureau of Reclamation (formerly Water & Power Resources Service) |
| 12 | N. Antelope |

Water Quality, Well Level, Climate, Snow Course:

| | |
|---|---|
| 0 | Unknown |
| 1 | U.S. Geological Survey |
| 2 | U.S. Forest Service |
| 3 | U.S. Bureau of Reclamation (formerly Water and Power Resources Service) |
| 4 | Bureau of Land Management (BLM) |
| 5 | Soil Conservation Service (SCS) |
| 6 | Environmental Protection Agency (EPA) |
| 7 | Western Research Institute (formerly Laramie Energy Technology Center); U.S. Department of Energy (Energy Research and Development Administration; U.S. Bureau of Mines) |
| 8 | Argonne National Laboratory |
| 9 | Wyoming Department of Environmental Quality (DEQ) |
| 10 | Wyoming Game and Fish Department |
| 11 | Wyoming Highway Department |
| 12 | State Testing Laboratory, Laramie |
| 13 | Wyoming Water Research Center (WWRC) (formerly Water Resources Research Institute) |
| 14 | Western Wyoming College |
| 22 | Individual (i.e., not part of a corporation) |
| 72 | Wyoming Geological Association Guidebook |
| 73 | American Association of Petroleum Geologists Bulletin |
| 74 | National Oceanic & Atmospheric Administration (NOAA), National Climate Center |
| 75 | Wyoming State Engineer, Cheyenne |

## Source Organization Station Number

Stations which have an assigned WRDS station number differing from the sources identification number can often be retrieved by the original number. WRDS must assign its own numbers when the original number is not unique, contains alphabetic characters, or is of a length which makes database management cumbersome. For instance, USGS water quality sites, which are identified by a longitude/latitude/sequence numbering scheme, can be retrieved by their original numbers.

The user should ask the WRDS staff for assistance if retrieval by source organization station number is desired.

## Testing Laboratory

Water quality grab sample data can be excluded from reports on the basis of testing laboratory. Up to three laboratories can be excluded from a given report. The user should use the list below when specifying laboratories to be excluded.

00 Unknown
01 State Testing Laboratory, Laramie
02 Northwest Analytical Laboratories, Powell
03 State Laboratory, Cheyenne
04 Federal Laboratory, Salt Lake City, Utah
05 Acculab Research, Inc., Wheat Ridge, Colorado, aka CDM (Camp, Dresser, McKee)
06 Game and Fish Laboratory, Lander
07 Argonne National Laboratory, Argonne, Illinois
08 Ford Chemical Laboratory, Salt Lake City, Utah
09 Western Wyoming College Laboratory, Rock Springs
10 U.S. Geological Survey Laboratory, Worland
11 Agricultural Micro Laboratory, University of Wyoming, Laramie
12 Energy Research and Development Administration Laboratory, Laramie (now Laramie Energy Technology Center, U.S. Department of Energy)
13 Rocky Mountain Energy Company, Denver, Colorado
14 Colorado Analytical Laboratory, Denver, Colorado
15 Atlantic Richfield Company Testing Laboratory, Denver, Colorado
16 Northern Testing Laboratories, Billings, Montana
17 Peter Kiewit Sons' Company Laboratory, Sheridan
18 Front Range Laboratory, Fort Collins, Colorado
19 Wamco Testing Laboratory, Casper
20 Chemical and Geological Laboratory, Casper
21 Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio
22 NALCO, Inc., Northbrook, Illinois
23 South Dakota School of Mines and Technology
24 Controls for Environmental Pollution, Inc.
25 Environmental Analysis Laboratories, Richmond, California
26 U.S. Bureau of Mines
27 Colorado School of Mines, Golden, Colorado
28 Kerr McGee Laboratories
29 Wyoming Analytical Laboratories (WAL)
30 Petroleum Analytical Laboratories, Casper (PALS)
31 Industrial Laboratories, Denver, Colorado
32 Commercial Testing and Engineering Laboratories, Denver, Colorado
33 Producers and Refiners Company, Wyoming
34 CLI Environmental Services
35 Coors/Spectro Chemical Laboratory, Golden, Colorado
36 Energy Laboratories, Billings, Montana (formerly Energy and Environmental Resource Consultants, Inc., EERC)

37 Inter-Mountain Laboratories, Inc., Sheridan
38 Exxon Metallurgical/Environmental Laboratory
39 Texas Gulf, Inc.
40 Energy Analytical Laboratory
41 Central Laboratory, Boulder, Colorado
42 Irigaray Laboratory of Wyoming Mineral Corporation
43 Montana Testing Laboratory, Billings, Montana
44 Bruner Corporation, Milwaukee, Wisconsin
45 Bureau of Reclamation, Upper Colorado Regional Water and Soils Laboratory, Salt Lake City, Utah
46 U.S. Geological Survey Laboratory, Denver, Colorado

## Township-Range

Specification of township and range offers the user an additional geographic retrieval option. The user must specify the principal meridian, township, township direction, range, and range direction for each area to be reported.

Principal Meridian:

01 Sixth (Wyoming-Colorado)
02 Wind River (Wyoming)
04 Montana
05 Salt Lake (Utah)
06 Boise (Idaho)
07 Black Hills (South Dakota)

Township (2 digits)

Township Direction:

1 North
2 South

Range (must have 3 digits; left fill with zero if needed)

Range Direction:

3 East
4 West

Though data are often recorded by section and even smaller areas, it is not currently possible to retrieve an area more refined than that described above.

## Use

Water quality and well level data are characterized by type of water use. Select use(s) from the list below to specify secondary retrieval based upon this option. If no options are specified by the user, all use types are reported. Note that data reside on WRDS for which the use is unknown.

0 Unknown
1 Community, municipal (city or town) system supply (stable population)
2 Community, non-municipal (stable population)
3 Non-community system supply (i.e., transient population, small number of people at a time, public, mainly drinking water; e.g., commercial, institutional, recreational)
4 Individual, domestic or household drinking supply
5 Stock-water supply
6 Irrigation supply
7 Industrial supply, non-mining (mainly non-drinking water)
8 Water flooding (mineral recovery)
9 Storm drainage discharge
10 Irrigation return
11 Industrial discharge, non-mining
12 Industrial discharge, mining
13 Municipal waste water discharge
14 Monitoring or observation
15 Exploratory or test
16 Abandoned or unused

## Well Depth

Well depth is stored on the water quality and well level databases. Currently only the well level plot program, PLOTWLL, allows the user to specify well depth as a secondary retrieval characteristic. The user should define a depth range in terms of feet below ground when using this option.

## Other Header Items

Other characteristics appear as heading information but are not used for retrieval purposes. These data are listed below with the databases for which the information is stored.

| Data Item: | Database(s): |
|---|---|
| City name | Water quality |
| Drainage area ($mi^2$) | Surface water, water quality |
| Elevation | Surface water, water quality, climate, well level |
| Original water treatment | Water quality |
| NPDES discharge permit number | Water quality |
| Storage coefficient | Well level |
| Transmissivity | Well level |
| Well permit number | Water quality, well level |
| x, y coordinate and zone | Well level |
| Other information & comments | Surface water, water quality, well level |

# CHAPTER 3

# TEMPORAL DATA AND PROGRAM DESCRIPTIONS

## 3.1 INTRODUCTION

There are five databases in WRDS: Surface Water Quantity, Water Quality (for surface and ground water), Well Level, Climate, and Snow Course. Information on the data available and program descriptions are provided, by database, in sections 3.2 to 3.6 of this chapter.

### Data Available

As described in Chapter 2, temporal data have values that change over time; these data are collected at the sites described by the header items. For certain databases, the data are grouped according to the frequency with which they are collected (e.g., daily, monthly) or the type of data. For instance, the surface water database has daily and monthly sample streamflow data, monthly reservoir content data, and instantaneous peak sample data. The climate database has the following temperature parameters: the mean, maximum and minimum air temperature on a daily basis; the 6-hour, daily maximum and minimum, and monthly maximum and minimum for 6-hourly data; and the dry and wet bulb air temperatures for 1- and 3-hourly data. From these two examples, one can ascertain the necessity of assessing the availability of data before deciding which program(s) is (are) needed.

## Programs

The primary purpose of WRDS is to report and analyze the temporal data, and there are a number of retrieval and analysis programs to perform this function. A description of each program's purpose and options to be specified can be found under the program description part of each database section later in this chapter. The program options may involve the specification of the type of data or the selection of particular parameters. Almost all programs require that the user define a time span for which data are to be reported or analyzed; instructions on the way the time range should be specified are given with each program description. All programs report the entire period of record when the data range specification is omitted.

The retrieval programs are common to each database, and are therefore described individually in this section. The analytical programs vary according to the specific task being performed, so only a general description of analysis programs is given below. Users will have to examine the program descriptions themselves to find out specifically what is available.

### Retrieval Programs

For each database, there are five basic programs that retrieve and report data:

LISTDATA
DATE
PLOTL
PLOTT
TAPE

A short description of each is provided here, but more detailed descriptions (including retrieval and program options) are given in the database program sections.

LISTDATA prints the values of temporal parameters for a particular database; e.g., daily streamflow values or water quality grab sample parameter values. This program can also produce summary statistics on the data.

DATE prints the station headers and the date range of available data for each station.

PLOTL is a set of programs on the WRDS which plot stations by location. The plots can be made to any scale. For each database, stations can be plotted in 3 to 6 different styles, and the program can prevent overprinting of data by stations too close together (a new "overlap" point is created). The size of the print can also be changed to reduce overprinting. Primary retrieval for these plots must be by latitude-longitude or township-range.

PLOTT is a set of programs which plot the WRDS data versus time, allowing the user to discern trends in the data in a visual manner. A year on the x-axis can be represented in 3.6, 9, or 23.4 inches. The computer can scale the y-axis values to the data, or the y-axis value range can be pre-set to allow comparison of plots. Various options are available in each database which reflect their different types of data.

The LISTDATA, DATE, PLOTT, and PLOTL programs are differentiated for the various databases by adding a 2-letter code. Thus, the DATE programs are DATESW, DATEWQ, DATEWL, DATECL, and DATESC. For the two plotting programs, the database code is added before the final letter.

Thus, PLOTSWL plots surface water data by location, and PLOTCLT plots climate data versus time.

TAPE is a program that has been written to facilitate sending our data on magnetic tape to users. We now have the capability of writing our data to tape in 80 character records, in either EBCDIC or ASCII, labeled or unlabeled, 7 or 9 track, with a density of 556, 800, 1600, or 6250 BPI. With the tape, the user receives a description of the format of the data and a source listing of our FORTRAN program to read the tape. A further discussion of magnetic tape output is given in Appendix A.

Water quality has one additional basic retrieval program. LPARAM lists all of the water quality grab parameters that are stored on WRDS.

Analysis Programs

Programs are also available which analyze rather than report data. Regressions may be performed on surface water and water quality data with their REGRES programs. The remaining analytic programs serve purposes peculiar to specific databases. For example, FLOW performs a streamflow frequency analysis on surface water data and WINDROSE analyzes wind patterns on climatic data. The user should refer to individual program descriptions for the database(s) of interest to gain familiarity with WRDS analytical capabilities.

## 3.2 SURFACE WATER QUANTITY

### Data Available

The surface water quantity database contains four types of data: daily, monthly, peak flow, and end of month reservoir contents. Data items stored for each of the four types is shown below.

| Data Type: | Parameters: | Unit of Measurement: |
|---|---|---|
| Daily sample data | Mean daily flow | Cubic feet per second |
| | Total monthly flow | Acre-feet |
| | Total annual[1] flow[2] | Acre-feet |
| Monthly sample data | Monthly flow | Acre-feet |
| | Total annual[1] flow[2] | Acre-feet |
| Monthly reservoir content data | End of month content | Acre-feet |
| | Annual[1] average content[2] | Acre-feet |
| Instantaneous peak sample data | Annual[1] peak flow | Cubic feet per second |
| | Stage at instantaneous peak | Feet |

Monthly flow data may be computed from daily values or from actual monthly and readings depending upon the collection site. To insure that all pertinent information is retrieved, the user should request that both sources of information be reported when selecting these data types.

---

[1] Water year.

[2] Total of all periods for which data are available.

## Programs

### DATESW

This program prints the available surface water station headers, and optionally the date ranges of the sample data, for daily streamflow, monthly streamflow, reservoir contents, and/or peak streamflow. Any combination of data types can be requested. If several data types are requested, and only headers are printed, it is not possible to tell what data types each header has.

For each listing, the user should specify:

Retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Source organization (unless all are to be used)

Whether or not dates, in addition to headers, are to be printed

SURFACE WATER
YEAR RANGES OF DATA AVAILABLE ON THE
WATER RESOURCES DATA SYSTEM
WYOMING WATER RESEARCH CENTER, LARAMIE, WY

YEAR RANGES FOR THE FOLLOWING DATA TYPES WERE REQUESTED:
DAILY DATA FROM THE DAILY FILE
MONTHLY DATA FROM THE DAILY FILE
MONTHLY DATA FROM THE MONTHLY FILE
RESERVOIR DATA FROM THE RESERVOIR FILE
PEAK DATA FROM THE PEAK FILE

| DAILY STREAMFLOW DATA (ALWAYS INCLUDES MONTHLY SOMETIMES INCLUDES PEAK) | MONTHLY STREAMFLOW DATA | END OF MONTH RESERVOIR CONTENTS DATA | ANNUAL PEAK STREAMFLOW DATA |
|---|---|---|---|
| FONTENELLE CREEK NEAR HERSCHLER RANCH NEAR FONTENELLE, WYO | | | STATION NO. 092105.00 |
| LATITUDE 42-05-46 LONGITUDE 110-24-57 NW1/4SW1/4NE1/4 SECTION 2 TOWNSHIP 24 N,RANGE 115 W 6TH P.M. | | | |
| ELEVATION 6950.00 FT DRAINAGE AREA 152.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15370000 | | | |
| LINCOLN COUNTY DATA FROM USGS | | | (P) |
| 1952 - 1982 | 1951 - 1982 | | 1952 - 1981 |
| FONTENELLE CREEK NEAR FONTENELLE, WYOMING | | | STATION NO. 092110.00 |
| LATITUDE 42-05-50 LONGITUDE 110-13-20 NE1/4 SECTION 3 TOWNSHIP 24 N,RANGE 113 W 6TH P.M. | | | |
| ELEVATION 6580.00 FT DRAINAGE AREA 224.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15370000 | | | |
| LINCOLN COUNTY DATA FROM USGS | | | (P) |
| 1916 - 1919 | 1914 - 1919 | | 1916 - 1919 |
| 1932 - 1953 | 1932 - 1953 | | 1932 - 1941 |
| | | | 1943 - 1953 |
| GREEN RIVER TRIBUTARY NEAR FONTENELLE, WYO. | | | STATION NO. 092111.00 |
| LATITUDE 42-02-40 LONGITUDE 110-09-40 SE1/4 SECTION 19 TOWNSHIP 24 N,RANGE 112 W 6TH P.M. | | | |
| ELEVATION UNKNOWN DRAINAGE AREA 3.75 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15360000 | | | |
| LINCOLN COUNTY DATA FROM USGS | | | (P) |
| | | | 1969 - 1974 |
| FONTENELLE RESERVOIR NEAR FONTENELLE, WYOMING | | | STATION NO. 092111.50 |
| LATITUDE 42-02-00 LONGITUDE 110-04-00 SECTION 25 TOWNSHIP 24 N,RANGE 112 W 6TH P.M. | | | |
| ELEVATION 6508.68 FT DRAINAGE AREA 4280.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15320000 | | | |
| LINCOLN COUNTY DATA FROM USGS | | | (P) |
| | 1965 - 1981 | | |

DAYAVE

This program computes and prints average daily streamflows based on daily values for a specified year range. The standard deviations of the daily flow for each day in the range of years are also computed. The calculations can include either all available data or years with complete data only. In either case, incomplete years are listed. Monthly mean flows and total flows in cubic feet per second (cfs) and acre-feet are also computed.

For each request, the user should specify:

Retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Source organization (unless all are to be used)

Water year range (unless all available years are to be used)

Whether or not the calculations should include years with missing data

GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING — STATION NO. 091885.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N,RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
SUBLETTE COUNTY DATA FROM USGS (P)

*** AVERAGE DAILY STREAMFLOW IN CFS FOR 1971 - 1982 ***

ALL YEARS SPECIFIED INCLUDED

| DAY | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | DAY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 202.8 | 155.6 | 128.8 | 103.0 | 103.7 | 113.8 | 129.5 | 450.9 | 1532.7 | 1822.8 | 873.0 | 417.5 | 1 |
| 2 | 199.3 | 156.3 | 128.3 | 101.4 | 102.5 | 112.6 | 132.4 | 476.2 | 1537.3 | 1859.5 | 843.4 | 404.8 | 2 |
| 3 | 194.8 | 154.8 | 127.2 | 101.4 | 102.1 | 109.8 | 133.1 | 512.4 | 1608.2 | 1869.1 | 823.2 | 383.0 | 3 |
| 4 | 192.8 | 155.0 | 128.4 | 100.8 | 100.7 | 106.5 | 136.1 | 559.9 | 1648.8 | 1799.3 | 780.7 | 363.2 | 4 |
| 5 | 193.8 | 161.0 | 130.3 | 100.4 | 98.5 | 107.1 | 138.5 | 602.1 | 1683.0 | 1718.3 | 735.2 | 346.9 | 5 |
| 6 | 194.2 | 160.9 | 128.5 | 101.1 | 97.3 | 109.0 | 145.2 | 654.7 | 1768.8 | 1669.5 | 709.0 | 336.0 | 6 |
| 7 | 190.2 | 161.5 | 125.3 | 102.8 | 96.9 | 110.8 | 156.1 | 701.0 | 1867.2 | 1618.4 | 681.0 | 333.6 | 7 |
| 8 | 187.8 | 165.4 | 121.4 | 104.1 | 96.5 | 111.2 | 167.2 | 740.1 | 1925.8 | 1571.8 | 651.3 | 334.1 | 8 |
| 9 | 186.3 | 157.5 | 119.2 | 104.8 | 97.9 | 111.4 | 186.0 | 723.3 | 1985.0 | 1557.3 | 637.1 | 333.3 | 9 |
| 10 | 186.5 | 156.8 | 116.3 | 105.4 | 99.2 | 113.4 | 202.3 | 729.7 | 2050.8 | 1540.7 | 633.8 | 332.4 | 10 |
| 11 | 190.9 | 146.7 | 116.1 | 107.5 | 99.8 | 113.7 | 210.0 | 734.8 | 2123.8 | 1519.8 | 615.8 | 340.8 | 11 |
| 12 | 191.2 | 149.3 | 116.8 | 108.7 | 102.3 | 113.4 | 209.3 | 726.5 | 2065.8 | 1497.3 | 589.1 | 354.1 | 12 |
| 13 | 191.2 | 149.5 | 117.2 | 109.2 | 103.3 | 111.8 | 214.6 | 728.8 | 1990.8 | 1467.0 | 571.1 | 360.3 | 13 |
| 14 | 189.2 | 144.8 | 119.1 | 110.6 | 104.5 | 111.8 | 216.2 | 788.8 | 1997.5 | 1419.6 | 572.8 | 343.7 | 14 |
| 15 | 187.0 | 139.5 | 119.2 | 113.5 | 104.4 | 112.3 | 224.8 | 910.0 | 2057.5 | 1371.1 | 571.3 | 319.1 | 15 |
| 16 | 185.3 | 135.6 | 120.2 | 113.6 | 104.6 | 112.8 | 231.3 | 1009.0 | 2078.2 | 1309.3 | 555.9 | 298.8 | 16 |
| 17 | 184.0 | 134.1 | 120.1 | 112.9 | 105.5 | 113.5 | 231.7 | 1080.3 | 2028.0 | 1259.4 | 529.3 | 283.1 | 17 |
| 18 | 182.8 | 128.0 | 118.4 | 112.1 | 106.0 | 112.8 | 239.6 | 1154.2 | 2007.3 | 1223.8 | 507.6 | 272.4 | 18 |
| 19 | 180.0 | 122.6 | 117.4 | 111.3 | 105.8 | 113.6 | 247.8 | 1202.3 | 2006.4 | 1184.2 | 494.8 | 265.6 | 19 |
| 20 | 182.8 | 119.4 | 117.0 | 110.1 | 107.2 | 115.8 | 250.3 | 1241.8 | 1948.6 | 1153.9 | 484.3 | 261.0 | 20 |
| 21 | 183.5 | 119.3 | 115.8 | 109.7 | 105.8 | 116.8 | 257.3 | 1263.6 | 1899.1 | 1144.0 | 478.5 | 252.6 | 21 |
| 22 | 180.5 | 119.9 | 115.6 | 107.9 | 103.8 | 116.5 | 271.3 | 1276.7 | 1902.5 | 1122.4 | 477.3 | 245.8 | 22 |
| 23 | 177.0 | 120.8 | 114.3 | 108.2 | 103.8 | 117.9 | 302.3 | 1297.1 | 1932.3 | 1075.7 | 466.2 | 242.3 | 23 |
| 24 | 176.3 | 123.8 | 113.8 | 107.3 | 105.5 | 119.7 | 353.5 | 1350.2 | 1995.4 | 1024.6 | 449.4 | 237.5 | 24 |
| 25 | 174.7 | 123.0 | 113.7 | 105.5 | 107.2 | 119.8 | 393.1 | 1405.3 | 2067.4 | 1003.8 | 437.3 | 232.3 | 25 |
| 26 | 168.9 | 119.3 | 113.2 | 103.0 | 109.9 | 120.7 | 384.9 | 1429.8 | 2058.2 | 991.6 | 430.0 | 230.0 | 26 |
| 27 | 166.2 | 115.0 | 113.7 | 101.7 | 110.8 | 122.4 | 376.2 | 1498.8 | 1969.4 | 976.8 | 418.8 | 242.8 | 27 |
| 28 | 162.8 | 115.3 | 109.9 | 100.6 | 111.7 | 125.8 | 394.8 | 1602.9 | 1898.0 | 934.1 | 404.8 | 257.2 | 28 |
| 29 | 165.1 | 119.2 | 107.7 | 100.6 | 122.0 | 127.1 | 407.2 | 1679.6 | 1857.9 | 922.1 | 391.3 | 263.2 | 29 |
| 30 | 151.7 | 125.6 | 105.7 | 103.2 | | 126.7 | 433.2 | 1691.2 | 1817.5 | 918.3 | 391.3 | 255.3 | 30 |
| 31 | 153.6 | | 104.0 | 105.1 | | 128.3 | | 1612.3 | | 910.8 | 409.2 | | 31 |
| TOTALS | 5652.7 | 4155.2 | 3662.0 | 3287.1 | 3019.0 | 3578.2 | 7375.5 | 31833.7 | 57309.1 | 41455.7 | 17613.5 | 9142.3 | |
| MEAN | 182.3 | 138.5 | 118.1 | 106.0 | 104.1 | 115.4 | 245.8 | 1026.9 | 1910.3 | 1337.3 | 568.2 | 304.7 | |
| AC-FT | 11212.0 | 8241.7 | 7263.4 | 6519.9 | 5988.1 | 7097.3 | 14629.1 | 63141.3 | 113670.9 | 82226.1 | 34935.8 | 18133.5 | |

AVERAGE ANNUAL TOTAL FLOW IN ACRE FEET: 373049.1

* INDICATES ENCOUNTERED MISSING DATA
** INDICATES MISSING DATA
*** INDICATES TOTAL MONTH'S DATA MISSING

GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING STATION NO. 091885.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N,RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
SUBLETTE COUNTY DATA FROM USGS (P)

*** STANDARD DEVIATION OF DAILY STREAMFLOW FOR 1971 - 1982 ***

ALL YEARS SPECIFIED INCLUDED

| DAY | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | DAY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 34.1 | 33.1 | 24.4 | 20.2 | 14.0 | 18.3 | 32.4 | 179.7 | 857.9 | 677.4 | 478.0 | 227.1 | 1 |
| 2 | 34.9 | 43.4 | 23.7 | 18.5 | 13.3 | 17.4 | 35.7 | 200.7 | 857.2 | 664.8 | 412.7 | 186.7 | 2 |
| 3 | 34.1 | 50.6 | 23.5 | 17.4 | 14.4 | 17.6 | 33.2 | 200.9 | 879.2 | 681.5 | 404.5 | 154.2 | 3 |
| 4 | 32.1 | 49.9 | 20.4 | 15.8 | 14.5 | 19.1 | 31.7 | 195.3 | 869.0 | 706.1 | 365.6 | 139.1 | 4 |
| 5 | 39.1 | 45.4 | 20.4 | 15.7 | 14.9 | 21.2 | 29.9 | 220.0 | 860.5 | 756.1 | 326.9 | 122.8 | 5 |
| 6 | 52.5 | 50.5 | 21.7 | 17.6 | 15.5 | 22.0 | 30.3 | 262.3 | 864.3 | 797.7 | 310.9 | 109.6 | 6 |
| 7 | 46.8 | 48.3 | 19.5 | 18.9 | 14.3 | 20.5 | 38.8 | 329.3 | 855.7 | 785.9 | 295.2 | 109.4 | 7 |
| 8 | 42.2 | 48.7 | 16.8 | 19.2 | 12.2 | 18.4 | 45.1 | 399.1 | 909.5 | 741.4 | 258.4 | 108.6 | 8 |
| 9 | 40.2 | 57.0 | 15.1 | 21.1 | 12.4 | 18.2 | 62.9 | 413.4 | 1002.8 | 747.5 | 245.5 | 102.9 | 9 |
| 10 | 43.0 | 51.7 | 12.6 | 22.8 | 14.7 | 19.1 | 86.2 | 431.5 | 1019.5 | 808.1 | 254.5 | 108.6 | 10 |
| 11 | 55.7 | 54.2 | 11.0 | 23.2 | 16.1 | 21.6 | 74.2 | 409.6 | 991.9 | 843.2 | 259.6 | 121.3 | 11 |
| 12 | 49.5 | 47.3 | 10.2 | 22.1 | 17.1 | 22.0 | 65.6 | 409.3 | 900.6 | 808.6 | 249.7 | 137.2 | 12 |
| 13 | 44.9 | 43.4 | 10.6 | 22.1 | 17.5 | 21.3 | 60.5 | 399.2 | 785.6 | 731.9 | 234.4 | 152.5 | 13 |
| 14 | 43.6 | 40.9 | 13.0 | 22.2 | 18.5 | 23.0 | 62.1 | 408.8 | 681.0 | 666.5 | 227.9 | 135.5 | 14 |
| 15 | 45.4 | 39.2 | 13.6 | 21.9 | 18.2 | 25.0 | 62.2 | 473.2 | 708.9 | 625.0 | 223.9 | 107.9 | 15 |
| 16 | 51.2 | 41.8 | 15.2 | 21.1 | 17.5 | 25.5 | 64.9 | 498.5 | 869.5 | 628.7 | 210.7 | 89.1 | 16 |
| 17 | 47.4 | 41.1 | 15.7 | 19.7 | 16.7 | 27.1 | 69.0 | 515.6 | 1006.0 | 658.3 | 190.4 | 74.5 | 17 |
| 18 | 49.7 | 31.6 | 16.0 | 19.9 | 15.9 | 26.5 | 81.2 | 585.4 | 1112.2 | 651.3 | 171.7 | 63.9 | 18 |
| 19 | 47.5 | 25.7 | 16.0 | 17.9 | 15.7 | 27.5 | 97.5 | 646.3 | 1199.0 | 587.5 | 163.6 | 59.5 | 19 |
| 20 | 47.3 | 26.7 | 16.4 | 17.8 | 14.6 | 28.2 | 102.1 | 677.5 | 1239.3 | 518.6 | 157.9 | 59.6 | 20 |
| 21 | 56.5 | 26.3 | 17.1 | 18.6 | 15.9 | 28.5 | 94.3 | 693.3 | 1247.0 | 476.6 | 150.3 | 55.4 | 21 |
| 22 | 53.8 | 23.5 | 18.0 | 19.4 | 16.2 | 30.7 | 91.4 | 652.4 | 1207.1 | 459.0 | 155.1 | 51.3 | 22 |
| 23 | 50.7 | 23.5 | 19.6 | 18.1 | 15.2 | 30.7 | 120.0 | 652.7 | 1159.8 | 443.2 | 146.4 | 50.5 | 23 |
| 24 | 50.0 | 24.8 | 18.3 | 16.9 | 15.4 | 28.1 | 166.6 | 679.2 | 1133.5 | 434.4 | 138.7 | 49.8 | 24 |
| 25 | 51.7 | 26.7 | 17.9 | 15.7 | 14.5 | 26.3 | 224.0 | 624.9 | 1130.4 | 449.1 | 130.9 | 48.3 | 25 |
| 26 | 51.4 | 25.5 | 19.4 | 14.6 | 16.2 | 26.7 | 185.7 | 586.1 | 1094.4 | 456.5 | 114.0 | 47.4 | 26 |
| 27 | 51.7 | 26.2 | 21.3 | 15.1 | 16.8 | 27.4 | 163.6 | 647.7 | 1001.1 | 454.1 | 105.2 | 96.9 | 27 |
| 28 | 46.7 | 28.1 | 21.3 | 15.2 | 17.1 | 29.9 | 171.0 | 776.7 | 905.7 | 434.8 | 104.7 | 153.4 | 28 |
| 29 | 36.3 | 25.6 | 19.9 | 15.7 | 24.2 | 31.9 | 173.5 | 886.9 | 788.9 | 482.9 | 100.4 | 191.3 | 29 |
| 30 | 25.9 | 24.9 | 18.9 | 16.0 | | 33.5 | 180.3 | 977.8 | 707.4 | 538.6 | 126.1 | 175.6 | 30 |
| 31 | 22.2 | | 20.6 | 15.7 | | 34.2 | | 917.5 | | 545.8 | 194.7 | | 31 |

* INDICATES ENCOUNTERED MISSING DATA
** INDICATES MISSING DATA
*** INDICATES TOTAL MONTH'S DATA MISSING

DURCUR

This program conducts a flow duration analysis on stream discharge data for a specified station over a range of water years. Duration curves and tables that may be useful in conducting water supply, irrigation, or low flow analyses are produced.

The first table tabulates the number of streamflow occurrences that fall within predetermined intervals for each year specified. Up to 36 intervals (class sizes) can be defined by the user; otherwise, these intervals will be computed automatically. Data can be classified based on daily, monthly, or annual discharge. When using daily values, the analysis can include the entire year, a portion of the year (e.g., October through February) or a combination of two distinct portions of the year (e.g., October-December and February-March). In all cases, years (or portions of years) with incomplete data are excluded from the analysis.

The table also reports total second-foot-days for the entire period (acre-feet for monthly and annual), mean annual second-foot-days, mean daily discharge in cubic feet per second, and total number of occurrences in each class. Cumulative totals, percent of total accumulated occurrences in each class, class size divided by the drainage area (square miles), and class size divided by the mean daily discharge are also computed.

DURCUR optionally produces three plots depicting stream discharge values as a function of the percent of time in which they are exceeded in a given time period. The horizontal axis always represents percent of time. For mean daily flow analyses, the vertical axes for each plot are:

DURCUR (continued)

1. Cubic feet per second per square mile of drainage area (csm)

2. Cubic feet per second divided by mean daily flow for the period (cmd)

3. Cubic feet per second (cfs)

For monthly or annual flow analyses, the vertical axes for each plot are:

1. Hundred-acre-feet per square mile of drainage area

2. Acre-feet divided by monthly mean or annual total

3. Thousand-acre-feet

For each request, the user should specify:

Frequency:
- daily
- monthly
- annual

Retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Source organization (unless all are to be used)

Water year range (unless all are to be used)

Period to be analyzed specified by beginning and ending month/day. For daily only (unless entire year is to be used).

Lower limit of each streamflow interval (unless limits are to be computed automatically)

Whether or not the data should be plotted

GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING — STATION NO. 091885.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N,RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
SUBLETTE COUNTY DATA FROM USGS (P)

FLOW IN CFS
DURATION TABLE OF DISCHARGE
OCT 1 - SEP 30
DAILY

| CLASS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | TOTAL FLOW SFD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1971 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22114 | 70 | 16 | 5 | 6 | 6 | 24 | 14 | 23 | 36 | 5 | 8 | 7 | 9 | 0 | 0 | 0 | | 251847.0 |
| 1972 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 93 | 44 | 42 | 18 | 18 | 14 | 30 | 21 | 26 | 18 | 11 | 6 | 7 | 7 | 0 | 0 | 0 | 245319.0 |
| 1973 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4127 | 36 | 12 | 35 | 30 | 22 | 31 | 19 | 26 | 16 | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 164648.0 |
| 1974 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6139 | 37 | 37 | 17 | 14 | 7 | 19 | 17 | 33 | 6 | 11 | 6 | 11 | 5 | 0 | 0 | 0 | 0 | 221407.0 |
| 1975 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 34149 | 30 | 18 | 22 | 7 | 8 | 22 | 13 | 19 | 21 | 9 | 4 | 9 | 0 | 0 | 0 | 0 | 0 | 189718.0 |
| 1976 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29116 | 45 | 11 | 33 | 13 | 17 | 8 | 12 | 35 | 27 | 17 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 197488.0 |
| 1977 | 0 | 0 | 0 | 0 | 0 | 0 | 33 | 79 | 45 | 27 | 38 | 39 | 39 | 19 | 21 | 12 | 6 | 5 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 102475.0 |
| 1978 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 69 | 77 | 41 | 13 | 9 | 26 | 20 | 21 | 11 | 32 | 22 | 21 | 3 | 0 | 0 | 0 | 0 | 0 | 201030.0 |
| 1979 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 21135 | 41 | 12 | 19 | 17 | 24 | 41 | 20 | 22 | 10 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 141985.0 |
| 1980 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 55128 | 16 | 11 | 23 | 19 | 6 | 18 | 28 | 25 | 16 | 16 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 170909.0 |
| 1981 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 31114 | 59 | 12 | 16 | 34 | 16 | 25 | 10 | 25 | 9 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 129571.0 |
| 1982 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20131 | 44 | 7 | 3 | 9 | 14 | 35 | 14 | 27 | 23 | 23 | 7 | 8 | 0 | 0 | 0 | 0 | 0 | 239532.0 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | SUM IN SFD 2255924.0 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | PERIOD MEAN IN SFD 187993.7 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | PERIOD MEAN IN CFS 514.7 |

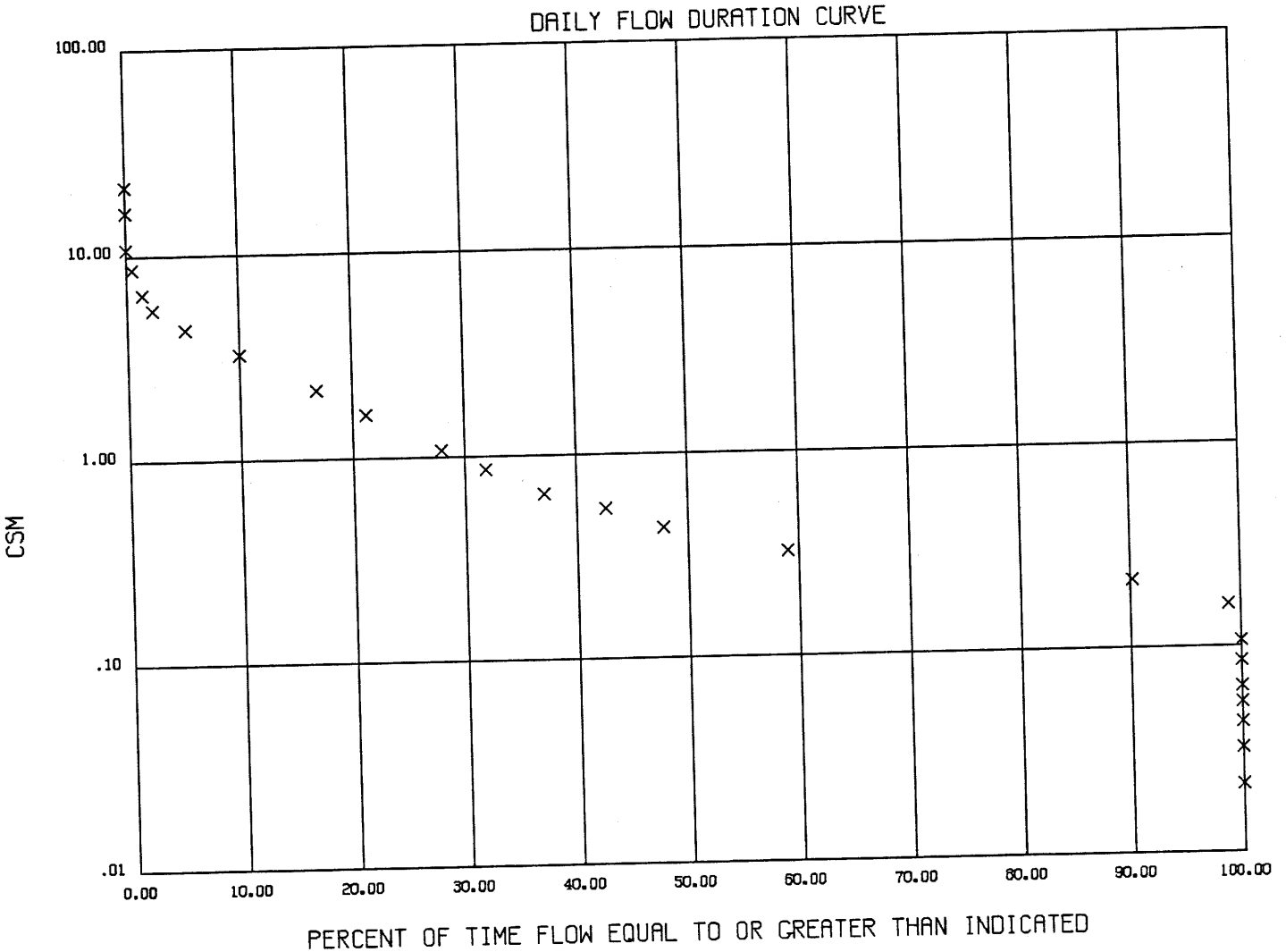
INCOMPLETE YEARS EXCLUDED FROM ANALYSIS

GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING — STATION NO. 091885.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N,RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
SUBLETTE COUNTY DATA FROM USGS (P)

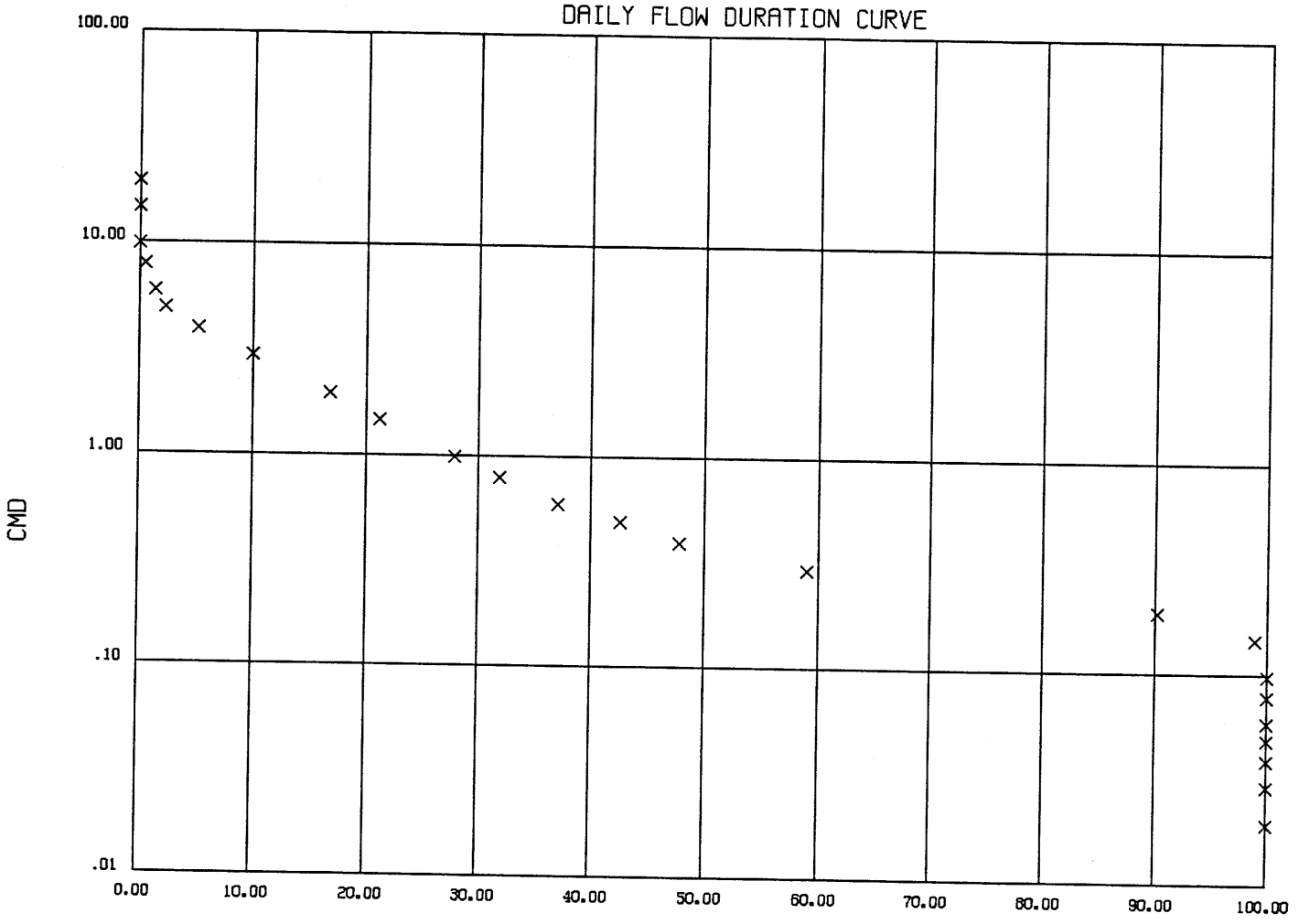
| CLASS | SIZE | TOTAL | ACCUM | PERCENT | SIZE/DA | SIZE/MEAN |
|---|---|---|---|---|---|---|
| 1 | 10.0 | 0. | 4383. | 100.00 | .02 | .02 |
| 2 | 15.0 | 0. | 4383. | 100.00 | .03 | .03 |
| 3 | 20.0 | 0. | 4383. | 100.00 | .04 | .04 |
| 4 | 25.0 | 0. | 4383. | 100.00 | .05 | .05 |
| 5 | 30.0 | 0. | 4383. | 100.00 | .06 | .06 |
| 6 | 40.0 | 0. | 4383. | 100.00 | .09 | .08 |
| 7 | 50.0 | 48. | 4383. | 100.00 | .11 | .10 |
| 8 | 75.0 | 381. | 4335. | 98.90 | .16 | .15 |
| 9 | 100.0 | 1368. | 3954. | 90.21 | .21 | .19 |
| 10 | 150.0 | 490. | 2586. | 59.00 | .32 | .29 |
| 11 | 200.0 | 229. | 2096. | 47.82 | .43 | .39 |
| 12 | 250.0 | 239. | 1867. | 42.60 | .53 | .49 |
| 13 | 300.0 | 232. | 1628. | 37.14 | .64 | .58 |
| 14 | 400.0 | 173. | 1396. | 31.85 | .85 | .78 |
| 15 | 500.0 | 295. | 1223. | 27.90 | 1.07 | .97 |
| 16 | 750.0 | 191. | 928. | 21.17 | 1.60 | 1.46 |
| 17 | 1000.0 | 299. | 737. | 16.81 | 2.14 | 1.94 |
| 18 | 1500.0 | 209. | 438. | 9.99 | 3.21 | 2.91 |
| 19 | 2000.0 | 126. | 229. | 5.22 | 4.27 | 3.89 |
| 20 | 2500.0 | 40. | 103. | 2.35 | 5.34 | 4.86 |
| 21 | 3000.0 | 62. | 63. | 1.44 | 6.41 | 5.83 |
| 22 | 4000.0 | 21. | 21. | .48 | 8.55 | 7.77 |
| 23 | 5000.0 | 0. | 0. | 0.00 | 10.68 | 9.71 |
| 24 | 7500.0 | 0. | 0. | 0.00 | 16.03 | 14.57 |
| 25 | 10000.0 | 0. | 0. | 0.00 | 21.37 | 19.43 |

EACH CLASS SIZE REPRESENTS THE LOWER LIMIT OF THE FLOW RANGE

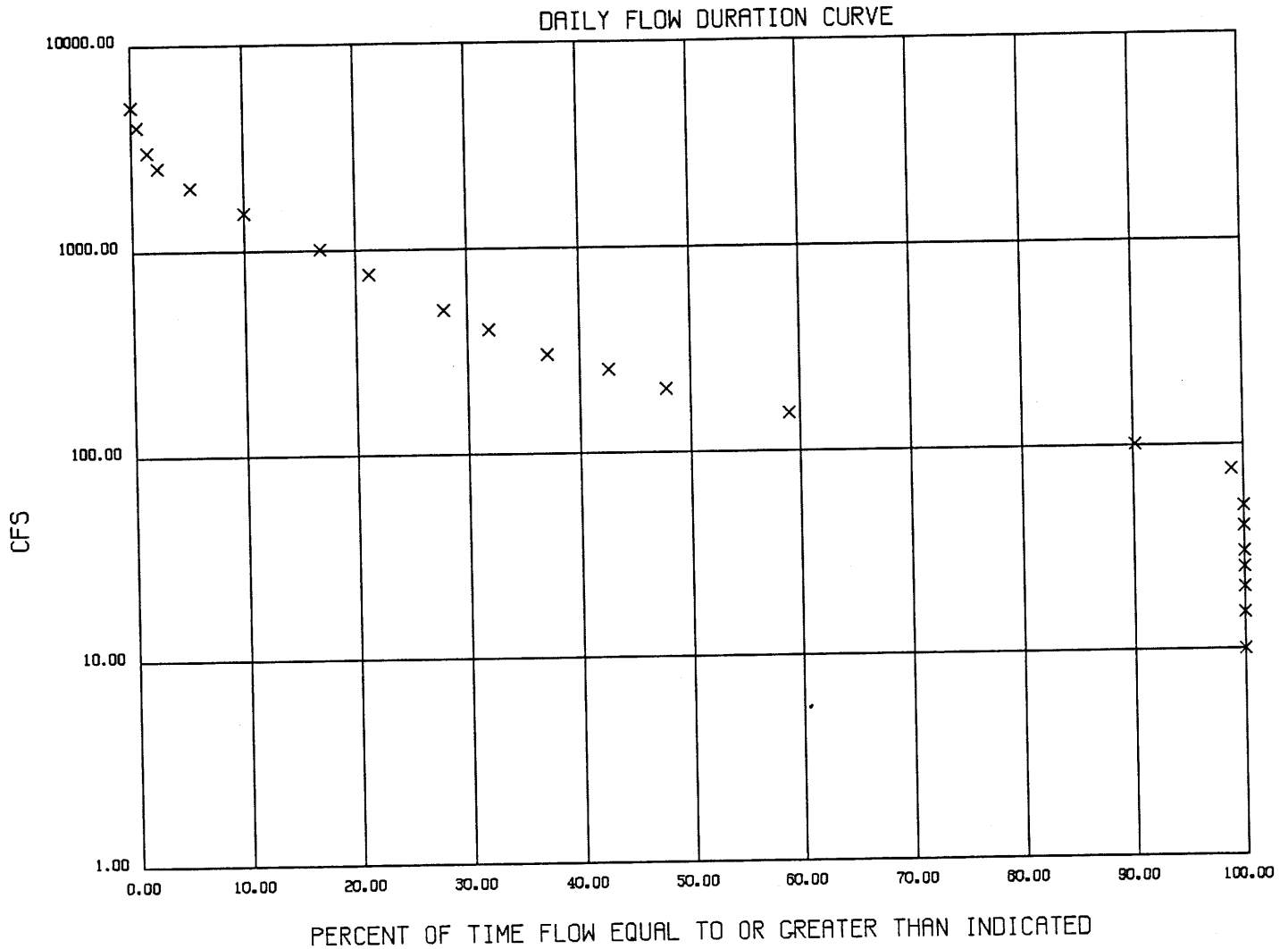
GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING STATION NO. 091685.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N, RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000



GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING STATION NO. 091885.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N. RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000



GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING STATION NO. 091885.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N, RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000



EXTREMESW

This program prints a table of minimum or maximum daily streamflows for each month for a range of years. The extreme daily streamflow and month of occurrence are printed for each year, and the extreme daily value for the entire reporting year range is printed along with its date of occurrence.

For each request, the user should specify:

Retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Source organization (unless all are to be used)

Water year range (unless all years of available data are to be used)

Whether to print maximum or minimum flows

GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING — STATION NO. 09188500
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N,RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
SUBLETTE COUNTY DATA FROM USGS (P)

MAXIMUM DAILY FLOW IN CFS FOR MONTH

| YEAR | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | MAX | MONTH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1969 | 380.00 | 213.00 | 170.00 | 194.00 | 169.00 | 153.00 | 1090.00 | 2360.00 | 2410.00 | 1640.00 | 831.00 | 385.00 | 2410.00 | JUN |
| 1970 | 190.00 | 147.00 | 95.00 | 119.00 | 126.00 | 138.00 | 152.00 | 3050.00 | 2900.00 | 2330.00 | 674.00 | 484.00 | 3050.00 | MAY |
| 1971 | 185.00 | 167.00 | 180.00 | 144.00 | 115.00 | 153.00 | 265.00 | 3100.00 | 4720.00 | 1990.00 | 1290.00 | 1020.00 | 4720.00 | JUN |
| 1972 | 259.00 | 251.00 | 139.00 | 139.00 | 148.00 | 197.00 | 590.00 | 2670.00 | 4760.00 | 1840.00 | 845.00 | 580.00 | 4760.00 | JUN |
| 1973 | 355.00 | 270.00 | 189.00 | 158.00 | 135.00 | 135.00 | 264.00 | 2550.00 | 2150.00 | 1840.00 | 712.00 | 719.00 | 2550.00 | MAY |
| 1974 | 239.00 | 242.00 | 145.00 | 135.00 | 132.00 | 140.00 | 622.00 | 3570.00 | 4160.00 | 2250.00 | 708.00 | 296.00 | 4160.00 | JUN |
| 1975 | 177.00 | 142.00 | 140.00 | 114.00 | 120.00 | 126.00 | 240.00 | 950.00 | 2040.00 | 3750.00 | 1310.00 | 294.00 | 3750.00 | JUL |
| 1976 | 215.00 | 200.00 | 120.00 | 130.00 | 125.00 | 115.00 | 320.00 | 2310.00 | 2560.00 | 2090.00 | 1390.00 | 334.00 | 2560.00 | JUN |
| 1977 | 228.00 | 162.00 | 140.00 | 85.00 | 90.00 | 90.00 | 400.00 | 346.00 | 2110.00 | 778.00 | 594.00 | 450.00 | 2110.00 | JUN |
| 1978 | 191.00 | 160.00 | 135.00 | 110.00 | 110.00 | 180.00 | 540.00 | 1570.00 | 2570.00 | 2440.00 | 1200.00 | 460.00 | 2570.00 | JUN |
| 1979 | 235.00 | 144.00 | 125.00 | 110.00 | 130.00 | 155.00 | 455.00 | 2280.00 | 1900.00 | 1340.00 | 778.00 | 311.00 | 2280.00 | MAY |
| 1980 | 204.00 | 137.00 | 127.00 | 95.00 | 118.00 | 124.00 | 800.00 | 2580.00 | 2350.00 | 2290.00 | 642.00 | 310.00 | 2580.00 | MAY |
| 1981 | 220.00 | 172.00 | 150.00 | 134.00 | 130.00 | 115.00 | 502.00 | 1420.00 | 2570.00 | 1330.00 | 392.00 | 262.00 | 2570.00 | JUN |
| 1982 | 208.00 | 140.00 | 122.00 | 118.00 | 135.00 | 180.00 | 900.00 | 2640.00 | 3390.00 | 3390.00 | 2070.00 | 859.00 | 3390.00 | SEP |

| | | DAY | MONTH | YEAR |
|---|---|---|---|---|
| MAXIMUM DAILY FLOW FOR GIVEN YEAR RANGE | 4760.00 CFS | 9 | JUN | 1972 |

* INDICATES ENCOUNTERED MISSING DATA
** INDICATES MISSING DATA

GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING — STATION NO. 09188500
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N,RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
SUBLETTE COUNTY DATA FROM USGS (P)

MINIMUM DAILY FLOW IN CFS FOR MONTH

| YEAR | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | MIN | MONTH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1969 | 215.00 | 150.00 | 106.00 | 122.00 | 113.00 | 117.00 | 172.00 | 698.00 | 719.00 | 652.00 | 395.00 | 187.00 | 106.00 | DEC |
| 1970 | 136.00 | 74.00 | 62.00 | 66.00 | 95.00 | 110.00 | 119.00 | 160.00 | 896.00 | 618.00 | 280.00 | 191.00 | 62.00 | DEC |
| 1971 | 94.00 | 105.00 | 123.00 | 105.00 | 83.00 | 90.00 | 129.00 | 332.00 | 1720.00 | 1020.00 | 475.00 | 183.00 | 83.00 | FEB |
| 1972 | 197.00 | 121.00 | 95.00 | 96.00 | 91.00 | 140.00 | 165.00 | 451.00 | 1310.00 | 712.00 | 425.00 | 253.00 | 91.00 | FEB |
| 1973 | 100.00 | 155.00 | 110.00 | 90.00 | 101.00 | 98.00 | 108.00 | 214.00 | 617.00 | 622.00 | 278.00 | 246.00 | 90.00 | JAN |
| 1974 | 148.00 | 93.00 | 95.00 | 91.00 | 104.00 | 105.00 | 120.00 | 634.00 | 1370.00 | 735.00 | 283.00 | 161.00 | 91.00 | JAN |
| 1975 | 126.00 | 78.00 | 95.00 | 93.00 | 91.00 | 95.00 | 102.00 | 168.00 | 950.00 | 1190.00 | 302.00 | 161.00 | 78.00 | NOV |
| 1976 | 143.00 | 95.00 | 105.00 | 95.00 | 80.00 | 90.00 | 120.00 | 350.00 | 967.00 | 851.00 | 347.00 | 229.00 | 80.00 | FEB |
| 1977 | 139.00 | 60.00 | 70.00 | 59.00 | 80.00 | 65.00 | 75.00 | 210.00 | 228.00 | 370.00 | 267.00 | 188.00 | 59.00 | JAN |
| 1978 | 149.00 | 80.00 | 85.00 | 85.00 | 78.00 | 85.00 | 180.00 | 415.00 | 1120.00 | 1020.00 | 338.00 | 239.00 | 78.00 | FEB |
| 1979 | 132.00 | 97.00 | 100.00 | 90.00 | 94.00 | 100.00 | 122.00 | 360.00 | 801.00 | 504.00 | 315.00 | 179.00 | 90.00 | JAN |
| 1980 | 115.00 | 89.00 | 75.00 | 70.00 | 85.00 | 100.00 | 105.00 | 718.00 | 892.00 | 609.00 | 279.00 | 228.00 | 70.00 | JAN |
| 1981 | 120.00 | 80.00 | 110.00 | 100.00 | 58.00 | 90.00 | 110.00 | 334.00 | 681.00 | 393.00 | 266.00 | 164.00 | 58.00 | FEB |
| 1982 | 140.00 | 91.00 | 100.00 | 92.00 | 89.00 | 120.00 | 160.00 | 434.00 | 956.00 | 1570.00 | 565.00 | 294.00 | 89.00 | FEB |

| | | DAY | MONTH | YEAR |
|---|---|---|---|---|
| MINIMUM DAILY FLOW FOR GIVEN YEAR RANGE | 58.00 CFS | 11 | FEB | 1981 |

* INDICATES ENCOUNTERED MISSING DATA
** INDICATES MISSING DATA

FLOW

This program performs streamflow frequency analyses. Flood frequencies can be estimated using three methods: the log-Pearson Type III distribution, the Gumbel (Extreme Value Type I) distribution, and the Hazen method. Partial series low and high flow analyses can also be performed using the log-Pearson Type III distribution. For each method, the analysis is limited to data from WRDS; historic data, comparisons with similar watersheds, or flood estimates from precipitation cannot be incorporated into the analysis. The program computes expected flows, but sometimes the predictions are not justifiable by the amount of data available. As a rule, a minimum of 10 years of data is needed for a useful analysis, and flow estimates for return periods greater than about twice the number of years of data are generally not reliable. The user is responsible for taking into account changes to the watershed such as dams, levees, diversions, etc.

For each analysis, a table is printed containing the data and flow value, along with statistics pertaining to the type of analysis. Percent chance, recurrence intervals, and computed flow are printed in a second table for selected return periods. A plot of the data and the computed curve is provided as an option. For the low and high flow analyses, a month range within the water year can also be specified.

All three of these methods can be useful in performing flow analysis. The Water Resources Council in 1967 chose the log-Pearson Type III as the standard flood frequency distribution for all U.S. government agencies. In that report, and others, comparisons have not

FLOW (continued)

shown that any method is always superior to all others (Kite, 1977). It is left to the user to decide the usefulness or applicability of any of these analyses.

For each analysis, the user should specify:

Method of analysis (Log-Pearson, Gumbel, or Hazen)

Type of analysis:
- peak
- low flow-specific # of days in period
- high flow-specific # of days in period

Method of retrieval and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Source organization (unless all are to be used)

Water year range (unless all years of available data are to be used)

Date range (specified by beginning and ending month and day) within each water year for low or high flow analysis (unless the whole year is to be used)

Whether or not to plot the data

**********

FLOOD FLOW FREQUENCY ANALYSIS LOG-PEARSON TYPE III METHOD

ANNUAL INSTANTANEOUS PEAK DISCHARGE IN CFS

**********

GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING STATION NO. 091885.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N,RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
SUBLETTE COUNTY DATA FROM USGS (P)

PERIOD 1956 - 1981 26 YEARS OF DATA

| YEAR | DATE | FLOW VALUE Y | LOG Y = X |
|---|---|---|---|
| 1956 | 3 JUN | 4030.00 | 3.605305 |
| 1957 | 7 JUN | 3720.00 | 3.570543 |
| 1958 | 27 MAY | 2430.00 | 3.385606 |
| 1959 | 17 JUN | 4420.00 | 3.645422 |
| 1960 | 5 JUN | 1730.00 | 3.238046 |
| 1961 | 30 MAY | 2020.00 | 3.305351 |
| 1962 | 28 JUN | 3350.00 | 3.525045 |
| 1963 | 17 JUN | 2840.00 | 3.453318 |
| 1964 | 1 JUL | 3100.00 | 3.491362 |
| 1965 | 26 JUN | 3940.00 | 3.595496 |
| 1966 | 10 MAY | 2100.00 | 3.322219 |
| 1967 | 6 JUL | 3360.00 | 3.526339 |
| 1968 | 24 JUN | 2820.00 | 3.450249 |
| 1969 | 9 JUN | 2430.00 | 3.385606 |
| 1970 | 31 MAY | 3090.00 | 3.489958 |
| 1971 | 25 JUN | 4780.00 | 3.679428 |
| 1972 | 9 JUN | 4840.00 | 3.684845 |
| 1973 | 19 MAY | 2670.00 | 3.426511 |
| 1974 | 19 JUN | 4230.00 | 3.626340 |
| 1975 | 7 JUL | 3800.00 | 3.579784 |
| 1976 | 10 JUN | 2590.00 | 3.413300 |
| 1977 | 10 JUN | 2170.00 | 3.336460 |
| 1978 | 17 JUN | 2620.00 | 3.418301 |
| 1979 | 29 MAY | 2330.00 | 3.367356 |
| 1980 | 24 MAY | 2640.00 | 3.421604 |
| 1981 | 11 JUN | 2650.00 | 3.423246 |

SUMMATION X = 90.367042
SUMMATION X SQUARED = 314.450725
SUMMATION X CUBED = 1095.470495
MEAN OF X = 3.475655
STANDARD DEVIATION = .120999
SKEW COEFFICIENT = .092891

STANDARD DEVIATION AND SKEW COEFFICIENT AS DEFINED FOR LOG PEARSON TYPE III METHOD

**********
*
*  FLOOD FLOW FREQUENCY ANALYSIS  LOG-PEARSON TYPE III METHOD
*
*  ANNUAL INSTANTANEOUS PEAK DISCHARGE IN CFS
*
**********

GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING STATION NO. 091885.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N,RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
SUBLETTE COUNTY DATA FROM USGS (P)

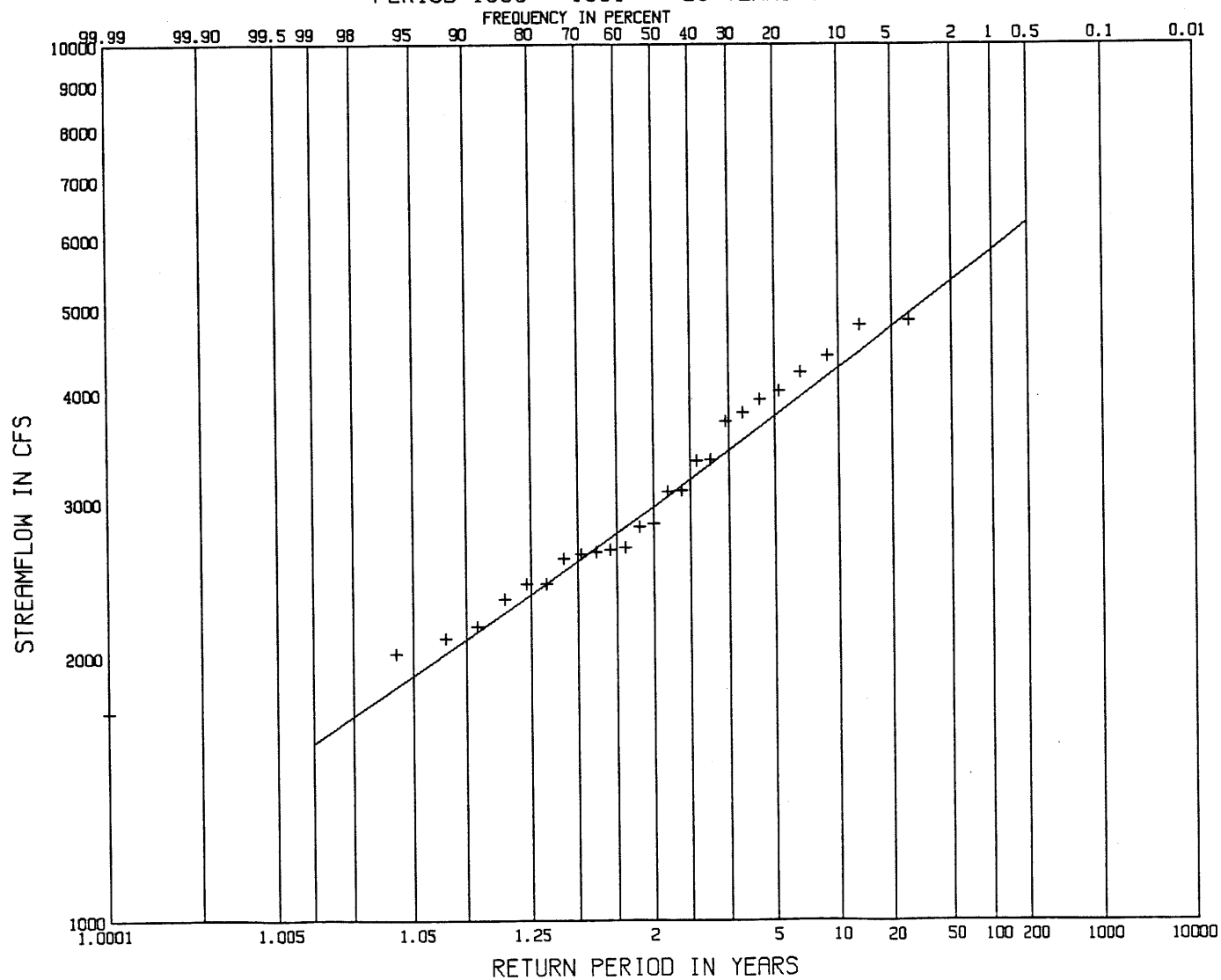
PERIOD 1956 - 1981 26 YEARS OF DATA

| PERCENT CHANCE | RECURRENCE INTERVAL YEARS | COMPUTED FLOW OR GREATER CFS |
|---|---|---|
| 99.0 | 1.0101 | 1596.49 |
| 95.0 | 1.0526 | 1905.99 |
| 90.0 | 1.1111 | 2098.88 |
| 80.0 | 1.2500 | 2362.06 |
| 50.0 | 2.0000 | 2975.76 |
| 20.0 | 5.0000 | 3774.08 |
| 10.0 | 10.0000 | 4285.35 |
| 4.0 | 25.0000 | 4916.30 |
| 2.0 | 50.0000 | 5377.75 |
| 1.0 | 100.0000 | 5835.16 |
| .5 | 200.0000 | 6291.04 |

GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING STATION NO. 091885.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N, RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
SUBLETTE COUNTY DATA FROM USGS (P)

FLOOD FREQUENCY--LOG-PEARSON TYPE III METHOD

PERIOD 1956 - 1981 26 YEARS OF DATA



# FLOOD FLOW FREQUENCY ANALYSIS - HAZEN METHOD

## ANNUAL INSTANTANEOUS PEAK DISCHARGE IN CFS

GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING STATION NO. 091885.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N,RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
LINCOLN COUNTY DATA FROM USGS (P)

PERIOD 1950- 1976 27 YEARS OF DATA

| DATE | FLOW | DEVIATION | DEVIATION SQUARED | DEVIATION CUBED PER 1000 |
|---|---|---|---|---|
| 4 JUL 1950 | 3180. | -95. | 9060. | -862.4 |
| 19 JUN 1951 | 3180. | -95. | 9060. | -862.4 |
| 9 JUN 1952 | 2960. | -315. | 99342. | -31311.0 |
| 16 JUN 1953 | 4080. | 805. | 647727. | 521300.2 |
| 29 JUN 1954 | 4460. | 1185. | 1403786. | 1663226.6 |
| 25 JUN 1955 | 2280. | -995. | 990394. | -985625.0 |
| 3 JUN 1956 | 4030. | 755. | 569745. | 430052.3 |
| 7 JUN 1957 | 3720. | 445. | 197860. | 88011.2 |
| 31 APR 1958 | 2430. | -845. | 714338. | -603747.9 |
| 31 MAY 1959 | 4420. | 1145. | 1310601. | 1500395.4 |
| 5 JUN 1960 | 1730. | -1545. | 2387597. | -3689279.9 |
| 31 APR 1961 | 2020. | -1255. | 1575490. | -1977531.5 |
| 31 MAY 1962 | 3350. | 75. | 5597. | 418.8 |
| 31 MAY 1963 | 2840. | -435. | 189386. | -82418.0 |
| 1 JUL 1964 | 3100. | -175. | 30690. | -5376.4 |
| 31 MAY 1965 | 3940. | 665. | 441979. | 293834.0 |
| 10 MAY 1966 | 2100. | -1175. | 1381060. | -1623001.5 |
| 6 JUL 1967 | 3360. | 85. | 7194. | 610.1 |
| 24 JUN 1968 | 2820. | -455. | 207194. | -94311.4 |
| 9 JUN 1969 | 2430. | -845. | 714338. | -603747.9 |
| 31 MAY 1970 | 3090. | -185. | 34294. | -6350.7 |
| 25 JUN 1971 | 4780. | 1505. | 2264468. | 3407604.4 |
| 9 JUN 1972 | 4840. | 1565. | 2448645. | 3831676.6 |
| 19 MAY 1973 | 2670. | -605. | 366249. | -221648.5 |
| 19 JUN 1974 | 4230. | 955. | 911671. | 870477.3 |
| 7 JUL 1975 | 3800. | 525. | 275431. | 144550.1 |
| 10 JUN 1976 | 2590. | -685. | 469479. | -321679.9 |
| TOTALS | 88430. | 0. | 19662674. | 2504402.4 |

MEAN 3275.

STANDARD DEVIATION 870.

COEFFICIENT OF SKEW
FOR HAZEN METHOD .19

# FLOOD FLOW FREQUENCY ANALYSIS - HAZEN METHOD

## ANNUAL INSTANTANEOUS PEAK DISCHARGE IN CFS

GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING STATION NO. 091885.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N,RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
LINCOLN COUNTY DATA FROM USGS (P)

PERIOD 1950- 1976 27 YEARS OF DATA

INTERPOLATED FACTORS FROM HAZEN FREQUENCY TABLE

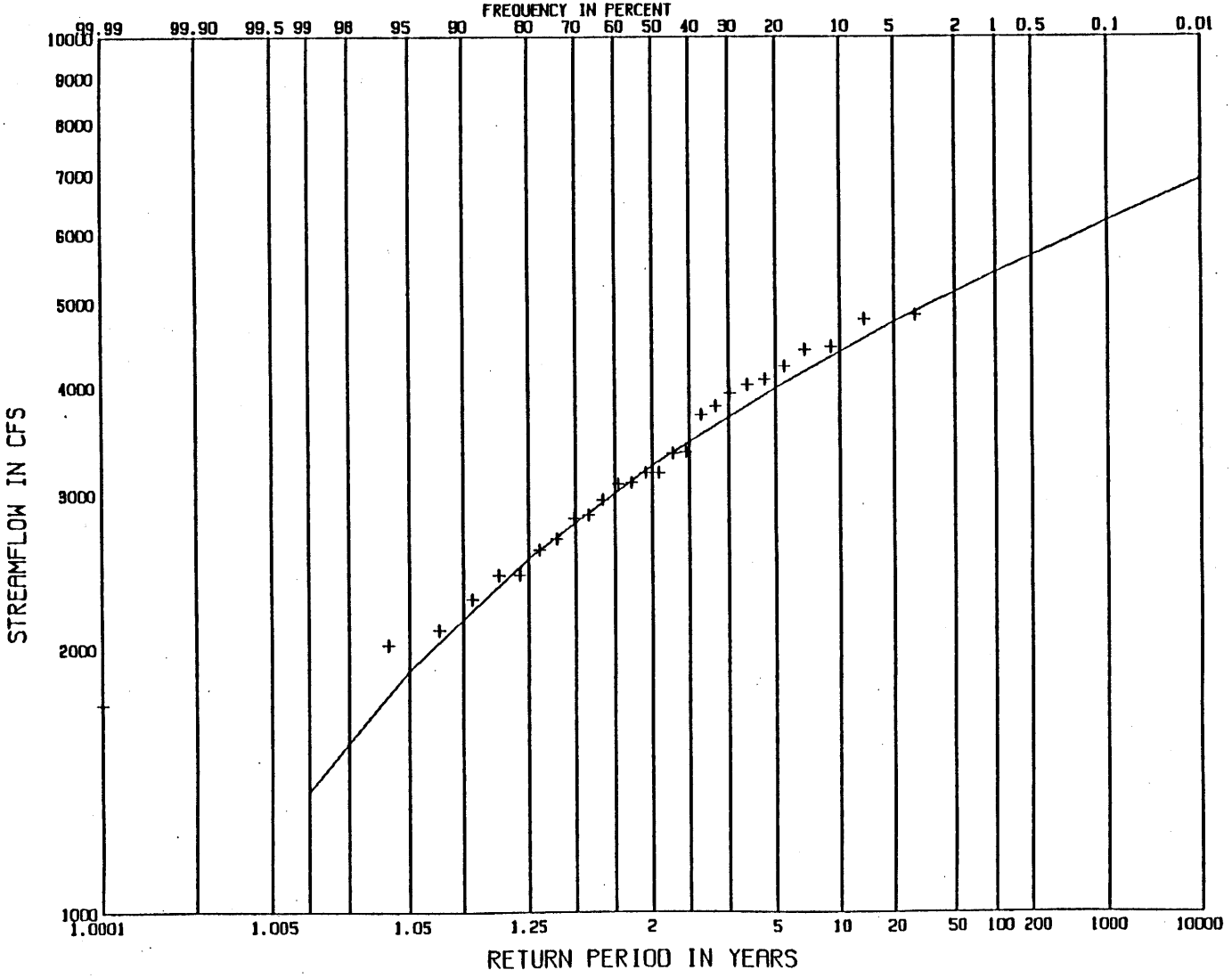
AND COMPUTED FLOWS

| PERCENT CHANCE | RECURRENCE INTERVAL YEARS | FACTOR | COMPUTED FLOW OR GREATER CFS |
|---|---|---|---|
| 99.00 | 1.01 | -2.19 | 1375. |
| 95.00 | 1.05 | -1.59 | 1891. |
| 80.00 | 1.25 | -.85 | 2536. |
| 50.00 | 2.00 | -.03 | 3250. |
| 20.00 | 5.00 | .83 | 3997. |
| 5.00 | 20.00 | 1.71 | 4760. |
| 1.00 | 100.00 | 2.47 | 5427. |
| .10 | 1000.00 | 3.38 | 6214. |
| .01 | 10000.00 | 4.18 | 6912. |

GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING — STATION NO. 091885.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N, RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
LINCOLN COUNTY. DATA FROM USGS (P)

FLOOD-FREQUENCY--HAZEN METHOD

PERIOD 1950 - 1976 27 YEARS OF DATA



# FLOOD-FREQUENCY ANALYSIS

## GUMBEL METHOD

GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING STATION NO. 091885.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N,RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
SUBLETTE COUNTY DATA FROM USGS (P)

ANNUAL INSTANTANEOUS PEAK DISCHARGE IN CFS

PERIOD 1971 - 1981 11 YEARS OF DATA

INPUT DATA

| DATE | FLOW, X | X SQUARED |
|---|---|---|
| 25 JUN 1971 | 4780. | 22848400. |
| 9 JUN 1972 | 4840. | 23425600. |
| 19 MAY 1973 | 2670. | 7128900. |
| 19 JUN 1974 | 4230. | 17892900. |
| 7 JUL 1975 | 3800. | 14440000. |
| 10 JUN 1976 | 2590. | 6708100. |
| 10 JUN 1977 | 2170. | 4708900. |
| 17 JUN 1978 | 2620. | 6864400. |
| 29 MAY 1979 | 2330. | 5428900. |
| 24 MAY 1980 | 2640. | 6969600. |
| 11 JUN 1981 | 2650. | 7022500. |

SUMMATION X = 35320. MEAN OF X = 3211.

SUMMATION X SQUARED = 123438200. MEAN OF X SQUARED = 11221655.

GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING STATION NO. 091885.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N,RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
SUBLETTE COUNTY DATA FROM USGS (P)

ANNUAL INSTANTANEOUS PEAK DISCHARGE IN CFS

SORTED DATA

| DATE | FLOW, X | ORDER NO. M | N/(N-M) |
|---|---|---|---|
| 10 JUN 1977 | 2170. | 1 | 1.10000 |
| 29 MAY 1979 | 2330. | 2 | 1.22222 |
| 10 JUN 1976 | 2590. | 3 | 1.37500 |
| 17 JUN 1978 | 2620. | 4 | 1.57143 |
| 24 MAY 1980 | 2640. | 5 | 1.83333 |
| 11 JUN 1981 | 2650. | 6 | 2.20000 |
| 19 MAY 1973 | 2670. | 7 | 2.75000 |
| 7 JUL 1975 | 3800. | 8 | 3.66667 |
| 19 JUN 1974 | 4230. | 9 | 5.50000 |
| 25 JUN 1971 | 4760. | 10 | 11.00000 |
| 9 JUN 1972 | 4840. | 11 | |

S = 993.82785

1/ALPHA = 774.88758

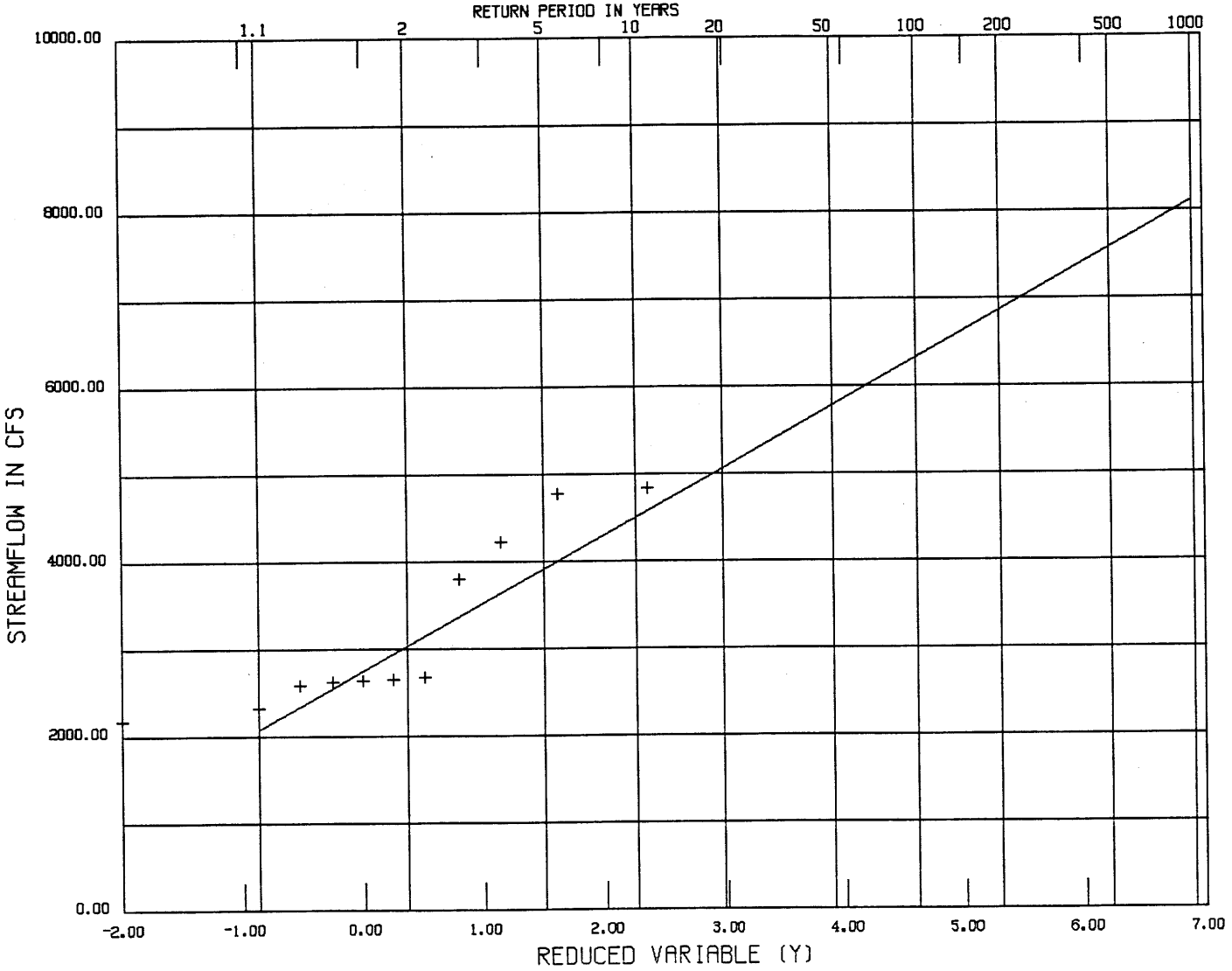
U = 2763.68656

| RETURN PERIOD YEARS | Y | ESTIMATED FLOW OR GREATER CFS |
|---|---|---|
| 2 | .3665 | 3048. |
| 5 | 1.5000 | 3926. |
| 10 | 2.2504 | 4507. |
| 20 | 2.9702 | 5065. |
| 25 | 3.1985 | 5242. |
| 50 | 3.9019 | 5787. |
| 100 | 4.6001 | 6328. |
| 200 | 5.2958 | 6867. |
| 500 | 6.2136 | 7579. |
| 1000 | 6.9073 | 8116. |

GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING STATION NO. 091885.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N,RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
SUBLETTE COUNTY DATA FROM USGS (P)

FLOOD FREQUENCY--GUMBEL METHOD

PERIOD 1971 - 1981 11 YEARS OF DATA



LISTDATASW

This program prints streamflow and reservoir data in a tabular format. Streamflow data can be printed in a daily format, which includes monthly summaries for each water year of data, and the instantaneous peak, if known. Monthly values or peak values can also be output in a tabular format. Reservoir contents data are printed in a monthly format only.

For each request, the user should specify:

Data types to report:
- daily streamflow
- monthly streamflow
- reservoir contents
- annual instantaneous peak streamflow
- monthly streamflow calculated from daily data

Retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Water year range (unless all years of available data are to be used)

Source organization (unless all sources are to be used)

GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING STATION NO. 09188500
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N,RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
SUBLETTE COUNTY DATA FROM USGS (P)

MEAN DAILY FLOW IN CFS BY WATER YEAR
1982

| DAY | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | DAY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 166.00 | 137.00 | 105.00 | 103.00 | 106.00 | 128.00 | 160.00 | 535.00 | 1480.00 | 3390.00 | 2070.00 | 715.00 | 1 |
| 2 | 163.00 | 140.00 | 110.00 | 99.00 | 100.00 | 126.00 | 165.00 | 434.00 | 1480.00 | 3230.00 | 1790.00 | 719.00 | 2 |
| 3 | 161.00 | 140.00 | 115.00 | 95.00 | 98.00 | 124.00 | 160.00 | 471.00 | 1490.00 | 2960.00 | 1670.00 | 638.00 | 3 |
| 4 | 161.00 | 137.00 | 122.00 | 93.00 | 95.00 | 120.00 | 165.00 | 604.00 | 1460.00 | 2650.00 | 1600.00 | 562.00 | 4 |
| 5 | 161.00 | 135.00 | 122.00 | 92.00 | 90.00 | 120.00 | 160.00 | 630.00 | 1450.00 | 2400.00 | 1480.00 | 517.00 | 5 |
| 6 | 155.00 | 133.00 | 120.00 | 93.00 | 89.00 | 125.00 | 160.00 | 597.00 | 1340.00 | 2290.00 | 1300.00 | 486.00 | 6 |
| 7 | 150.00 | 130.00 | 115.00 | 95.00 | 92.00 | 130.00 | 165.00 | 617.00 | 1180.00 | 2030.00 | 1150.00 | 461.00 | 7 |
| 8 | 153.00 | 130.00 | 110.00 | 98.00 | 97.00 | 135.00 | 170.00 | 651.00 | 1080.00 | 1730.00 | 1060.00 | 439.00 | 8 |
| 9 | 161.00 | 128.00 | 105.00 | 100.00 | 100.00 | 134.00 | 180.00 | 664.00 | 1010.00 | 1690.00 | 1070.00 | 417.00 | 9 |
| 10 | 163.00 | 123.00 | 100.00 | 104.00 | 105.00 | 134.00 | 190.00 | 678.00 | 956.00 | 1800.00 | 1190.00 | 402.00 | 10 |
| 11 | 183.00 | 114.00 | 105.00 | 110.00 | 110.00 | 130.00 | 210.00 | 578.00 | 1020.00 | 1800.00 | 1220.00 | 438.00 | 11 |
| 12 | 208.00 | 123.00 | 110.00 | 110.00 | 120.00 | 128.00 | 210.00 | 505.00 | 1140.00 | 1740.00 | 1140.00 | 450.00 | 12 |
| 13 | 201.00 | 123.00 | 115.00 | 112.00 | 125.00 | 130.00 | 220.00 | 523.00 | 1340.00 | 1770.00 | 1060.00 | 453.00 | 13 |
| 14 | 195.00 | 125.00 | 115.00 | 114.00 | 135.00 | 140.00 | 210.00 | 619.00 | 1680.00 | 1880.00 | 981.00 | 451.00 | 14 |
| 15 | 189.00 | 120.00 | 110.00 | 118.00 | 135.00 | 140.00 | 200.00 | 790.00 | 1870.00 | 2020.00 | 911.00 | 421.00 | 15 |
| 16 | 183.00 | 115.00 | 108.00 | 116.00 | 132.00 | 135.00 | 190.00 | 966.00 | 2020.00 | 2130.00 | 826.00 | 400.00 | 16 |
| 17 | 180.00 | 120.00 | 105.00 | 112.00 | 130.00 | 130.00 | 190.00 | 1160.00 | 2140.00 | 2190.00 | 792.00 | 381.00 | 17 |
| 18 | 172.00 | 125.00 | 105.00 | 108.00 | 126.00 | 125.00 | 185.00 | 1250.00 | 2320.00 | 2060.00 | 790.00 | 359.00 | 18 |
| 19 | 163.00 | 115.00 | 110.00 | 106.00 | 124.00 | 125.00 | 180.00 | 1450.00 | 2410.00 | 1760.00 | 777.00 | 339.00 | 19 |
| 20 | 158.00 | 100.00 | 115.00 | 102.00 | 127.00 | 125.00 | 191.00 | 1400.00 | 2450.00 | 1570.00 | 754.00 | 325.00 | 20 |
| 21 | 153.00 | 105.00 | 115.00 | 101.00 | 135.00 | 130.00 | 250.00 | 1390.00 | 2500.00 | 1610.00 | 737.00 | 320.00 | 21 |
| 22 | 153.00 | 105.00 | 113.00 | 100.00 | 130.00 | 135.00 | 350.00 | 1490.00 | 2610.00 | 1630.00 | 736.00 | 308.00 | 22 |
| 23 | 145.00 | 97.00 | 113.00 | 103.00 | 124.00 | 140.00 | 500.00 | 1680.00 | 2730.00 | 1720.00 | 735.00 | 305.00 | 23 |
| 24 | 142.00 | 96.00 | 110.00 | 108.00 | 120.00 | 145.00 | 800.00 | 1810.00 | 2860.00 | 1870.00 | 722.00 | 296.00 | 24 |
| 25 | 145.00 | 94.00 | 109.00 | 112.00 | 120.00 | 150.00 | 900.00 | 1950.00 | 3010.00 | 2060.00 | 705.00 | 294.00 | 25 |
| 26 | 140.00 | 92.00 | 108.00 | 115.00 | 125.00 | 160.00 | 707.00 | 2180.00 | 3110.00 | 2150.00 | 665.00 | 315.00 | 26 |
| 27 | 142.00 | 91.00 | 108.00 | 117.00 | 130.00 | 170.00 | 591.00 | 2440.00 | 3040.00 | 2160.00 | 617.00 | 528.00 | 27 |
| 28 | 142.00 | 93.00 | 106.00 | 117.00 | 130.00 | 160.00 | 505.00 | 2640.00 | 3020.00 | 2050.00 | 580.00 | 731.00 | 28 |
| 29 | 150.00 | 96.00 | 106.00 | 116.00 | | 175.00 | 466.00 | 2410.00 | 3190.00 | 2170.00 | 569.00 | 859.00 | 29 |
| 30 | 161.00 | 100.00 | 110.00 | 114.00 | | 170.00 | 523.00 | 1840.00 | 3390.00 | 2320.00 | 565.00 | 801.00 | 30 |
| 31 | 145.00 | | 108.00 | 110.00 | | 165.00 | | 1540.00 | | 2330.00 | 658.00 | | 31 |
| TOTAL | 5044.00 | 3482.00 | 3428.00 | 3293.00 | 3250.00 | 4304.00 | 9253.00 | 36492.00 | 60776.00 | 65160.00 | 30920.00 | 14130.00 | |
| MEAN | 162.71 | 116.07 | 110.58 | 106.23 | 116.07 | 138.84 | 308.43 | 1177.16 | 2025.87 | 2101.94 | 997.42 | 471.00 | |
| AC-FT | 10004.62 | 6906.44 | 6799.33 | 6531.57 | 6446.28 | 8536.85 | 18353.05 | 72380.82 | 120547.43 | 129242.97 | 61328.92 | 28026.44 | |

TOTAL ANNUAL FLOW IN ACRE-FEET = 475104.72

INSTANTANEOUS PEAK IN CFS = **

** INDICATES MISSING DATA
* INDICATES COMPUTED FROM INCOMPLETE DATA
E INDICATES ESTIMATED VALUE

FONTENELLE RESERVOIR NEAR FONTENELLE, WYOMING STATION NO. 092111.50
LATITUDE 42-02-00 LONGITUDE 110-04-00 SECTION 25 TOWNSHIP 24 N,RANGE 112 W 6TH P.M.
ELEVATION 6508.68 FT DRAINAGE AREA 4280.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15320000
LINCOLN COUNTY DATA FROM USGS (P)

END-OF-MONTH RESERVOIR CONTENTS
IN ACRE-FEET

| YEAR | OCTOBER | NOVEMBER | DECEMBER | JANUARY | FEBRUARY | MARCH | APRIL | MAY | JUNE | JULY | AUGUST | SEPTEMBER | MEAN ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1965 | 21560. | 28330. | 35070. | 42280. | 43140. | 45370. | 121300. | 221000. | 384000. | 368700. | 358200. | 18430. | 140615. |
| 1966 | 27170. | 19010. | 24390. | 23530. | 24180. | 26380. | 23310. | 27550. | 24180. | 24780. | 24680. | 25200. | 24530. |
| 1967 | 31580. | 38110. | 40400. | 49400. | 60120. | 72180. | 19170. | 21160. | 31930. | 13810. | 27430. | 17940. | 35269. |
| 1968 | 18580. | 17240. | 34100. | 49990. | 65470. | 80700. | 126500. | 162400. | 264200. | 341400. | 341400. | 304000. | 150498. |
| 1969 | 258600. | 258600. | 264200. | 250900. | 191300. | 170600. | 222400. | 310100. | 332100. | 332900. | 314400. | 287300. | 266117. |
| 1970 | 252800. | 240400. | 225000. | 211500. | 204700. | 180200. | 162600. | 194300. | 287300. | 308600. | 276000. | 246400. | 232483. |
| 1971 | 224400. | 219300. | 207500. | 201500. | 191600. | 177500. | 178700. | 178300. | 323000. | 345400. | 337800. | 327100. | 242675. |
| 1972 | 323200. | 314100. | 272200. | 237300. | 216800. | 223200. | 197100. | 197700. | 351100. | 349000. | 344700. | 342900. | 280775. |
| 1973 | 341500. | 319100. | 309900. | 279100. | 220300. | 175200. | 188000. | 230500. | 312900. | 349100. | 324000. | 337300. | 282242. |
| 1974 | 325000. | 323600. | 314000. | 276200. | 208300. | 174300. | 188700. | 210000. | 355400. | 348300. | 329000. | 315900. | 280725. |
| 1975 | 301100. | 288500. | 256200. | 222300. | 193900. | 173700. | 167500. | 188100. | 211300. | 357500. | 338800. | 329700. | 252383. |
| 1976 | 320300. | 305600. | 281900. | 248200. | 217200. | 168900. | 198800. | 224400. | 308300. | 352700. | 335100. | 328200. | 274133. |
| 1977 | 315500. | 293700. | 256000. | 216900. | 188800. | 182900. | 200000. | 186000. | 250900. | 277000. | 294400. | 295700. | 246483. |
| 1978 | 296600. | 297000. | 285600. | 252200. | 222200. | 206000. | 205000. | 219300. | 319700. | 358200. | 340100. | 322200. | 277008. |
| 1979 | 321500. | 309300. | 284700. | 255700. | 227500. | 199200. | 205400. | 269100. | 267900. | 295300. | 305300. | 290400. | 269275. |
| 1980 | 281400. | 261600. | 229500. | 213300. | 206900. | 186400. | 189200. | 344000. | 365600. | 348400. | 312300. | 299300. | 269825. |
| 1981 | 294500. | 276800. | 241000. | 213700. | 205100. | 208100. | 182500. | 203200. | 334200. | 328700. | 265500. | 246400. | 249975. |

* INDICATES ENCOUNTERED MISSING DATA
** INDICATES MISSING DATA

PLOTSWL

This program plots streamflow and reservoir stations by location. The area to be plotted can be specified by either latitude-longitude or township-range. If two or more stations are so close that plotting their data would cause overprinting, an overlap point can be created, merging these data. This can sometimes be avoided by plotting in a larger scale, or with smaller type. The plot size is limited to 18 inches by 10 feet. It is suggested that the WRDS staff be consulted during request submittal if the user is unfamiliar with plot scaling.

Information to be plotted is specified through selection of one of the following styles:

Style 1. Type of data available
Station number

Style 2. Number of years of data available in date range
Station number
Mean data value (daily, monthly, reservoir or peak)

Style 3. Number of years of data available in date range
Station number
Maximum data value (daily, monthly, reservoir or peak)
Minimum data value (daily, monthly, reservoir or peak)

To prevent overprinting of data from adjacent stations, the program can combine the data of these stations and plot instead an "overlap point," whose position is the weighted average of the points it replaces.

For overlap points created with style 2, the mean of all of the merged data can be plotted, and with style 3, the maximum data value of all of the merged data can be plotted.

PLOTSWL (continued)

For each plot, the user should specify:

Style of plot

Scale of plot (such as 1:250000, which is the default specification)

Whether or not overlap points should be created, and what to put beside them (if anything)

Data types to retrieve

Retrieval method and range of values:
latitude-longitude
township-range (Wyoming only)

Water year range (unless all available years of data are desired)

Source organization (unless all are to be used)

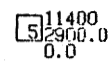
Data print height (.1 or .06 inches)

SCALE -- 1 : 24000

POINTS PLOTTED REPRESENT
[N] N YRS OF DATA AVAIL.
(N=** FOR MORE THAN 99 POINTS)

41.23' 0"
106.15' 0"

41.23' 0"
106.12' 0"

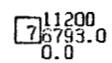


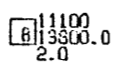

VALUES PRINTED ARE
LINE 1
STATION NUMBER

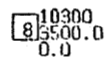
LINE 2
(MAX.)
STREAMFLOW (CFS)

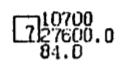
LINE 3
(MIN.)
STREAMFLOW (CFS)

LATITUDE (TICK = 10 MINUTES)




5 DATA POINTS ARE REPRESENTED.

41.20' 0"
106.15' 0"

41.20' 0"
106.12' 0"

LONGITUDE (TICK = 10 MINUTES)

PLOTSWT

This program plots streamflow or reservoir data versus time. Daily values are plotted as a continuous line; monthly and reservoir data are plotted as connected points; peak data are plotted as a histogram. The scale on the x-axis can be set to 3.6, 9, or 23.4 inches per water year. Plots can be a maximum of 10 feet long or 30 years. The scale on the y-axis can be set by the computer to accommodate the data, or can be pre-set to insure the same scale for comparison of plots. Peak values can optionally be plotted with daily values.

For each plot, the user should specify:

Data type to plot:
- daily streamflow
- monthly streamflow
- monthly reservoir content
- annual instantaneous peak streamflow

Retrieval method and range of values:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Water year range (unless all available years of data are desired)

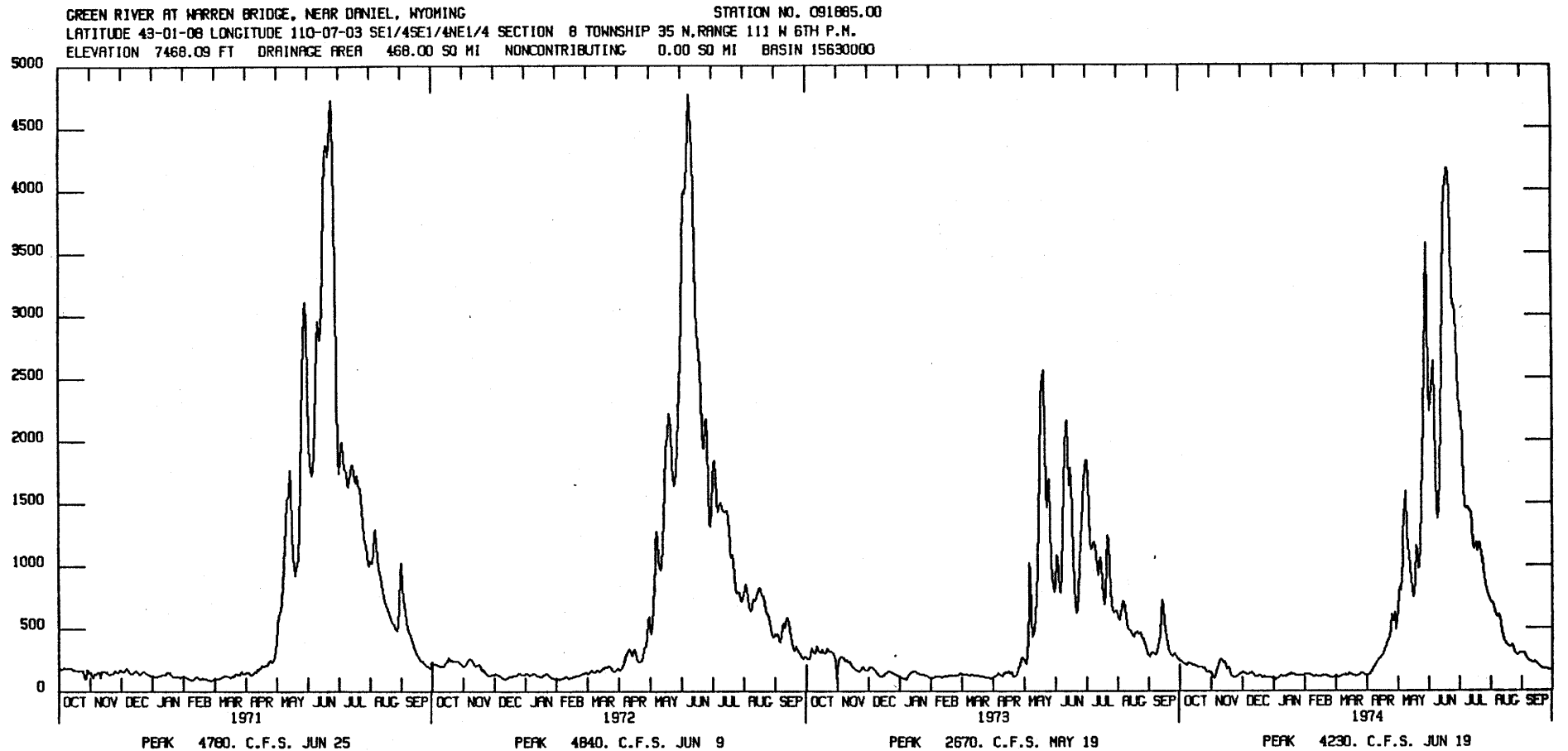
Source organization (unless all sources are to be used)

Whether the y-axis should be linear or logarithmic

x-axis interval size (3.6, 9, or 23.4 inches per year)

y-axis data value range (unless the automatic range is acceptable)

Whether or not peak values are to be plotted (if daily data have been requested)


GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING STATION NO. 091885.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N,RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
DAILY STREAMFLOW IN C.F.S.
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
1971
1972
1973
1974
PEAK 4780. C.F.S. JUN 25
PEAK 4840. C.F.S. JUN 9
PEAK 2670. C.F.S. MAY 19
PEAK 4230. C.F.S. JUN 19

REGRESSW

This program generates a least squares regression analysis for streamflow data. The regression can be one of five types:

1. One daily parameter for two stations
2. Monthly data for two stations, analyzed monthly
3. Reservoir data and monthly streamflow, analyzed monthly
4. Peak data, for two stations
5. Total annual streamflow for two stations

The regression fit may be linear or curvilinear. Data transformations ($\log_{10}$ or $\log_e$) may optionally be applied to either or both of the independent and dependent values. The fit may be forced through the origin if requested. Plots of the data and regression curve are optional.

The dates of the dependent variable may optionally be offset by a given time period from the dates of the independent variable. This allows a regression analysis between stations when one is downstream of another.

Confidence limits are calculated and optionally plotted for linear regressions. Also on linear regressions, a test is made of the significance of the slope coefficient (b). The user may specify the significance level, alpha, to be used in the confidence limits and test of the slope coefficient significance (t test).

REGRESSW (continued)

For each request, the user should specify:

Type of regression (see previous page)

Primary retrieval method for dependent station(s) and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Water year range (unless all years of available data are to be used)

Independent station number

Source organization

Date offset range between independent and dependent stations

Independent variable (parameter) transformation:
- none
- $\log_{10}$
- $\log_e$

Dependent variable (parameter) transformation:
- none
- $\log_{10}$
- $\log_e$

Significance level (.01, .02, .05, .1, or .2)

Whether or not the regression equation should be forced through the origin

Whether the equation should be linear or curvilinear

Whether or not to plot the data and regression line

DEPENDENT HEADER

NORTH FORK LITTLE SNAKE RIVER NEAR ENCAMPMENT, WYOMING STATION NO. 092518.00
LATITUDE 41-03-00 LONGITUDE 106-57-25 SW1/4 SECTION 33 TOWNSHIP 13 N,RANGE 86 W 6TH P.M.
ELEVATION 8250.00 FT DRAINAGE AREA 9.64 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 14150000
CARBON COUNTY DATA FROM USGS (P)

INDEPENDENT HEADER

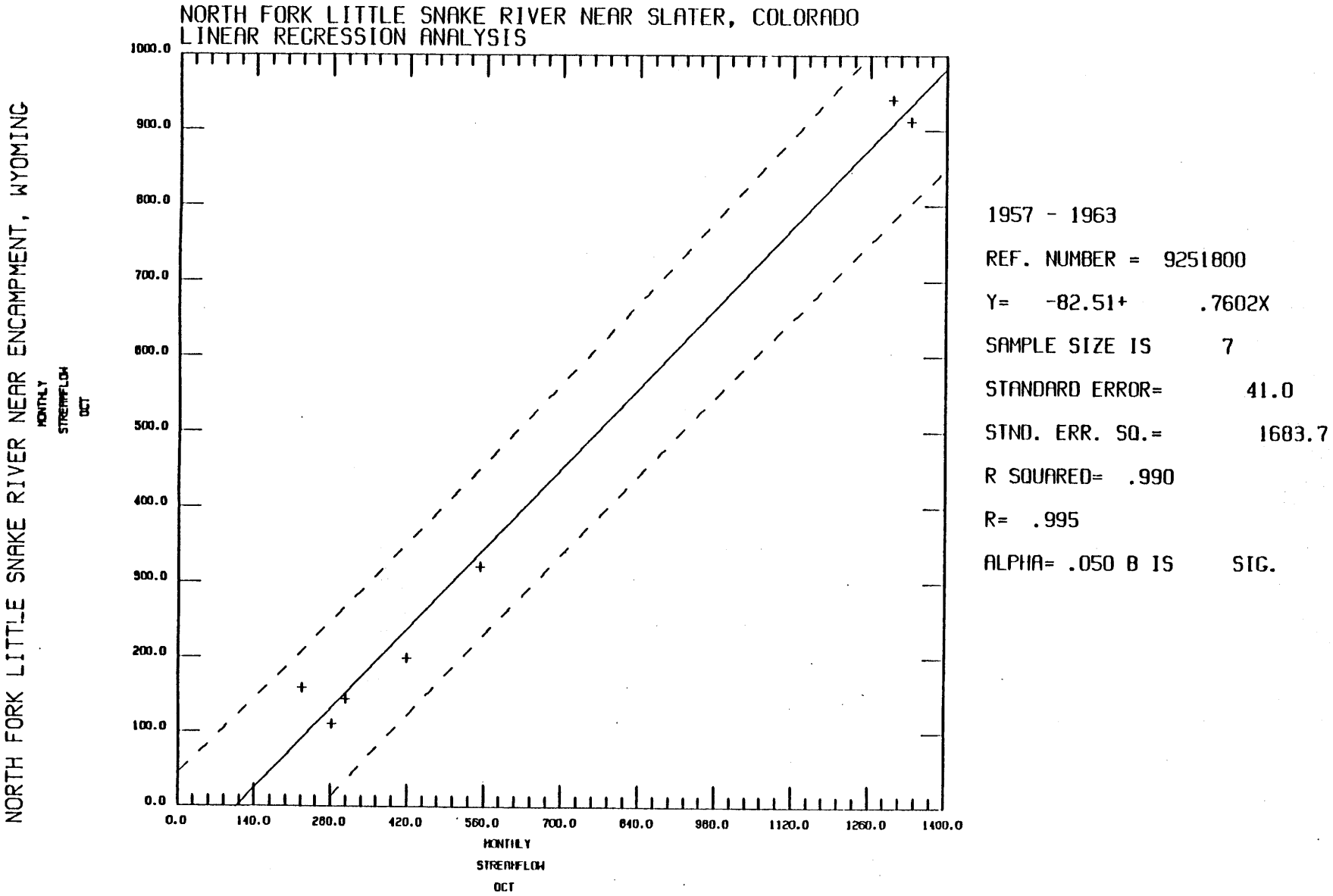
NORTH FORK LITTLE SNAKE RIVER NEAR SLATER, COLORADO STATION NO. 092519.00
LATITUDE 41-00-55 LONGITUDE 107-01-20 NE1/4 SECTION 14 TOWNSHIP 12 N,RANGE 86 W 6TH P.M.
ELEVATION 7350.00 FT DRAINAGE AREA 29.30 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 14150000
CARBON COUNTY DATA FROM USGS (P)

*** LINEAR REGRESSION ANALYSIS ***
NO TRANSFORMATION APPLIED TO Y AXIS
NO TRANSFORMATION APPLIED TO X AXIS

1957 - 1963
REGRESSION ON MEAN OF MONTHLY VALUES
OCT OCT

| | DEPENDENT VARIABLE | INDEPENDENT VARIABLE |
|---|---|---|
| | MONTHLY STREAMFLOW | MONTHLY STREAMFLOW |
| | 157.88 | 225.92 |
| | 319.74 | 551.80 |
| | 109.69 | 280.86 |
| | 911.60 | 1333.29 |
| | 143.21 | 305.65 |
| | 940.16 | 1301.16 |
| | 197.36 | 417.52 |
| ARITHMETIC MEAN | 397.09 | 630.89 |
| WEIGHTED ARITHMETIC MEAN | 635.80 | 1010.13 |
| STANDARD DEVIATION | 367.38 | 480.75 |

Y= -92.51+ .7602X
SAMPLE SIZE IS 7
STANDARD ERROR= 41.03
STANDARD ERROR SQUARED= 1683.66
COEFFICIENT OF DETERMINATION, R SQUARED= .990
COEFFICIENT OF CORRELATION, R= .995
FOR ALPHA= .050 B IS SIGNIFICANT
MINIMUM X= 225.92 CONFIDENCE LIMITS= 207.71 AND -29.23
MAXIMUM X= 1333.29 CONFIDENCE LIMITS= 1060.20 AND 801.91


NORTH FORK LITTLE SNAKE RIVER NEAR SLATER, COLORADO
LINEAR REGRESSION ANALYSIS
NORTH FORK LITTLE SNAKE RIVER NEAR ENCAMPMENT, WYOMING
MONTHLY STREAMFLOW OCT
1000.0
900.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
0.0
140.0
280.0
420.0
560.0
700.0
840.0
980.0
1120.0
1260.0
1400.0
MONTHLY STREAMFLOW OCT
1957 - 1963
REF. NUMBER = 9251800
Y= -82.51+ .7602X
SAMPLE SIZE IS 7
STANDARD ERROR= 41.0
STND. ERR. SQ.= 1683.7
R SQUARED= .990
R= .995
ALPHA= .050 B IS SIG.

DEPENDENT HEADER

NORTH FORK LITTLE SNAKE RIVER NEAR ENCAMPMENT, WYOMING STATION NO. 092518.00
LATITUDE 41-03-00 LONGITUDE 106-57-25 SW1/4 SECTION 33 TOWNSHIP 13 N,RANGE 85 W 6TH P.M.
ELEVATION 8250.00 FT DRAINAGE AREA 9.64 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 14150000
CARBON COUNTY DATA FROM USGS (P)

INDEPENDENT HEADER

NORTH FORK LITTLE SNAKE RIVER NEAR SLATER, COLORADO STATION NO. 092519.00
LATITUDE 41-00-55 LONGITUDE 107-01-20 NE1/4 SECTION 14 TOWNSHIP 12 N,RANGE 86 W 6TH P.M.
ELEVATION 7350.00 FT DRAINAGE AREA 29.30 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 14150000
CARBON COUNTY DATA FROM USGS (P)

*** LINEAR REGRESSION ANALYSIS ***
NO TRANSFORMATION APPLIED TO Y AXIS
NO TRANSFORMATION APPLIED TO X AXIS

1957 - 1963

| | DEPENDENT VARIABLE DAILY STREAMFLOW | INDEPENDENT VARIABLE DAILY STREAMFLOW |
|---|---|---|
| ARITHMETIC MEAN | 26.02 | 44.29 |
| WEIGHTED ARITHMETIC MEAN | 126.17 | 214.80 |
| STANDARD DEVIATION | 53.18 | 87.13 |

Y= .12+ .5846X
SAMPLE SIZE IS 2556
STANDARD ERROR= 15.31
STANDARD ERROR SQUARED= 234.33
COEFFICIENT OF DETERMINATION, R SQUARED= .917
COEFFICIENT OF CORRELATION, R= .958
FOR ALPHA= .050 B IS SIGNIFICANT

| | | | | |
|---|---|---|---|---|
| MINIMUM X= | 2.40 | CONFIDENCE LIMITS= | 31.54 AND | -28.48 |
| MAXIMUM X= | 565.00 | CONFIDENCE LIMITS= | 360.64 AND | 300.20 |

## 3.3 WATER QUALITY

### Data Available

The water quality database contains both daily samples and grab samples for ground and surface water locations. For every site sampled for water quality, a header is stored with location defined in terms of latitude-longitude, township-range, city, county-state and elevation. The type of site, use of the water, source organization, source organization station number, and WRDS station number are also present in each header. Drainage basin code and drainage area (both total and non-contributing) are given for stream locations when known; aquifer, well depth, and well permit number are given for wells when known. There are currently over 8,000 water quality sites on WRDS; for many, not all header information is known. For location, latitude-longitude is the most complete header item. Site type and use are usually known, but the aquifer has not been identified for most wells.

Two types of temporal water quality data, daily and grab sample, reside on the system. Parameters currently stored for daily samples, by water year, are listed below.

| Daily Sample Parameters: | Unit of Measurement: |
|---|---|
| Temperature<br>Maximum<br>Minimum<br>Once daily | Degrees centigrade |
| Mean streamflow | Cubic feet per second |
| Specific conductance (once daily) | Micromhos per centimeter at 25°C |

| Daily Sample Parameters: | Unit of Measurement: |
|---|---|
| Mean suspended sediment concentration | Milligrams per liter |
| Mean suspended sediment discharge | Tons per day |

The monthly and annual mean of the above values are also stored for daily samples.

There are more than 55,000 grab samples on WRDS. For each, the following information may be available: the date, the time, the sample collector, the testing laboratory, and the way the water was originally treated. There are over 800 possible grab sample water quality parameters on WRDS; their codes and names are presented in Table 4. The parameter codes have been converted to the USGS numbering system. Only a few parameters are available for each grab sample; to find out which parameters were determined for specific stations, request a listing from the retrieval program, DATEWQ.

Table 4: Water Quality Grab Sample Parameters.

00437 ACIDITY, CO2 (PHENOLPHTHALEIN) (MG/L AS CACO3)
00435 ACIDITY, TOTAL (MG/L AS CACO3)
71825 ACIDITY, TOTAL, HEATED (MG/L AS H)
00028 AGENCY ANALYZING SAMPLE
00027 AGENCY COLLECTING SAMPLE (NUMERIC CODE)
39331 ALDRIN, DISSOLVED (UG/L)
39332 ALDRIN, SUSPENDED TOTAL (UG/L)
39330 ALDRIN, TOTAL (UG/L)
39333 ALDRIN, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)
01325 ALGAE MATS, FLOATING (SEVERITY)
85209 ALGAL GROWTH POTENTIAL, USGS MOD. BOTTLE TEST (MG/L) (MG/L)
00431 ALKALINITY (MG/L AS CACO3)
00425 ALKALINITY, BICARBONATE (MG/L AS CACO3)
00430 ALKALINITY, CARBONATE (MG/L AS CACO3)
00420 ALKALINITY, HYDROXIDE (MG/L)
00411 ALKALINITY, METHYLORANGE (MG/L)
00415 ALKALINITY, PHENOLPHTHALEIN (MG/L)
90410 ALKALINITY, TITRATION TO PH 4.5, LAB (MG/L AS CACO3)
00410 ALKALINITY, TOTAL, TITRATION TO PH 4.5 (MG/L AS CACO3)
99905 ALKALINITY, TOTAL, UNSPECIFIED METHOD (MG/L AS CACO3)
39900 ALLETHRIN, TOTAL (UG/L)
01503 ALPHA, DISSOLVED (PCI/L)
01504 ALPHA, DISSOLVED, COUNTING ERROR (PCI/L)
01515 ALPHA, GROSS, DISSOLVED (PCI/L AS U NATURAL)
80030 ALPHA, GROSS, DISSOLVED (UG/L AS U NATURAL)
01517 ALPHA, GROSS, SUSPENDED TOTAL (PCI/G AS U NATURAL)
01516 ALPHA, GROSS, SUSPENDED TOTAL (PCI/L AS U NATURAL)
01518 ALPHA, GROSS, SUSPENDED TOTAL (UG/G AS U NATURAL)
80040 ALPHA, GROSS, SUSPENDED TOTAL (UG/L AS U NATURAL)
80029 ALPHA, GROSS, TOTAL (UG/L AS U NATURAL)
01507 ALPHA, SEDIMENT (PCI/G)
01508 ALPHA, SEDIMENT, COUNTING ERROR (PCI/G)
01505 ALPHA, SUSPENDED TOTAL (PCI/L)
01506 ALPHA, SUSPENDED TOTAL, COUNTING ERROR (PCI/L)
01501 ALPHA, TOTAL (PCI/L)
01502 ALPHA, TOTAL, COUNTING ERROR (PCI/L)
00042 ALTITUDE ABOVE MEAN SEA LEVEL (FEET)
01106 ALUMINUM, DISSOLVED (UG/L AS AL)
01107 ALUMINUM, SUSPENDED (UG/L AS AL)
01105 ALUMINUM, TOTAL (UG/L AS AL)
01108 ALUMINUM, TOTAL IN BOTTOM DEPOSITS (UG/G AS AL)
01095 ANTIMONY, DISSOLVED (UG/L AS SB)
01096 ANTIMONY, SUSPENDED TOTAL (UG/L AS SB)
01097 ANTIMONY, TOTAL (UG/L AS SB)
01098 ANTIMONY, TOTAL IN BOTTOM DEPOSITS (UG/G AS SB)
39501 AROCLOR, 1248 PCB SERIES, DISSOLVED (UG/L)
39502 AROCLOR, 1248 PCB SERIES, SUSPENDED (UG/L)
39500 AROCLOR, 1248 PCB SERIES, TOTAL (UG/L)
39503 AROCLOR, 1248 PCB SERIES, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)
39505 AROCLOR, 1254 PCB SERIES, DISSOLVED (UG/L)
39506 AROCLOR, 1254 PCB SERIES, SUSPENDED (UG/L)
39504 AROCLOR, 1254 PCB SERIES, TOTAL (UG/L)
39507 AROCLOR, 1254 PCB SERIES, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)
39509 AROCLOR, 1260 PCB SERIES, DISSOLVED (UG/L)
39510 AROCLOR, 1260 PCB SERIES, SUSPENDED (UG/L)
39508 AROCLOR, 1260 PCB SERIES, TOTAL (UG/L)
39511 AROCLOR, 1260 PCB SERIES, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)
01000 ARSENIC, DISSOLVED (UG/L AS AS)
01001 ARSENIC, SUSPENDED TOTAL (UG/L AS AS)
01002 ARSENIC, TOTAL (UG/L AS AS)
01003 ARSENIC, TOTAL IN BOTTOM DEPOSITS (UG/G AS AS)
39630 ATRAZINE, TOTAL (UG/L)
82052 BANVEL (DICAMBA) (UG/L)
01005 BARIUM, DISSOLVED (UG/L AS BA)
01006 BARIUM, SUSPENDED (UG/L AS BA)
01007 BARIUM, TOTAL (UG/L AS BA)
01008 BARIUM, TOTAL IN BOTTOM DEPOSITS (UG/G AS BA)
34030 BENZENE, TOTAL (UG/L)
34526 BENZO-(A)ANTHRACENE, 1,2-BENZANTHRACENE, TOTAL (UG/L)
34247 BENZO-(A)PYRENE, TOTAL (UG/L)
34267 BENZO-(C)PYRENE, TOTAL (UG/L)
77802 BENZO-(E)PYRENE, TOTAL (UG/L)

Table 4: Water Quality Grab Sample Parameters. (cont.)

| | |
|---|---|
| 01010 | BERYLLIUM, DISSOLVED (UG/L AS BE) |
| 01011 | BERYLLIUM, SUSPENDED (UG/L AS BE) |
| 01012 | BERYLLIUM, TOTAL (UG/L AS BE) |
| 01013 | BERYLLIUM, TOTAL IN BOTTOM DEPOSITS (UG/G AS BE) |
| 03503 | BETA, DISSOLVED (PCI/L) |
| 03504 | BETA, DISSOLVED, COUNTING ERROR (PCI/L) |
| 03515 | BETA, GROSS, DISSOLVED (PCI/L AS CS-137) |
| 80050 | BETA, GROSS, DISSOLVED (PCI/L AS SR-90/YT-90) |
| 03518 | BETA, GROSS, SUSPENDED TOTAL (PCI/G AS CS-137) |
| 03517 | BETA, GROSS, SUSPENDED TOTAL (PCI/G AS SR-90/YT-90) |
| 03516 | BETA, GROSS, SUSPENDED TOTAL (PCI/L AS CS-137) |
| 80060 | BETA, GROSS, SUSPENDED TOTAL (PCI/L AS SR-90/YT-90) |
| 03507 | BETA, SEDIMENT (PCI/G) |
| 03508 | BETA, SEDIMENT, COUNTING ERROR (PCI/G) |
| 03505 | BETA, SUSPENDED TOTAL (PCI/L) |
| 03506 | BETA, SUSPENDED TOTAL, COUNTING ERROR (PCI/L) |
| 03501 | BETA, TOTAL (PCI/L) |
| 03502 | BETA, TOTAL, COUNTING ERROR (PCI/L) |
| 00440 | BICARBONATE ION (MG/L AS HCO3) |
| 99908 | BICARBONATE ION, FIELD (MG/L AS HCO3) |
| 99440 | BICARBONATE, INCREMENTAL TITRATION, FIELD (MG/L AS HCO3) |
| 90440 | BICARBONATE, INCREMENTAL TITRATION, LAB (MG/L AS HCO3) |
| 95440 | BICARBONATE, TITRATION TO PH 4.5, LAB (MG/L AS HCO3) |
| 70950 | BIOMASS-CHLOROPHYLL RATIO, PERIPHYTON (UNITS) |
| 70949 | BIOMASS-CHLOROPHYLL RATIO, PLANKTON (UNITS) |
| 00572 | BIOMASS, PERIPHYTON, ASH WEIGHT (GRAMS PER SQUARE METER) |
| 00573 | BIOMASS, PERIPHYTON, DRY WEIGHT, TOTAL (GRAMS PER SQUARE METER) |
| 01015 | BISMUTH, DISSOLVED (UG/L AS BI) |
| 01016 | BISMUTH, SUSPENDED TOTAL (UG/L AS BI) |
| 01017 | BISMUTH, TOTAL (UG/L AS BI) |
| 99910 | BORON, DISSOLVED (MG/L AS B) |
| 01020 | BORON, DISSOLVED (UG/L AS B) |
| 01021 | BORON, SUSPENDED (UG/L AS B) |
| 01022 | BORON, TOTAL (UG/L AS B) |
| 01023 | BORON, TOTAL IN BOTTOM DEPOSITS (UG/G AS B) |
| 71870 | BROMIDE, DISSOLVED (MG/L AS BR) |
| 91000 | BROMIDE, DISSOLVED (UG/L) |
| 71871 | BROMINE (MG/L AS BR) |
| 01025 | CADMIUM, DISSOLVED (UG/L AS CD) |
| 01026 | CADMIUM, SUSPENDED (UG/L AS CD) |
| 01027 | CADMIUM, TOTAL (UG/L AS CD) |
| 01028 | CADMIUM, TOTAL IN BOTTOM DEPOSITS (UG/G AS CD) |
| 01113 | CADMIUM, TOTAL RECOVERABLE (UG/L AS CD) |
| 00915 | CALCIUM, DISSOLVED (MG/L AS CA) |
| 00916 | CALCIUM, TOTAL (MG/L AS CA) |
| 00910 | CALCIUM, TOTAL (MG/L AS CACO3) |
| 32004 | CARBON ALCOHOL EXTRACTABLES (UG/L) |
| 32003 | CARBON CHLOROFORM AND ALCOHOL EXTRACTABLES, TOTAL (UG/L) |
| 32005 | CARBON CHLOROFORM EXTRACTABLES (UG/L) |
| 00405 | CARBON DIOXIDE, DISSOLVED (MG/L AS CO2) |
| 28004 | CARBON 14, DISSOLVED, APPARENT AGE (YEARS BEFORE PRESENT) |
| 82081 | CARBON-13/CARBON-12 STABLE ISOTOPE RATIO PER MIL |
| 00691 | CARBON, INORGANIC, DISSOLVED (MG/L AS C) |
| 00688 | CARBON, INORGANIC, SUSPENDED TOTAL (MG/L AS C) |
| 00685 | CARBON, INORGANIC, TOTAL (MG/L AS C) |
| 00686 | CARBON, INORGANIC, TOTAL IN BOTTOM DEPOSITS (G/KG) |
| 00682 | CARBON, ORGANIC + INORGANIC, DISSOLVED (MG/L AS C) |
| 00693 | CARBON, ORGANIC + INORGANIC, TOTAL IN BOTTOM MATERIAL, DRY WEIGHT (G/KG) |
| 00681 | CARBON, ORGANIC, DISSOLVED (MG/L AS C) |
| 00692 | CARBON, ORGANIC, IMMISCIBLE (MG/L AS C) |
| 00683 | CARBON, ORGANIC, SUSPENDED TOTAL (MG/KG AS C) |
| 00689 | CARBON, ORGANIC, SUSPENDED TOTAL (MG/L AS C) |
| 00680 | CARBON, ORGANIC, TOTAL (MG/L AS C) |
| 00687 | CARBON, ORGANIC, TOTAL IN BOTTOM DEPOSITS (G/KG) |
| 00690 | CARBON, TOTAL (MG/L AS C) |
| 00445 | CARBONATE ION (MG/L AS CO3) |
| 99911 | CARBONATE ION, FIELD (MG/L AS CO3) |
| 99445 | CARBONATE, INCREMENTAL TITRATION, FIELD (MG/L AS CO3) |
| 95445 | CARBONATE, TITRATION TO PH 8.3, LAB (MG/L AS CO3) |
| 99912 | CARBONATE, TOTAL (MG/L AS CO3) |
| 00401 | CATIONS MINUS ANIONS (MILLIEQUIVALENTS) |

Table 4: Water Quality Grab Sample Parameters. (cont.)

28901 CERIUM 144, TOTAL (PCI/L)
28902 CERIUM 144, TOTAL, COUNTING ERROR (PCI/L)
01112 CERIUM, TOTAL (UG/L AS CE)
28401 CESIUM 137, TOTAL (PCI/L)
28402 CESIUM 137, TOTAL, COUNTING ERROR (PCI/L)
01115 CESIUM, DISSOLVED (UG/L AS CS)
01117 CESIUM, TOTAL (UG/L AS CS)
39352 CHLORDANE, DISSOLVED (UG/L)
39353 CHLORDANE, SUSPENDED TOTAL (UG/L)
39350 CHLORDANE, TOTAL (UG/L)
39351 CHLORDANE, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)
00940 CHLORIDE, DISSOLVED (MG/L AS CL)
70290 CHLORIDE, DISSOLVED (TONS PER DAY)
91001 CHLORIDE, DISSOLVED (UG/L)
99914 CHLORIDE, TOTAL (MG/L)
50066 CHLORINE, COMBINED AVAILABLE (MG/L)
50064 CHLORINE, FREE AVAILABLE (MG/L)
99915 CHLORINE, TOTAL (MG/L)
50060 CHLORINE, TOTAL RESIDUAL (MG/L)
39460 CHLOROBENZILATE, TOTAL (UG/L)
32209 CHLOROPHYLL A, FLUOROMETRIC METHOD, CORRECTED (UG/L)
32217 CHLOROPHYLL A, FLUOROMETRIC METHOD, UNCORRECTED (UG/L)
70957 CHLOROPHYLL A, PERIPHYTON, CHROMOTOGRAPHIC-FLUOROMETRIC (MILLIGRAMS PER SQUARE METER)
70955 CHLOROPHYLL A, PERIPHYTON, CHROMOTOGRAPHIC-SPECTROPHOTOMETRIC (MILLIGRAMS PER SQUARE METER)
32228 CHLOROPHYLL A, PERIPHYTON, SPECTROPHOTOMETRIC, UNCORRECTED (MILLIGRAMS PER SQUARE METER)
70953 CHLOROPHYLL A, PHYTOPLANKTON, CHROMOTOGRAPHIC-FLUOROMETRIC (UG/L)
70951 CHLOROPHYLL A, PHYTOPLANKTON, CHROMOTOGRAPHIC-SPECTROPHOTOMETRIC (UG/L)
32211 CHLOROPHYLL A, PHYTOPLANKTON, SPECTROPHOTOMETRIC, ACID METHOD (UG/L)
32230 CHLOROPHYLL A, PHYTOPLANKTON, SPECTROPHOTOMETRIC, UNCORRECTED (UG/L)
70958 CHLOROPHYLL B, PERIPHYTON, CHROMOTOGRAPHIC-FLUOROMETRIC (MILLIGRAMS PER SQUARE METER)
70956 CHLOROPHYLL B, PERIPHYTON, CHROMOTOGRAPHIC-SPECTROPHOTOMETRIC (MILLIGRAMS PER SQUARE METER)
32226 CHLOROPHYLL B, PERIPHYTON, SPECTROPHOTOMETRIC, UNCORRECTED (MILLIGRAMS PER SQUARE METER)
70954 CHLOROPHYLL B, PHYTOPLANKTON, CHROMOTOGRAPHIC-FLUOROMETRIC (UG/L)
70952 CHLOROPHYLL B, PHYTOPLANKTON, CHROMOTOGRAPHIC-SPECTROPHOTOMETRIC (UG/L)
32231 CHLOROPHYLL B, PHYTOPLANKTON, SPECTROPHOTOMETRIC (UG/L)
32232 CHLOROPHYLL C, PHYTOPLANKTON, SPECTROPHOTOMETRIC (UG/L)
32234 CHLOROPHYLL, TOTAL, PHYTOPLANKTON, SPECTROPHOTOMETRIC, UNCORRECTED (UG/L)
39550 CHLOROTHION, TOTAL (UG/L)
01030 CHROMIUM, DISSOLVED (UG/L AS CR)
99922 CHROMIUM, HEXAVALENT (UG/L AS CR)
01032 CHROMIUM, HEXAVALENT, DISSOLVED (UG/L AS CR)
01031 CHROMIUM, SUSPENDED (UG/L AS CR)
01034 CHROMIUM, TOTAL (UG/L AS CR)
01029 CHROMIUM, TOTAL IN BOTTOM DEPOSITS (UG/G AS CR)
39910 CINERIN, TOTAL (UG/L)
00032 CLOUD COVER (PERCENT)
82031 COAL, TOTAL IN BOTTOM MATERIAL (GM/KG)
29601 COBALT 60, TOTAL (PCI/L)
29602 COBALT 60, TOTAL, COUNTING ERROR (PCI/L)
01035 COBALT, DISSOLVED (UG/L AS CO)
01036 COBALT, SUSPENDED (UG/L AS CO)
01037 COBALT, TOTAL (UG/L AS CO)
01038 COBALT, TOTAL IN BOTTOM DEPOSITS (UG/G AS CO)
31507 COLIFORM, COMPLETE (MOST PROBABLE NUMBER)
31505 COLIFORM, CONFIRMED (MOST PROBABLE NUMBER)
31625 COLIFORM, FECAL, .7 UM-MF (COLONIES/100 ML)
31619 COLIFORM, FECAL, BORIC ACID LACTOSE BROTH AT 43 DEGREES C. (MOST PROBABLE NUMBER)
31615 COLIFORM, FECAL, EC BROTH AT 44.5 DEGREES C. (MOST PROBABLE NUMBER)
31617 COLIFORM, FECAL, EIJKMAN TEST AT 44.5 DEGREES C. (MOST PROBABLE NUMBER)
31613 COLIFORM, FECAL, MEMBRANE FILTER, M-FC AGAR AT 44.5 DEGREES C., 24-HOUR (COLONIES/100 ML)
31616 COLIFORM, FECAL, MEMBRANE FILTER, M-FC MEDIA AT 44.5 DEGREES C. (COLONIES/100 ML)
31614 COLIFORM, FECAL, TUBE CONFIGURATION (MOST PROBABLE NUMBER)
31503 COLIFORM, MEMBRANE FILTER, DELAYED M-ENDO MEDIUM (COLONIES/100 ML)
31501 COLIFORM, MEMBRANE FILTER, IMMEDIATE M-ENDO MEDIUM (COLONIES/100 ML)
31508 COLIFORM, TOTAL, COMPLETED TEST, TUBE CONFIGURATION (MOST PROBABLE NUMBER)
31506 COLIFORM, TOTAL, CONFIRMED TEST, TUBE CONFIGURATION (MOST PROBABLE NUMBER)
00080 COLOR (PLATINUM-COBALT UNITS)
00095 CONDUCTANCE, SPECIFIC (MICROMHOS PER CM AT 25 DEGREES C.)
00094 CONDUCTANCE, SPECIFIC, FIELD (MICROMHOS PER CM AT 25 DEGREES C.)
90095 CONDUCTANCE, SPECIFIC, LAB (MICROMHOS PER CM AT 25 DEGREES C.)

Table 4: Water Quality Grab Sample Parameters. (cont.)

| | |
|---|---|
| 01040 | COPPER, DISSOLVED (UG/L AS CU) |
| 01041 | COPPER, SUSPENDED (UG/L AS CU) |
| 01042 | COPPER, TOTAL (UG/L AS CU) |
| 01043 | COPPER, TOTAL IN BOTTOM DEPOSITS (UG/G AS CU) |
| 01119 | COPPER, TOTAL RECOVERABLE (UG/L AS CU) |
| 71350 | COSMARIUM SPECIES (NUMBER/LITER) |
| 00009 | CROSS-SECTION LOCATION, FEET FROM LEFT BANK LOOKING DOWNSTREAM |
| 00001 | CROSS-SECTION LOCATION, FEET FROM RIGHT BANK LOOKING UPSTREAM |
| 00005 | CROSS-SECTION LOCATION, VERTICAL (PERCENT OF TOTAL DEPTH) |
| 00723 | CYANIDE, DISSOLVED (MG/L AS CN) |
| 00720 | CYANIDE, TOTAL (MG/L AS CN) |
| 00721 | CYANIDE, TOTAL IN BOTTOM DEPOSITS (UG/G AS CN) |
| 81570 | CYCLOHEXANE, TOTAL (UG/L) |
| 39770 | DACTHAL (DCPA), TOTAL (UG/L) |
| 39361 | DDD, DISSOLVED (UG/L) |
| 39362 | DDD, SUSPENDED TOTAL (UG/L) |
| 39360 | DDD, TOTAL (UG/L) |
| 39363 | DDD, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS) |
| 39366 | DDE, DISSOLVED (UG/L) |
| 39367 | DDE, SUSPENDED TOTAL (UG/L) |
| 39365 | DDE, TOTAL (UG/L) |
| 39368 | DDE, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS) |
| 39371 | DDT, DISSOLVED (UG/L) |
| 39372 | DDT, SUSPENDED TOTAL (UG/L) |
| 39370 | DDT, TOTAL (UG/L) |
| 39373 | DDT, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS) |
| 01345 | DEBRIS, FLOATING (SEVERITY) |
| 39560 | DEMETON, TOTAL (UG/L) |
| 71820 | DENSITY (GM/ML AT 20 DEGREES C.) |
| 72001 | DEPTH OF HOLE, TOTAL (FEET) |
| 72016 | DEPTH TO BOTTOM OF SAMPLE INTERVAL (FEET BELOW LAND SURFACE DATUM) |
| 72015 | DEPTH TO TOP OF SAMPLE INTERVAL (FEET BELOW LAND SURFACE DATUM) |
| 72002 | DEPTH TO TOP OF WATER-BEARING ZONE SAMPLED (FEET) |
| 72019 | DEPTH TO WATER LEVEL (FEET BELOW LAND SURFACE) |
| 72025 | DEPTH, RESERVOIR (FEET) |
| 00068 | DEPTH, SAMPLE, MAXIMUM (FEET) |
| 00003 | DEPTH, SAMPLING (FEET) |
| 00098 | DEPTH, SAMPLING (METERS) |
| 82300 | DEPTH, SNOW (INCHES) |
| 00064 | DEPTH, STREAM, MEAN (FEET) |
| 72008 | DEPTH, WELL, TOTAL (FEET) |
| 01305 | DETERGENT SUDS (SEVERITY) |
| 82082 | DEUTERIUM/PROTIUM (H-2/H-1) STABLE ISOTOPE RATIO PER MIL |
| 39572 | DIAZINON, DISSOLVED (UG/L) |
| 39573 | DIAZINON, SUSPENDED TOTAL (UG/L) |
| 39570 | DIAZINON, TOTAL (UG/L) |
| 39571 | DIAZINON, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS) |
| 39780 | DICOFOL, TOTAL (UG/L) |
| 39381 | DIELDRIN, DISSOLVED (UG/L) |
| 39382 | DIELDRIN, SUSPENDED TOTAL (UG/L) |
| 39380 | DIELDRIN, TOTAL (UG/L) |
| 39383 | DIELDRIN, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS) |
| 39470 | DILAN, TOTAL (UG/L) |
| 00060 | DISCHARGE, STREAM (CUBIC FEET PER SECOND) |
| 00061 | DISCHARGE, STREAM, INSTANTANEOUS (CUBIC FEET PER SECOND) |
| 39920 | DNOC, TOTAL (UG/L) |
| 82330 | DYSPROSIUM, TOTAL (UG/L AS DY) |
| 72020 | ELEVATION (FT ABV NAT GEODETIC VERT DATUM-1929) |
| 72009 | ELEVATION OF LAND SURFACE (FEET) |
| 72000 | ELEVATION OF LAND SURFACE DATUM (FT ABV NAT GEODETIC VERT DATUM-1929) |
| 00062 | ELEVATION, RESERVOIR, WATER SURFACE (FEET) |
| 39388 | ENDOSULFAN, TOTAL (UG/L) |
| 39389 | ENDOSULFAN, TOTAL IN BOTTOM MATERIAL, DRY WEIGHT (UG/KG) |
| 39391 | ENDRIN, DISSOLVED (UG/L) |
| 39392 | ENDRIN, SUSPENDED TOTAL (UG/L) |
| 39390 | ENDRIN, TOTAL (UG/L) |
| 39393 | ENDRIN, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS) |
| 01246 | ERBIUM, TOTAL (UG/L) |
| 39398 | ETHION, TOTAL (UG/L) |
| 39399 | ETHION, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS) |
| 01236 | EUROPIUM, TOTAL (UG/L) |
| 00050 | EVAPORATION, TOTAL (INCHES PER DAY) |
| 00022 | EXPOSURE, LENGTH OF (DAYS) |

Table 4: Water Quality Grab Sample Parameters. (cont.)

| | |
|---|---|
| 01340 | FISH, DEAD (SEVERITY) |
| 50050 | FLOW IN CONDUIT OR THROUGH A TREATMENT PLANT (MILLIONS OF GALLONS PER DAY) |
| 00056 | FLOW RATE (GALLONS PER DAY) |
| 00058 | FLOW RATE (GALLONS PER MINUTE) |
| 00059 | FLOW RATE, INSTANTANEOUS (GALLONS PER MINUTE) |
| 50051 | FLOW RATE, INSTANTANEOUS (MILLIONS OF GALLONS PER DAY) |
| 50053 | FLOW THROUGH A TREATMENT PLANT, MONTHLY AVERAGE (MILLIONS OF GALLONS PER DAY) |
| 00950 | FLUORIDE, DISSOLVED (MG/L AS F) |
| 91002 | FLUORIDE, DISSOLVED (UG/L) |
| 00951 | FLUORIDE, TOTAL (MG/L AS F) |
| 00953 | FLUORINE, TOTAL (UG/L) |
| 71880 | FORMALDEHYDE (MG/L) |
| 01219 | GADOLINIUM, TOTAL (UG/L) |
| 00065 | GAGE HEIGHT (FEET ABOVE DATUM) |
| 01120 | GALLIUM, DISSOLVED (UG/L AS GA) |
| 01121 | GALLIUM, SUSPENDED TOTAL (UG/L AS GA) |
| 01122 | GALLIUM, TOTAL (UG/L AS GA) |
| 01320 | GARBAGE, FLOATING (SEVERITY) |
| 01310 | GAS BUBBLES (SEVERITY) |
| 01125 | GERMANIUM, DISSOLVED (UG/L AS GE) |
| 01126 | GERMANIUM, SUSPENDED TOTAL (UG/L AS GE) |
| 01127 | GERMANIUM, TOTAL (UG/L AS GE) |
| 71910 | GOLD, TOTAL (UG/L AS AU) |
| 72050 | GROUND WATER, WITHDRAWAL (MILLIONS OF GALLONS PER MONTH) |
| 72051 | GROUND WATER, WITHDRAWAL (MILLIONS OF GALLONS PER YEAR) |
| 39580 | GUTHION, TOTAL (UG/L) |
| 01243 | HAFNIUM, TOTAL (UG/L) |
| 00901 | HARDNESS, CARBONATE (MG/L AS CACO3) |
| 00902 | HARDNESS, NONCARBONATE (MG/L AS CACO3) |
| 00900 | HARDNESS, TOTAL (MG/L AS CACO3) |
| 39421 | HEPTACHLOR EPOXIDE, DISSOLVED (UG/L) |
| 39422 | HEPTACHLOR EPOXIDE, SUSPENDED TOTAL (UG/L) |
| 39420 | HEPTACHLOR EPOXIDE, TOTAL (UG/L) |
| 39423 | HEPTACHLOR EPOXIDE, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS) |
| 39411 | HEPTACHLOR, DISSOLVED (UG/L) |
| 39412 | HEPTACHLOR, SUSPENDED TOTAL (UG/L) |
| 39410 | HEPTACHLOR, TOTAL (UG/L) |
| 39413 | HEPTACHLOR, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS) |
| 01247 | HOLMIUM, TOTAL (UG/L) |
| 71875 | HYDROGEN SULFIDE (MG/L AS H2S) |
| 71830 | HYDROXIDE ION (MG/L AS OH) |
| 01355 | ICE COVER, FLOATING OR SOLID (SEVERITY) |
| 39800 | IMIDAN, TOTAL (UG/L) |
| 70943 | INVERTEBRATES, BENTHIC, TOTAL (ORGANISMS PER SQUARE METER) |
| 70940 | INVERTEBRATES, BENTHIC, WET WEIGHT (GRAMS PER SQUARE METER) |
| 71865 | IODIDE, DISSOLVED (MG/L AS I) |
| 71866 | IODINE, TOTAL (MG/L AS I) |
| 01240 | IRIDIUM, TOTAL (UG/L) |
| 71885 | IRON (UG/L AS FE) |
| 01046 | IRON, DISSOLVED (UG/L AS FE) |
| 01048 | IRON, DISSOLVED FERRIC AND FERROUS (UG/L) |
| 99925 | IRON, FERRIC, DISSOLVED (UG/L AS FE) |
| 01047 | IRON, FERROUS (UG/L AS FE) |
| 99930 | IRON, FERROUS, DISSOLVED (UG/L AS FE) |
| 01044 | IRON, SUSPENDED (UG/L AS FE) |
| 74010 | IRON, TOTAL (MG/L AS FE) |
| 01045 | IRON, TOTAL (UG/L AS FE) |
| 01170 | IRON, TOTAL IN BOTTOM DEPOSITS (UG/G AS FE) |
| 00980 | IRON, TOTAL RECOVERABLE (UG/L AS FE) |
| 39431 | ISODRIN, DISSOLVED (UG/L) |
| 39432 | ISODRIN, SUSPENDED TOTAL (UG/L) |
| 39430 | ISODRIN, TOTAL (UG/L) |
| 39433 | ISODRIN, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS) |
| 99998 | LAB ID NUMBER FOR GRAB SAMPLE |
| 01182 | LANTHANUM, TOTAL (UG/L AS LA) |
| 17503 | LEAD 210, DISSOLVED (PCI/L) |
| 17504 | LEAD 210, DISSOLVED, COUNTING ERROR (PCI/L) |
| 17505 | LEAD 210, SUSPENDED (PCI/L) |
| 17506 | LEAD 210, SUSPENDED, COUNTING ERROR (PCI/L) |
| 01049 | LEAD, DISSOLVED (UG/L AS PB) |
| 01050 | LEAD, SUSPENDED (UG/L AS PB) |
| 01051 | LEAD, TOTAL (UG/L AS PB) |
| 01052 | LEAD, TOTAL IN BOTTOM DEPOSITS (UG/G AS PB) |
| 01114 | LEAD, TOTAL RECOVERABLE (UG/L AS PB) |

Table 4: Water Quality Grab Sample Parameters. (cont.)

39341 LINDANE, DISSOLVED (UG/L)
39342 LINDANE, SUSPENDED TOTAL (UG/L)
39340 LINDANE, TOTAL (UG/L)
39343 LINDANE, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)
01130 LITHIUM, DISSOLVED (UG/L AS LI)
01131 LITHIUM, SUSPENDED (UG/L AS LI)
01132 LITHIUM, TOTAL (UG/L AS LI)
00496 LOSS ON IGNITION, BOTTOM DEPOSITS (MG/KG)
01244 LUTETIUM, TOTAL (UG/L)
00920 MAGNESIUM (MG/L AS CACO3)
00925 MAGNESIUM, DISSOLVED (MG/L AS MG)
00926 MAGNESIUM, SUSPENDED TOTAL (MG/L AS MG)
00927 MAGNESIUM, TOTAL (MG/L AS MG)
39532 MALATHION, DISSOLVED (UG/L)
39533 MALATHION, SUSPENDED TOTAL (UG/L)
39530 MALATHION, TOTAL (UG/L)
39531 MALATHION, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)
71883 MANGANESE (UG/L AS MN)
29501 MANGANESE 54, TOTAL (PCI/L)
29502 MANGANESE 54, TOTAL, COUNTING ERROR (PCI/L)
01056 MANGANESE, DISSOLVED (UG/L AS MN)
01054 MANGANESE, SUSPENDED (UG/L AS MN)
01055 MANGANESE, TOTAL (UG/L AS MN)
01053 MANGANESE, TOTAL IN BOTTOM DEPOSITS (UG/G AS MN)
01123 MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)
71890 MERCURY, DISSOLVED (UG/L AS HG)
71895 MERCURY, SUSPENDED (UG/L AS HG)
71900 MERCURY, TOTAL (UG/L AS HG)
71921 MERCURY, TOTAL IN BOTTOM DEPOSITS (UG/G AS HG)
39480 METHOXYCHLOR, TOTAL (UG/L)
39481 METHOXYCHLOR, TOTAL IN BOTTOM MATERIAL, DRY WEIGHT (UG/KG)
39602 METHYL PARATHION, DISSOLVED (UG/L)
39603 METHYL PARATHION, SUSPENDED TOTAL (UG/L)
39600 METHYL PARATHION, TOTAL (UG/L)
39601 METHYL PARATHION, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)
39790 METHYL TRITHION, TOTAL (UG/L)
39791 METHYL TRITHION, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)
38260 METHYLENE BLUE ACTIVE SUBSTANCE (MG/L)
39755 MIREX, TOTAL (UG/L)
39758 MIREX, TOTAL IN BOTTOM MATERIAL, DRY WEIGHT (UG/KG)
01060 MOLYBDENUM, DISSOLVED (UG/L AS MO)
01061 MOLYBDENUM, SUSPENDED (UG/L AS MO)
01062 MOLYBDENUM, TOTAL (UG/L AS MO)
01063 MOLYBDENUM, TOTAL IN BOTTOM DEPOSITS (UG/G AS MO)
01129 MOLYBDENUM, TOTAL RECOVERABLE (UG/L AS MB)
34696 NAPHTHALENE, TOTAL (UG/L)
39250 NAPHTHALENES, POLYCHLORINATED (UG/L)
01237 NEODYMIUM, TOTAL (UG/L)
01065 NICKEL, DISSOLVED (UG/L AS NI)
01066 NICKEL, SUSPENDED (UG/L AS NI)
01067 NICKEL, TOTAL (UG/L AS NI)
01068 NICKEL, TOTAL IN BOTTOM DEPOSITS (UG/G AS NI)
01239 NIOBIUM, TOTAL (UG/L)
00639 NITROGEN, ALBUMINOID (MG/L AS N)
00623 NITROGEN, AMMONIA + ORGANIC (KJELDAHL), DISSOLVED (MG/L AS N)
00624 NITROGEN, AMMONIA + ORGANIC (KJELDAHL), SUSPENDED TOTAL (MG/L AS N)
00625 NITROGEN, AMMONIA + ORGANIC (KJELDAHL), TOTAL (MG/L AS N)
00626 NITROGEN, AMMONIA + ORGANIC (KJELDAHL), TOTAL IN BOTTOM DEPOSITS (MG/KG AS N)
00636 NITROGEN, AMMONIA + ORGANIC, DISSOLVED, ONE DETERMINATION (MG/L AS N)
00635 NITROGEN, AMMONIA + ORGANIC, TOTAL, ONE DETERMINATION (MG/L AS N)
00608 NITROGEN, AMMONIA, DISSOLVED (MG/L AS N)
71846 NITROGEN, AMMONIA, DISSOLVED (MG/L AS NH4)
00610 NITROGEN, AMMONIA, TOTAL (MG/L AS N)
71845 NITROGEN, AMMONIA, TOTAL (MG/L AS NH4)
00611 NITROGEN, AMMONIA, TOTAL IN BOTTOM DEPOSITS (MG/KG AS N)
00602 NITROGEN, DISSOLVED (MG/L AS N)
00618 NITROGEN, NITRATE, DISSOLVED (MG/L AS N)
71851 NITROGEN, NITRATE, DISSOLVED (MG/L AS NO3)
91003 NITROGEN, NITRATE, DISSOLVED (UG/L)
00620 NITROGEN, NITRATE, TOTAL (MG/L AS N)
71850 NITROGEN, NITRATE, TOTAL (MG/L AS NO3)
00621 NITROGEN, NITRATE, TOTAL IN BOTTOM DEPOSITS (MG/KG AS N)
00631 NITROGEN, NITRITE PLUS NITRATE, DISSOLVED (MG/L AS N)

Table 4: Water Quality Grab Sample Parameters. (cont.)

| | |
|---|---|
| 00630 | NITROGEN, NITRITE PLUS NITRATE, TOTAL (MG/L AS N) |
| 00633 | NITROGEN, NITRITE PLUS NITRATE, TOTAL IN BOTTOM DEPOSITS (MG/KG AS N) |
| 00613 | NITROGEN, NITRITE, DISSOLVED (MG/L AS N) |
| 71856 | NITROGEN, NITRITE, DISSOLVED (MG/L AS NO2) |
| 00615 | NITROGEN, NITRITE, TOTAL (MG/L AS N) |
| 71855 | NITROGEN, NITRITE, TOTAL (MG/L AS NO2) |
| 00616 | NITROGEN, NITRITE, TOTAL IN BOTTOM DEPOSITS (MG/KG AS N) |
| 00629 | NITROGEN, ORGANIC KJELDAHL, TOTAL (MG/L AS N) |
| 00607 | NITROGEN, ORGANIC, DISSOLVED (MG/L AS N) |
| 00605 | NITROGEN, ORGANIC, TOTAL (MG/L AS N) |
| 00600 | NITROGEN, TOTAL (MG/L AS N) |
| 71887 | NITROGEN, TOTAL (MG/L AS NO3) |
| 00603 | NITROGEN, TOTAL IN BOTTOM DEPOSITS (MG/KG AS N) |
| 76983 | NITROMETHANE, DISSOLVED (MG/L) |
| 00085 | ODOR (THRESHOLD NO. AT ROOM TEMP.) |
| 01330 | ODOR, ATMOSPHERIC (SEVERITY) |
| 01300 | OIL-GREASE (SEVERITY) |
| 00560 | OIL-GREASE, ELECTROMETRIC, INFRARED-FREON EXTRACTABLE, TOTAL RECOVERABLE (MG/L) |
| 00556 | OIL-GREASE, GRAVIMETRIC, FREON EXTRACTABLE, TOTAL RECOVERABLE (MG/L) |
| 00550 | OIL-GREASE, TOTAL (MG/L) |
| 99947 | ORGANIC SOLUTES, HYDROPHILIC, ACIDS (MG/L) |
| 99946 | ORGANIC SOLUTES, HYDROPHILIC, BASES (MG/L) |
| 99948 | ORGANIC SOLUTES, HYDROPHILIC, NEUTRAL (MG/L) |
| 99945 | ORGANIC SOLUTES, HYDROPHILIC, TOTAL (MG/L) |
| 99943 | ORGANIC SOLUTES, HYDROPHOBIC, ACIDS (MG/L) |
| 99942 | ORGANIC SOLUTES, HYDROPHOBIC, BASES (MG/L) |
| 99944 | ORGANIC SOLUTES, HYDROPHOBIC, NEUTRAL (MG/L) |
| 99941 | ORGANIC SOLUTES, HYDROPHOBIC, TOTAL (MG/L) |
| 01241 | OSMIUM, TOTAL (UG/L) |
| 00090 | OXIDATION REDUCTION POTENTIAL (MILLIVOLTS) |
| 71835 | OXYGEN CONSUMED, FILTERED (MG/L) |
| 71840 | OXYGEN CONSUMED, UNFILTERED (MG/L) |
| 00304 | OXYGEN DEMAND, BIOCHEMICAL, 2-DAY, 20 DEGREES C. (MG/L) |
| 00310 | OXYGEN DEMAND, BIOCHEMICAL, 5-DAY, 20 DEGREES C. (MG/L) |
| 00335 | OXYGEN DEMAND, CHEMICAL, .025N K2CR2O7 (MG/L) |
| 00340 | OXYGEN DEMAND, CHEMICAL, .25N K2CR2O7 (MG/L) |
| 00339 | OXYGEN DEMAND, CHEMICAL, IN BOTTOM DEPOSITS (MG/KG DRY WEIGHT) |
| 00302 | OXYGEN DEMAND, IMMEDIATE (MG/L) |
| 82085 | OXYGEN-18/OXYGEN-16 STABLE ISOTOPE RATIO PER MIL |
| 00300 | OXYGEN, DISSOLVED (MG/L) |
| 00301 | OXYGEN, DISSOLVED (PERCENT OF SATURATION) |
| 00299 | OXYGEN, DISSOLVED, ANALYSIS BY PROBE (MG/L) |
| 77133 | P-XYLENE, TOTAL (UG/L) |
| 01210 | PALLADIUM, TOTAL (UG/L AS PD) |
| 39542 | PARATHION, DISSOLVED (UG/L) |
| 39543 | PARATHION, SUSPENDED TOTAL (UG/L) |
| 39540 | PARATHION, TOTAL (UG/L) |
| 39541 | PARATHION, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS) |
| 39517 | PCB, DISSOLVED (UG/L) |
| 39518 | PCB, SUSPENDED TOTAL (UG/L) |
| 39516 | PCB, TOTAL (UG/L) |
| 39519 | PCB, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS) |
| 39251 | PCN, TOTAL IN BOTTOM MATERIAL, DRY WEIGHT (UG/KG) |
| 39034 | PERTHANE, TOTAL (UG/L) |
| 81886 | PERTHANE, TOTAL IN BOTTOM MATERIAL (UG/KG) |
| 00400 | PH, FIELD (STANDARD UNITS) |
| 00403 | PH, LABORATORY (STANDARD UNITS) |
| 32732 | PHENOLICS, DISSOLVED (UG/L) |
| 32730 | PHENOLS, TOTAL (UG/L) |
| 39610 | PHOSDRIN, TOTAL (UG/L) |
| 00653 | PHOSPHATE, SOLUBLE, TOTAL (MG/L AS PO4) |
| 70506 | PHOSPHATE, SOLUBLE, TOTAL, COLORIMETRIC METHOD (MG/L AS P) |
| 00650 | PHOSPHATE, TOTAL (MG/L AS PO4) |
| 70505 | PHOSPHATE, TOTAL, COLORIMETRIC METHOD (MG/L AS P) |
| 00666 | PHOSPHORUS, DISSOLVED (MG/L AS P) |
| 71888 | PHOSPHORUS, DISSOLVED (MG/L AS PO4) |
| 91004 | PHOSPHORUS, DISSOLVED (UG/L) |
| 00677 | PHOSPHORUS, HYDROLYZABLE + ORTHO, DISSOLVED (MG/L AS P) |
| 00678 | PHOSPHORUS, HYDROLYZABLE + ORTHO, TOTAL (MG/L AS P) |
| 00672 | PHOSPHORUS, HYDROLYZABLE, DISSOLVED (MG/L AS P) |
| 00669 | PHOSPHORUS, HYDROLYZABLE, TOTAL (MG/L AS P) |
| 00673 | PHOSPHORUS, ORGANIC, DISSOLVED (MG/L AS P) |

Table 4: Water Quality Grab Sample Parameters. (cont.)

00670 PHOSPHORUS, ORGANIC, TOTAL (MG/L AS P)
00671 PHOSPHORUS, ORTHOPHOSPHATE, DISSOLVED (MG/L AS P)
00660 PHOSPHORUS, ORTHOPHOSPHATE, DISSOLVED (MG/L AS PO4)
70507 PHOSPHORUS, ORTHOPHOSPHATE, TOTAL (MG/L AS P)
99950 PHOSPHORUS, ORTHOPHOSPHATE, TOTAL (MG/L AS PO4)
00665 PHOSPHORUS, TOTAL (MG/L AS P)
71886 PHOSPHORUS, TOTAL (MG/L AS PO4)
00668 PHOSPHORUS, TOTAL IN BOTTOM DEPOSITS (MG/KG AS P)
60050 PHYTOPLANKTON, TOTAL (CELLS/ML)
39720 PICLORAM, TOTAL (UG/L)
31751 PLATE COUNT, TOTAL, TPC AGAR, 35 DEGREES C, 24 HOURS (COLONIES/ML)
01171 PLATINUM, TOTAL (UG/L AS PT)
19503 POLONIUM 210, DISSOLVED (PCI/L)
19504 POLONIUM 210, DISSOLVED, COUNTING ERROR (PCI/L)
19505 POLONIUM 210, SUSPENDED (PCI/L)
19506 POLONIUM 210, SUSPENDED, COUNTING ERROR (PCI/L)
82068 POTASSIUM 40, DISSOLVED (PCI/L AS K40)
75038 POTASSIUM 40, TOTAL (PCI/L)
75037 POTASSIUM 40, TOTAL, COUNTING ERROR (PCI/L)
00935 POTASSIUM, DISSOLVED (MG/L AS K)
00937 POTASSIUM, TOTAL (MG/L AS K)
01238 PRASEODYMIUM, TOTAL (UG/L)
00045 PRECIPITATION, TOTAL (INCHES PER DAY)
00025 PRESSURE, BAROMETRIC (MM OF HG)
72004 PUMP OR FLOW PERIOD PRIOR TO SAMPLING (MINUTES)
39930 PYRETHRIN, TOTAL (UG/L)
09503 RADIUM 226, DISSOLVED (PCI/L)
09504 RADIUM 226, DISSOLVED, COUNTING ERROR (PCI/L)
09510 RADIUM 226, DISSOLVED, PLANCHET COUNT (PCI/L)
09511 RADIUM 226, DISSOLVED, RADON METHOD (PCI/L)
09505 RADIUM 226, SUSPENDED TOTAL (PCI/L)
09506 RADIUM 226, SUSPENDED, COUNTING ERROR (PCI/L)
09501 RADIUM 226, TOTAL (PCI/L)
81366 RADIUM 228, DISSOLVED (PCI/L AS RA-228)
81367 RADIUM 228, DISSOLVED, COUNTING ERROR (PCI/L AS RA-228)
81368 RADIUM 228, SUSPENDED (PCI/L AS RA-228)
81369 RADIUM 228, SUSPENDED, COUNTING ERROR (PCI/L AS RA-228)
11501 RADIUM 228, TOTAL (PCI/L AS RA-228)
11502 RADIUM 228, TOTAL, COUNTING ERROR (PCI/L AS RA-228)
00054 RESERVOIR STORAGE (ACRE-FEET)
72021 RESERVOIR STORAGE (CFS-DAYS)
71860 RESIDUAL SODIUM CARBONATE
00515 RESIDUE ON EVAPORATION AT 105 DEGREES C., DISSOLVED (MG/L)
00530 RESIDUE ON EVAPORATION AT 105 DEGREES C., SUSPENDED TOTAL (MG/L)
00500 RESIDUE ON EVAPORATION AT 105 DEGREES C., TOTAL (MG/L)
00525 RESIDUE, NONVOLATILE ON IGNITION, DISSOLVED (MG/L)
00548 RESIDUE, NONVOLATILE ON IGNITION, NON-SETTLEABLE (LOSS ON IGNITION ASH) (MG/L)
00540 RESIDUE, NONVOLATILE ON IGNITION, SUSPENDED (MG/L)
00510 RESIDUE, NONVOLATILE ON IGNITION, TOTAL (LOSS ON IGNITION ASH) (MG/L)
99953 RESIDUE, SETTLEABLE (ML/L)
00505 RESIDUE, TOTAL VOLATILE (LOSS ON IGNITION) (MG/L)
00520 RESIDUE, VOLATILE DISSOLVED (MG/L)
00549 RESIDUE, VOLATILE NON-SETTLEABLE (LOSS ON IGNITION) (MG/L)
00535 RESIDUE, VOLATILE, SUSPENDED (MG/L)
71876 RESIN ACID SOAP (MG/L)
72010 RESISTIVITY (OHM-METERS)
72014 RESISTIVITY, TEMPERATURE (DEGREES C.)
01242 RHENIUM, TOTAL (UG/L)
99955 RHODIUM, TOTAL (UG/L)
01135 RUBIDIUM, DISSOLVED (UG/L AS RB)
01136 RUBIDIUM, SUSPENDED TOTAL (UG/L AS RB)
01137 RUBIDIUM, TOTAL (UG/L AS RB)
28001 RUTHENIUM 106, TOTAL (PCI/L)
28002 RUTHENIUM 106, TOTAL, COUNTING ERROR (PCI/L)
82326 RUTHENIUM, TOTAL (UG/L AS RU)
71200 SALMONELLA, MEMBRANE FILTER (COLONIES/100 ML)
82322 SAMARIUM, TOTAL (UG/L AS SM)
00008 SAMPLE ACCOUNTING NUMBER
82301 SAMPLE LOCATION, SNOW COURSE, FROM BEGINNING MARKER (FEET)
99960 SAMPLE PRESERVATION METHOD
32002 SAMPLE SIZE (ML)
72005 SAMPLE SOURCE

Table 4: Water Quality Grab Sample Parameters. (cont.)

| | |
|---|---|
| 00063 | SAMPLING POINTS, NUMBER |
| 01089 | SCANDIUM, TOTAL (UG/L AS SC) |
| 80225 | SEDIMENT DISCHARGE, BEDLOAD (TONS PER DAY) |
| 80155 | SEDIMENT DISCHARGE, SUSPENDED (TONS PER DAY) |
| 80156 | SEDIMENT DISCHARGE, TOTAL, SUSPENDED PLUS BED MATERIAL (TONS PER DAY) |
| 80157 | SEDIMENT, BED MATERIAL, FALL DIAM., DISTILLED WATER, % FINER THAN .004 MM |
| 80158 | SEDIMENT, BED MATERIAL, FALL DIAM., DISTILLED WATER, % FINER THAN .062 MM |
| 80159 | SEDIMENT, BED MATERIAL, FALL DIAM., DISTILLED WATER, % FINER THAN .125 MM |
| 80160 | SEDIMENT, BED MATERIAL, FALL DIAM., DISTILLED WATER, % FINER THAN .250 MM |
| 80161 | SEDIMENT, BED MATERIAL, FALL DIAM., DISTILLED WATER, % FINER THAN .500 MM |
| 80162 | SEDIMENT, BED MATERIAL, FALL DIAM., DISTILLED WATER, % FINER THAN 1.00 MM |
| 80163 | SEDIMENT, BED MATERIAL, FALL DIAM., DISTILLED WATER, % FINER THAN 2.00 MM |
| 80164 | SEDIMENT, BED MATERIAL, SIEVE DIAM., % FINER THAN .062 MM |
| 80165 | SEDIMENT, BED MATERIAL, SIEVE DIAM., % FINER THAN .125 MM |
| 80166 | SEDIMENT, BED MATERIAL, SIEVE DIAM., % FINER THAN .250 MM |
| 80167 | SEDIMENT, BED MATERIAL, SIEVE DIAM., % FINER THAN .500 MM |
| 80168 | SEDIMENT, BED MATERIAL, SIEVE DIAM., % FINER THAN 1.00 MM |
| 80175 | SEDIMENT, BED MATERIAL, SIEVE DIAM., % FINER THAN 128.0 MM |
| 80172 | SEDIMENT, BED MATERIAL, SIEVE DIAM., % FINER THAN 16.0 MM |
| 80169 | SEDIMENT, BED MATERIAL, SIEVE DIAM., % FINER THAN 2.00 MM |
| 80173 | SEDIMENT, BED MATERIAL, SIEVE DIAM., % FINER THAN 32.0 MM |
| 80170 | SEDIMENT, BED MATERIAL, SIEVE DIAM., % FINER THAN 4.00 MM |
| 80174 | SEDIMENT, BED MATERIAL, SIEVE DIAM., % FINER THAN 64.0 MM |
| 80171 | SEDIMENT, BED MATERIAL, SIEVE DIAM., % FINER THAN 8.00 MM |
| 80226 | SEDIMENT, BEDLOAD, SIEVE DIAMETER, % FINER THAN .062 MM |
| 80227 | SEDIMENT, BEDLOAD, SIEVE DIAMETER, % FINER THAN .125 MM |
| 80228 | SEDIMENT, BEDLOAD, SIEVE DIAMETER, % FINER THAN .250 MM |
| 80229 | SEDIMENT, BEDLOAD, SIEVE DIAMETER, % FINER THAN .500 MM |
| 80230 | SEDIMENT, BEDLOAD, SIEVE DIAMETER, % FINER THAN 1.00 MM |
| 80238 | SEDIMENT, BEDLOAD, SIEVE DIAMETER, % FINER THAN 128.0 MM |
| 80234 | SEDIMENT, BEDLOAD, SIEVE DIAMETER, % FINER THAN 16.00 MM |
| 80231 | SEDIMENT, BEDLOAD, SIEVE DIAMETER, % FINER THAN 2.00 MM |
| 80235 | SEDIMENT, BEDLOAD, SIEVE DIAMETER, % FINER THAN 32.0 MM |
| 80232 | SEDIMENT, BEDLOAD, SIEVE DIAMETER, % FINER THAN 4.00 MM |
| 80236 | SEDIMENT, BEDLOAD, SIEVE DIAMETER, % FINER THAN 64.0 MM |
| 80237 | SEDIMENT, BEDLOAD, SIEVE DIAMETER, % FINER THAN 76.0 MM |
| 80233 | SEDIMENT, BEDLOAD, SIEVE DIAMETER, % FINER THAN 8.00 MM |
| 00495 | SEDIMENT, MOISTURE CONTENT IN SAMPLE (PERCENT OF TOTAL DRY WEIGHT) |
| 80154 | SEDIMENT, SUSPENDED, CONCENTRATION (MG/L) |
| 70337 | SEDIMENT, SUSPENDED, FALL DIAM., DISTILLED WATER, % FINER THAN .002 MM |
| 70338 | SEDIMENT, SUSPENDED, FALL DIAM., DISTILLED WATER, % FINER THAN .004 MM |
| 70339 | SEDIMENT, SUSPENDED, FALL DIAM., DISTILLED WATER, % FINER THAN .008 MM |
| 70340 | SEDIMENT, SUSPENDED, FALL DIAM., DISTILLED WATER, % FINER THAN .016 MM |
| 70341 | SEDIMENT, SUSPENDED, FALL DIAM., DISTILLED WATER, % FINER THAN .031 MM |
| 70342 | SEDIMENT, SUSPENDED, FALL DIAM., DISTILLED WATER, % FINER THAN .062 MM |
| 70343 | SEDIMENT, SUSPENDED, FALL DIAM., DISTILLED WATER, % FINER THAN .125 MM |
| 70344 | SEDIMENT, SUSPENDED, FALL DIAM., DISTILLED WATER, % FINER THAN .250 MM |
| 70345 | SEDIMENT, SUSPENDED, FALL DIAM., DISTILLED WATER, % FINER THAN .500 MM |
| 70346 | SEDIMENT, SUSPENDED, FALL DIAM., DISTILLED WATER, % FINER THAN 1.00 MM |
| 70347 | SEDIMENT, SUSPENDED, FALL DIAM., DISTILLED WATER, % FINER THAN 2.00 MM |
| 70326 | SEDIMENT, SUSPENDED, FALL DIAM., NATIVE WATER, % FINER THAN .002 MM |
| 70327 | SEDIMENT, SUSPENDED, FALL DIAM., NATIVE WATER, % FINER THAN .004 MM |
| 70328 | SEDIMENT, SUSPENDED, FALL DIAM., NATIVE WATER, % FINER THAN .008 MM |
| 70329 | SEDIMENT, SUSPENDED, FALL DIAM., NATIVE WATER, % FINER THAN .016 MM |
| 70330 | SEDIMENT, SUSPENDED, FALL DIAM., NATIVE WATER, % FINER THAN .031 MM |
| 70331 | SEDIMENT, SUSPENDED, SIEVE DIAM., % FINER THAN .062 MM |
| 70332 | SEDIMENT, SUSPENDED, SIEVE DIAM., % FINER THAN .125 MM |
| 70333 | SEDIMENT, SUSPENDED, SIEVE DIAM., % FINER THAN .250 MM |
| 70334 | SEDIMENT, SUSPENDED, SIEVE DIAM., % FINER THAN .500 MM |
| 70335 | SEDIMENT, SUSPENDED, SIEVE DIAM., % FINER THAN 1.00 MM |
| 70336 | SEDIMENT, SUSPENDED, SIEVE DIAM., % FINER THAN 2.00 MM |
| 80180 | SEDIMENT, TOTAL, CONCENTRATION (MG/L) |
| 80181 | SEDIMENT, TOTAL, FALL DIAM., DISTILLED WATER, % FINER THAN .002 MM |
| 80182 | SEDIMENT, TOTAL, FALL DIAM., DISTILLED WATER, % FINER THAN .004 MM |
| 80183 | SEDIMENT, TOTAL, FALL DIAM., DISTILLED WATER, % FINER THAN .008 MM |
| 80184 | SEDIMENT, TOTAL, FALL DIAM., DISTILLED WATER, % FINER THAN .016 MM |
| 80185 | SEDIMENT, TOTAL, FALL DIAM., DISTILLED WATER, % FINER THAN .031 MM |
| 80186 | SEDIMENT, TOTAL, FALL DIAM., DISTILLED WATER, % FINER THAN .062 MM |
| 80187 | SEDIMENT, TOTAL, FALL DIAM., DISTILLED WATER, % FINER THAN .125 MM |
| 80188 | SEDIMENT, TOTAL, FALL DIAM., DISTILLED WATER, % FINER THAN .250 MM |
| 80189 | SEDIMENT, TOTAL, FALL DIAM., DISTILLED WATER, % FINER THAN .500 MM |
| 80190 | SEDIMENT, TOTAL, FALL DIAM., DISTILLED WATER, % FINER THAN 1.00 MM |
| 80191 | SEDIMENT, TOTAL, FALL DIAM., DISTILLED WATER, % FINER THAN 2.00 MM |

Table 4: Water Quality Grab Sample Parameters. (cont.)

80192 SEDIMENT, TOTAL, FALL DIAM., NATIVE WATER, % FINER THAN .002 MM
80193 SEDIMENT, TOTAL, FALL DIAM., NATIVE WATER, % FINER THAN .004 MM
80194 SEDIMENT, TOTAL, FALL DIAM., NATIVE WATER, % FINER THAN .008 MM
80195 SEDIMENT, TOTAL, FALL DIAM., NATIVE WATER, % FINER THAN .016 MM
80196 SEDIMENT, TOTAL, FALL DIAM., NATIVE WATER, % FINER THAN .031 MM
80197 SEDIMENT, TOTAL, FALL DIAM., NATIVE WATER, % FINER THAN .062 MM
80198 SEDIMENT, TOTAL, FALL DIAM., NATIVE WATER, % FINER THAN .125 MM
80199 SEDIMENT, TOTAL, FALL DIAM., NATIVE WATER, % FINER THAN .250 MM
80200 SEDIMENT, TOTAL, FALL DIAM., NATIVE WATER, % FINER THAN .500 MM
80201 SEDIMENT, TOTAL, FALL DIAM., NATIVE WATER, % FINER THAN 1.00 MM
80202 SEDIMENT, TOTAL, FALL DIAM., NATIVE WATER, % FINER THAN 2.00 MM
80203 SEDIMENT, TOTAL, SIEVE DIAM., % FINER THAN .062 MM
80204 SEDIMENT, TOTAL, SIEVE DIAM., % FINER THAN .125 MM
80205 SEDIMENT, TOTAL, SIEVE DIAM., % FINER THAN .250 MM
80206 SEDIMENT, TOTAL, SIEVE DIAM., % FINER THAN .500 MM
80207 SEDIMENT, TOTAL, SIEVE DIAM., % FINER THAN 1.00 MM
80211 SEDIMENT, TOTAL, SIEVE DIAM., % FINER THAN 16.0 MM
80208 SEDIMENT, TOTAL, SIEVE DIAM., % FINER THAN 2.00 MM
80212 SEDIMENT, TOTAL, SIEVE DIAM., % FINER THAN 32.0 MM
80209 SEDIMENT, TOTAL, SIEVE DIAM., % FINER THAN 4.00 MM
80210 SEDIMENT, TOTAL, SIEVE DIAM., % FINER THAN 8.00 MM
01145 SELENIUM, DISSOLVED (UG/L AS SE)
01146 SELENIUM, SUSPENDED TOTAL (UG/L AS SE)
01147 SELENIUM, TOTAL (UG/L AS SE)
01148 SELENIUM, TOTAL IN BOTTOM DEPOSITS (UG/G AS SE)
71101 SESTON, ASH WEIGHT (MG/L)
71100 SESTON, TOTAL (MG/L)
39750 SEVIN, TOTAL (UG/L)
01335 SEWAGE SOLIDS, FRESH, FLOATING (SEVERITY)
00955 SILICA, DISSOLVED (MG/L AS SIO2)
00956 SILICA, TOTAL (MG/L AS SIO2)
01140 SILICON, DISSOLVED (UG/L AS SI)
01142 SILICON, TOTAL (UG/L AS SI)
01075 SILVER, DISSOLVED (UG/L AS AG)
01076 SILVER, SUSPENDED (UG/L AS AG)
01077 SILVER, TOTAL (UG/L AS AG)
01078 SILVER, TOTAL IN BOTTOM DEPOSITS (UG/G AS AG)
39762 SILVEX, DISSOLVED (UG/L)
39763 SILVEX, SUSPENDED TOTAL (UG/L)
39760 SILVEX, TOTAL (UG/L)
39761 SILVEX, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)
39025 SIMAZINE, TOTAL, COULSON CONDUCTIVITY (UG/L) (UG/L)
01315 SLUDGE, FLOATING (SEVERITY)
81026 SNOW, WATER CONTENT (INCHES)
00932 SODIUM (PERCENT)
00931 SODIUM ADSORPTION RATIO
00933 SODIUM PLUS POTASSIUM, DISSOLVED (MG/L AS NA)
00930 SODIUM, DISSOLVED (MG/L AS NA)
00929 SODIUM, TOTAL (MG/L AS NA)
74207 SOIL MOISTURE (PERCENT OF TOTAL)
00030 SOLAR RADIATION, INCIDENTAL, INTENSITY (CALORIES/SQUARE CENTIMETER/DAY)
70303 SOLIDS, DISSOLVED (TONS PER ACRE-FOOT)
70302 SOLIDS, DISSOLVED (TONS PER DAY)
70300 SOLIDS, DISSOLVED, RESIDUE ON EVAPORATION AT 180 DEGREES C. (MG/L)
70301 SOLIDS, DISSOLVED, SUM OF CONSTITUENTS (MG/L)
70299 SOLIDS, RESIDUE AT 110 DEGREES C., SUSPENDED TOTAL (MG/L)
70348 SOLIDS, SETTLEABLE (ML/L)
70349 SOLIDS, UNSETTLEABLE (ML/L)
72013 SPECIFIC GRAVITY
72012 SPECIFIC GRAVITY, TEMPERATURE (DEGREES C.)
80110 SPECIFIC GRAVITY, WATER, UNITY AT 4 DEGREES C.
00055 STREAM VELOCITY (FEET PER SECOND)
00004 STREAM WIDTH (FEET)
31677 STREPTOCOCCI, FECAL (MOST PROBABLE NUMBER)
31673 STREPTOCOCCI, FECAL, MEMBRANE FILTER, KF AGAR (COLONIES/100 ML)
31679 STREPTOCOCCI, FECAL, MEMBRANE FILTER, M-ENTEROCOCCUS AGAR (COLONIES/100 ML)
31671 STREPTOCOCCI, FECAL, PLATE COUNT, KF AGAR, 35 DEGREES C., 48-HOUR (COLONIES/100 ML)
31672 STREPTOCOCCI, FECAL, PLATE COUNT, M-ENTER AGAR, 35 DEGREES C., 48-HOUR (COLONIES/100 ML)
31678 STREPTOCOCCI, FECAL, TUBE CONFIGURATION
15501 STRONTIUM 89, TOTAL (PCI/L)

Table 4: Water Quality Grab Sample Parameters. (cont.)

15502 STRONTIUM 89, TOTAL, COUNTING ERROR (PCI/L)
13503 STRONTIUM 90, DISSOLVED (PCI/L)
13504 STRONTIUM 90, DISSOLVED, COUNTING ERROR (PCI/L)
13505 STRONTIUM 90, SUSPENDED TOTAL (PCI/L)
13506 STRONTIUM 90, SUSPENDED TOTAL, COUNTING ERROR (PCI/L)
13501 STRONTIUM 90, TOTAL (PCI/L)
13502 STRONTIUM 90, TOTAL, COUNTING ERROR (PCI/L)
01080 STRONTIUM, DISSOLVED (UG/L AS SR)
01081 STRONTIUM, SUSPENDED (UG/L AS SR)
01082 STRONTIUM, TOTAL (UG/L AS SR)
01083 STRONTIUM, TOTAL IN BOTTOM DEPOSITS (UG/G AS SR)
00945 SULFATE, DISSOLVED (MG/L AS SO4)
70291 SULFATE, DISSOLVED (TONS PER DAY)
91005 SULFATE, DISSOLVED (UG/L)
00946 SULFATE, TOTAL (MG/L)
00746 SULFIDE, DISSOLVED (MG/L AS S)
00745 SULFIDE, TOTAL (MG/L AS S)
00740 SULFITE (MG/L AS SO3)
82086 SULFUR-34/SULFUR-32 STABLE ISOTOPE RATIO PER MIL
80107 SULPHUR, TOTAL (MG/L)
00049 SURFACE AREA (SQUARE MILES)
32240 TANNIN AND LIGNIN (MG/L)
82318 TANTALUM, TOTAL (UG/L AS TA)
01064 TELLURIUM, TOTAL (UG/L AS TE)
00020 TEMPERATURE, AIR (DEGREES C.)
00013 TEMPERATURE, EVAPORATION, 24-INCH PAN (DEGREES C.)
00012 TEMPERATURE, EVAPORATION, 48-INCH PAN (DEGREES C.)
81027 TEMPERATURE, SOIL (DEGREES C.)
00010 TEMPERATURE, WATER (DEGREES C.)
00014 TEMPERATURE, WET BULB (DEGREES C.)
39620 TEPP, TOTAL (UG/L)
01218 TERBIUM, TOTAL (UG/L)
00738 TETRATHIONATE, DISSOLVED (MG/L)
00739 TETRATHIONATE, TOTAL (MG/L)
01059 THALLIUM, TOTAL (UG/L AS TL)
00731 THIOCYANATE, DISSOLVED (MG/L AS SCN)
00730 THIOCYANATE, TOTAL (MG/L AS SCN)
00737 THIOSULFATE, DISSOLVED (MG/L)
81317 THIOSULFATE, TOTAL (MG/L AS S2O3)
26503 THORIUM 230, DISSOLVED (PCI/L)
26504 THORIUM 230, DISSOLVED, COUNTING ERROR (PCI/L)
26505 THORIUM 230, SUSPENDED (PCI/L)
26506 THORIUM 230, SUSPENDED, COUNTING ERROR (PCI/L)
22501 THORIUM 232, TOTAL (PCI/L)
22502 THORIUM 232, TOTAL, COUNTING ERROR (PCI/L)
82364 THORIUM, TOTAL (UG/L AS TH)
01245 THULIUM, TOTAL (UG/L)
01100 TIN, DISSOLVED (UG/L AS SN)
01101 TIN, SUSPENDED (UG/L AS SN)
01102 TIN, TOTAL (UG/L AS SN)
01150 TITANIUM, DISSOLVED (UG/L AS TI)
01151 TITANIUM, SUSPENDED TOTAL (UG/L AS TI)
01152 TITANIUM, TOTAL (UG/L AS TI)
01153 TITANIUM, TOTAL IN BOTTOM DEPOSITS (UG/G AS TI)
34010 TOLUENE, TOTAL (UG/L)
39401 TOXAPHENE, DISSOLVED (UG/L)
39402 TOXAPHENE, SUSPENDED TOTAL (UG/L)
39400 TOXAPHENE, TOTAL (UG/L)
39403 TOXAPHENE, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)
00077 TRANSPARENCY, SECCHI DISK (INCHES)
39786 TRITHION, TOTAL (UG/L)
39787 TRITHION, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS)
07012 TRITIUM IN WATER MOLECULES (TRITIUM UNITS)
07013 TRITIUM IN WATER MOLECULES, COUNTING ERROR (TRITIUM UNITS)
07005 TRITIUM, DISSOLVED (PCI/L)
07018 TRITIUM, DISSOLVED (TRITIUM UNITS)
07006 TRITIUM, DISSOLVED, COUNTING ERROR (PCI/L)
07015 TRITIUM, DISSOLVED, COUNTING ERROR (TRITIUM UNITS)
07010 TRITIUM, SUSPENDED TOTAL (PCI/L)
07016 TRITIUM, SUSPENDED TOTAL (TRITIUM UNITS)
07011 TRITIUM, SUSPENDED TOTAL, COUNTING ERROR (PCI/L)
07014 TRITIUM, SUSPENDED TOTAL, COUNTING ERROR (TRITIUM UNITS)
07000 TRITIUM, TOTAL (PCI/L)

Table 4: Water Quality Grab Sample Parameters. (cont.)

| | |
|---|---|
| 07017 | TRITIUM, TOTAL (TRITIUM UNITS) |
| 07001 | TRITIUM, TOTAL, COUNTING ERROR (PCI/L) |
| 07019 | TRITIUM, TOTAL, COUNTING ERROR (TRITIUM UNITS) |
| 01154 | TUNGSTEN, TOTAL (UG/L AS W) |
| 00070 | TURBIDITY (JTU) |
| 00076 | TURBIDITY (NTU) |
| 01350 | TURBIDITY (SEVERITY) |
| 99962 | TURBIDITY, HACH KIT (FTU) |
| 00075 | TURBIDITY, HELLIGE (MG/L AS SILICON DIOXIDE) |
| 00074 | TURBIDITY, LIGHT TRANSMITTED, 1 METER PATHLENGTH (PERCENT) |
| 80010 | URANIUM, DISSOLVED, DIRECT FLUOROMETRIC (PCI/L) |
| 99965 | URANIUM, DISSOLVED, DIRECT FLUOROMETRIC, COUNTING ERROR (PCI/L) |
| 80015 | URANIUM, DISSOLVED, EXTRACTION FLUOROMETRIC (PCI/L) |
| 80020 | URANIUM, DISSOLVED, EXTRACTION FLUOROMETRIC (UG/L) |
| 22703 | URANIUM, NATURAL, DISSOLVED (UG/L) |
| 22705 | URANIUM, NATURAL, SUSPENDED TOTAL (UG/L AS U NATURAL) |
| 22708 | URANIUM, NATURAL, TOTAL (MG/L) |
| 28011 | URANIUM, NATURAL, TOTAL (UG/L AS U) |
| 22706 | URANIUM, TOTAL (UG/L AS U308) |
| 99970 | URANIUM, TOTAL (UG/L) |
| 99975 | URANIUM, TOTAL, COUNTING ERROR (UG/L) |
| 01085 | VANADIUM, DISSOLVED (UG/L AS V) |
| 01086 | VANADIUM, SUSPENDED TOTAL (UG/L AS V) |
| 01087 | VANADIUM, TOTAL (UG/L AS V) |
| 01088 | VANADIUM, TOTAL IN BOTTOM DEPOSITS (UG/G AS V) |
| 00041 | WEATHER |
| 00036 | WIND DIRECTION IN DEGREES FROM TRUE NORTH (CLOCKWISE) |
| 00035 | WIND VELOCITY (MILES PER HOUR) |
| 01196 | YTTERBIUM, TOTAL (UG/L AS YB) |
| 01203 | YTTRIUM, TOTAL (UG/L AS Y) |
| 29301 | ZINC 65, TOTAL (PCI/L) |
| 29302 | ZINC 65, TOTAL, COUNTING ERROR (PCI/L) |
| 01090 | ZINC, DISSOLVED (UG/L AS ZN) |
| 01091 | ZINC, SUSPENDED (UG/L AS ZN) |
| 01092 | ZINC, TOTAL (UG/L AS ZN) |
| 01093 | ZINC, TOTAL IN BOTTOM DEPOSITS (UG/G AS ZN) |
| 01094 | ZINC, TOTAL RECOVERABLE (UG/L AS ZN) |
| 01160 | ZIRCONIUM, DISSOLVED (UG/L AS ZR) |
| 75032 | ZIRCONIUM, NIOBIUM 95, TOTAL (PCI/L) |
| 75031 | ZIRCONIUM, NIOBIUM 95, TOTAL, COUNTING ERROR (PCI/L) |
| 01161 | ZIRCONIUM, SUSPENDED TOTAL (UG/L AS ZR) |
| 01162 | ZIRCONIUM, TOTAL (UG/L AS ZR) |
| 39732 | 2,4-D, DISSOLVED (UG/L) |
| 39733 | 2,4-D, SUSPENDED TOTAL (UG/L) |
| 39730 | 2,4-D, TOTAL (UG/L) |
| 39731 | 2,4-D, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS) |
| 82183 | 2,4-DICHLORPROP, TOTAL (UG/L) |
| 34609 | 2,4-DIMETHYLPHENOL, TOTAL IN BOTTOM MATERIAL, DRY WEIGHT (UG/KG) |
| 39742 | 2,4,5-T, DISSOLVED (UG/L) |
| 39743 | 2,4,5-T, SUSPENDED TOTAL (UG/L) |
| 39740 | 2,4,5-T, TOTAL (UG/L) |
| 39741 | 2,4,5-T, TOTAL IN BOTTOM DEPOSITS (UG/KG DRY SOLIDS) |

## Programs

### ANCAT

This program calculates ion ratios and the anion/cation balance from water quality grab samples. The balance is computed by dividing the difference of the cations and anions by the total cations and anions, and multiplying by 100. These are based on the following eight parameters (with their USGS/WRDS parameter codes):

| Anions | Cations |
|---|---|
| bicarbonate (440/49) | sodium (930/126) |
| carbonate (445/50) | potassium (935/130) |
| dissolved chloride (940/132) | calcium (915/120) |
| sulfate (945/133) | magnesium (925/122) |

Total dissolved solids concentrations (USGS/WRDS parameters 70300/467 and 70301/468) are also reported. The anions and cations are printed in milliequivalents per liter and as a percentage of the anion or cation total. The assumption made here is that the eight parameters examined represent essentially all of the anions and cations present. If none of the eight parameters is present, that sample is not printed. If only some parameters are present, the ratios and balance printed should be regarded as suspect.

For each request, the user should specify:

Primary retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- site type
- source organization
- use
- township-range (Wyoming only)
- station number
- source organization station number

ANCAT (continued)

Secondary retrieval, if any, and value range:
- latitude-longitude
- county-state
- drainage basin
- site type
- source organization
- use
- township-range (Wyoming only)
- aquifer
- station number
- source organization station number

Date range (year, month, day)

Labs to exclude, if any (up to three)

**STATION NO. 9188500 GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING
LATITUDE 43-01-00 LONGITUDE 110-07-20 IN SUBLETTE COUNTY ELEVATION 7468.00 FT.
1/4- 1/4 SECTION 8 TOWNSHIP 35N RANGE 111W 6TH P.M. DRAINAGE BASIN CODE 15620000
SITE TYPE STREAM USE MONITORING OR OBSERVATION USGS STN. NO. 9188500
DRAINAGE AREA 468.00 SQ. MI. NONCONTRIBUTING 0.00 SQ. MI.
WRRI DATA 1973-1974

* AFTER A VALUE TAGS IT AS LESS-THAN
$ AFTER A VALUE TAGS IT AS GREATER-THAN

22 JAN 80 TIME 1500
COLL. BY USGS
TESTING : UNKNOWN
TREATED : UNKNOWN

| DISSOLVED SODIUM MILLIEQUIV (PER CENT) | DISSOLVED POTASSIUM MILLIEQUIV (PER CENT) | DISSOLVED CALCIUM MILLIEQUIV (PER CENT) | DISSOLVED MAGNESIUM MILLIEQUIV (PER CENT) | BICARBONATE ION MILLIEQUIV (PER CENT) | CARBONATE ION MILLIEQUIV (PER CENT) | DISSOLVED CHLORIDE MILLIEQUIV (PER CENT) | SULFATE ION MILLIEQUIV (PER CENT) |
|---|---|---|---|---|---|---|---|
| .16530 ( 2.77433) | .03836 ( .64374) | 4.19160 ( 70.35016) | 1.56294 ( 26.23177) | ---------- ( 0.00000) | ---------- ( 0.00000) | .03949 ( 1.04286) | 3.74760 ( 98.95714) |

| BALANCE | TDS | TDS-ROE | CA/MG | CL/SO4 | CL/NA | HCO3/SO4 | NA/(CA+MG) |
|---|---|---|---|---|---|---|---|
| 22.278467 | 370.00000 | ---------- | 2.68187 | .01054 | .23892 | ---------- | .02873 |

27 FEB 80 TIME 1500
COLL. BY USGS
TESTING : UNKNOWN
TREATED : UNKNOWN

| DISSOLVED SODIUM MILLIEQUIV (PER CENT) | DISSOLVED POTASSIUM MILLIEQUIV (PER CENT) | DISSOLVED CALCIUM MILLIEQUIV (PER CENT) | DISSOLVED MAGNESIUM MILLIEQUIV (PER CENT) | BICARBONATE ION MILLIEQUIV (PER CENT) | CARBONATE ION MILLIEQUIV (PER CENT) | DISSOLVED CHLORIDE MILLIEQUIV (PER CENT) | SULFATE ION MILLIEQUIV (PER CENT) |
|---|---|---|---|---|---|---|---|
| .13920 ( 2.01960) | .03580 ( .51938) | 4.99000 ( 72.39797) | 1.72746 ( 25.06305) | ---------- ( 0.00000) | ---------- ( 0.00000) | .02257 ( .56727) | 3.95580 ( 99.43273) |

| BALANCE | TDS | TDS-ROE | CA/MG | CL/SO4 | CL/NA | HCO3/SO4 | NA/(CA+MG) |
|---|---|---|---|---|---|---|---|
| 26.806519 | 397.00000 | ---------- | 2.88663 | .00571 | .16213 | ---------- | .02072 |

DATEWQ

This program lists the dates of grab and/or daily water quality samples for a selected set of stations. For each station within the specified area, a header is printed which includes the reference number, station name, elevation, and location by: township-range, latitude-longitude, county (or state if outside Wyoming), and drainage basin. Site type, use (if known), and aquifer (if known) for ground water, the total and non-contributing drainage area for streams, depth for wells, and discharge permit number (if applicable) are also printed in the header.

In addition to having the header information printed for selected stations, the user may elect to have the collection dates for grab samples listed. If desired, the range of years for which daily samples are available will also be printed. If the user wishes to select particular water quality parameters for which headers and dates are to be listed, this option is available; otherwise, all parameters will be included. Another option is to print only those values that do not meet U.S. Public Health Department standards. The user may also exclude data analyzed by specified laboratories.

For each listing, the user should specify:

Primary retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- site type
- source organization
- use
- township-range (Wyoming only)
- station number
- source organization station number

DATEWQ (continued)

Secondary retrieval method, if any, and value range:
- latitude-longitude
- county-state
- drainage basin
- site type
- source organization
- use
- township-range (Wyoming only)
- aquifer
- station number
- source organization station number

Whether grab and/or daily dates are to be listed

Selected parameters for which dates are to be listed (if not all parameters)

Whether or not to print only those values that do not meet U.S. Public Health Department drinking water standards

Labs to exclude, if any (up to three)

ALL PARAMETERS WERE SELECTED FOR THE RETRIEVAL OF GRAB SAMPLES IN THIS LISTING.

**STATION NO. 11958 BUCKSKIN MINE WELL P4
LATITUDE 44-26-36 LONGITUDE 105-33-00 IN CAMPBELL COUNTY ELEVATION 4222.70 FT.
SW1/4-NW1/4 SECTION 32 TOWNSHIP 52N RANGE 72W 6TH P.M. DRAINAGE BASIN CODE 06011800
SITE TYPE WELL USE MONITORING OR OBSERVATION WYO DEQ STN. NO. 500
AQUIFER 125FRUN WELL DEPTH 119.0 FT.
WELL SCREENED AT 32-119 SAMPLING METHOD- BAIL

****DATES OF GRAB SAMPLES****
25 NOV 75 25 NOV 75 15 JAN 76 8 MAR 76 19 APR 76 2 JUN 76 20 JUL 76 11 AUG 76 1 SEP 76 12 OCT 76
12 OCT 76 2 NOV 77

**STATION NO. 11959 BUCKSKIN MINE WELL P4-C
LATITUDE 44-26-36 LONGITUDE 105-33-00 IN CAMPBELL COUNTY ELEVATION 4223.40 FT.
SW1/4-NW1/4 SECTION 32 TOWNSHIP 52N RANGE 72W 6TH P.M. DRAINAGE BASIN CODE 06011800
SITE TYPE WELL USE MONITORING OR OBSERVATION WYO DEQ STN. NO. 500
AQUIFER 125FRUN WELL DEPTH 245.0 FT.
WELL SCREENED AT 130-244 SAMPLING METHOD- BAIL

****DATES OF GRAB SAMPLES****
25 NOV 75 15 JAN 76 8 MAR 76 8 MAR 76 19 APR 76 19 APR 76 2 JUN 76 2 JUN 76 20 JUL 76 11 AUG 76
1 SEP 76 12 OCT 76 2 DEC 76 2 NOV 77

**STATION NO. 11960 BUCKSKIN MINE WELL P5
LATITUDE 44-25-38 LONGITUDE 105-32-21 IN CAMPBELL COUNTY ELEVATION 4200.00 FT.
1/4- 1/4 SECTION 5 TOWNSHIP 51N RANGE 72W 6TH P.M. DRAINAGE BASIN CODE 06011800
SITE TYPE WELL USE MONITORING OR OBSERVATION WYO DEQ STN. NO. 500
AQUIFER MISSING WELL DEPTH MISSING
SAMPLING METHOD-BAIL

****DATES OF GRAB SAMPLES****
25 NOV 75 15 JAN 76 8 MAR 76 19 APR 76 2 JUN 76 11 AUG 76 2 NOV 77

**STATION NO. 11961 BUCKSKIN MINE WELL P5-C
LATITUDE 44-25-44 LONGITUDE 105-32-30 IN CAMPBELL COUNTY ELEVATION 4186.40 FT.
SE1/4-NW1/4 SECTION 5 TOWNSHIP 51N RANGE 72W 6TH P.M. DRAINAGE BASIN CODE 06011800
SITE TYPE WELL USE MONITORING OR OBSERVATION WYO DEQ STN. NO. 500
AQUIFER 125FRUN WELL DEPTH 210.0 FT.
WELL SCREENED AT 125-210 10 JUN 79-PUMP ALL OTHER SAMPLES-BAIL

****DATES OF GRAB SAMPLES****
20 JUL 76 1 SEP 76 12 OCT 76 10 JUN 79

LISTDATAWQ

This program retrieves water quality data by one of eight header items. An optional secondary retrieval can also be made. Station headers are printed along with either grab or daily data. As with DATEWQ, particular parameters can be selected, the analysis can include only those values not meeting U.S. Public Health Department (USPH) drinking water standards, and specified labs can be excluded from analysis. Grab parameter values printed can also be flagged for not meeting either USPH or EPA standards, and milli-equivalents per liter can be printed for applicable parameters.

Unlike the other LISTDATA programs, LISTDATAWQ has the option to print statistics computed from the grab data with or without printing the grab data themselves. These statistics include the maximum, minimum, mean, standard deviation, ratio test value, ratio test results, the distribution curve skewness, and the coefficient of variation. Also, the data for up to five stations can be combined as one set of values for these statistics.

For each request, the user should specify:

Primary retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- site type
- source organization
- use
- township-range (Wyoming only)
- station number
- source organization station number

LISTDATAWQ (continued)

Secondary retrieval method, if any, and value range:
- Latitude-longitude
- county-state
- drainage basin
- site type
- source organization
- use
- township-range (Wyoming only)
- aquifer
- station number
- source organization station number

Whether grab or daily data are to be retrieved

Date range - dates are specified as follows:
- Year, month, day for grab sample data
- Year for daily sample data

Whether or not statistics for grab data are to be printed

Selected parameters to print, unless all data are to be printed

Whether or not milliequivalents are to be printed for grab data

Whether or not to print only those values that do not meet U.S. Public Health Department drinking water standards

Whether either of the following two situations is to be flagged:
1) grab parameter values do not meet the U.S. Public Health Department's drinking water requirements; or
2) grab parameter values do not meet the EPA's standards

Labs to exclude, if any (up to three)

Station numbers to combine, if any

**STATION NO. 9188500 GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING
LATITUDE 43-01-00 LONGITUDE 110-07-20 IN SUBLETTE COUNTY ELEVATION 7468.00 FT.
1/4- 1/4 SECTION 8 TOWNSHIP 35N RANGE 111W 6TH P.M. DRAINAGE BASIN CODE 15620000
SITE TYPE STREAM USE MONITORING OR OBSERVATION USGS STN. NO. 9188500
DRAINAGE AREA 468.00 SQ. MI. NONCONTRIBUTING 0.00 SQ. MI.
WRRI DATA 1973-1974

* AFTER A VALUE TAGS IT AS LESS-THAN
$ AFTER A VALUE TAGS IT AS GREATER-THAN

| COLLECTED BY / TESTING LAB UNKNOWN / TREATMENT UNKNOWN | USGS | 7 WATER TEMPERATURE DEG. C | 23 STREAMFLOW CFS | 24 INSTANT. STREAMFLOW CFS | 28 TURBIDITY JTU | 34 CONDUCTIVITY MICROMHOS AT 25 DEG. C | 36 DISSOLVED OXYGEN MG/L |
|---|---|---|---|---|---|---|---|
| 22 JAN 78 TIME 1100 | | 0. | ---------- | 87.0000 | 1.00000 | 520.000 | ---------- |
| 31 JAN 78 TIME 1415 | | 0. | ---------- | 110.000 | 1.00000 | 480.000 | ---------- |
| 19 FEB 78 TIME 1130 | | 0. | ---------- | 80.0000 | 0. | 430.000 | 9.80000 |
| 7 MAR 78 TIME 1245 | | 0. | ---------- | 96.0000 | 1.00000 | 580.000 | ---------- |
| 18 MAR 78 TIME 1115 | | 0. | ---------- | 97.0000 | 1.00000 | 570.000 | 10.2000 |
| 28 MAR 78 TIME 1615 | | 1.00000 | ---------- | 140.000 | ---------- | 540.000 | ---------- |
| 31 MAR 78 TIME 1125 | | .500000 | ---------- | 160.000 | ---------- | ---------- | ---------- |
| 30 APR 78 TIME 1430 | | 6.00000 | ---------- | 490.000 | 2.00000 | 460.000 | 9.80000 |
| 2 MAY 78 TIME 1815 | | 12.0000 | ---------- | 545.000 | 5.00000 | 420.000 | ---------- |
| 24 MAY 78 TIME 1150 | | 7.50000 | ---------- | 1150.00 | 15.0000 | 220.000 | ---------- |
| 27 MAY 78 TIME 1230 | | 10.0000 | ---------- | 1340.00 | 2.00000 | 330.000 | 10.8000 |
| 1 JUN 78 TIME 1200 | | 9.00000 | ---------- | 1170.00 | 5.00000 | 300.000 | ---------- |
| 13 JUN 78 TIME 1525 | | 10.5000 | ---------- | 1860.00 | 6.00000 | 190.000 | ---------- |
| 20 JUN 78 TIME 1130 | | 9.00000 | ---------- | 2030.00 | 6.00000 | 210.000 | 9.30000 |
| 27 JUN 78 TIME 1800 | | 12.0000 | ---------- | 2180.00 | 4.00000 | 160.000 | ---------- |
| 19 JUL 78 TIME 2030 | | 14.5000 | ---------- | 1750.00 | 6.00000 | 140.000 | ---------- |
| 2 AUG 78 TIME 1730 | | 17.0000 | ---------- | 1030.00 | 2.00000 | 130.000 | ---------- |
| 5 AUG 78 TIME 1030 | | 13.5000 | ---------- | 857.000 | ---------- | 185.000 | 8.40000 |
| 31 AUG 78 TIME 1315 | | 15.5000 | ---------- | 333.000 | 1.00000 | 245.000 | ---------- |
| 2 SEP 78 TIME 1130 | | 14.0000 | ---------- | 333.000 | 1.00000 | 290.000 | 8.20000 |
| 1 OCT 78 TIME 1030 | | 8.00000 | ---------- | 235.000 | 1.00000 | 370.000 | 8.80000 |
| 29 OCT 78 TIME 1040 | | 3.50000 | ---------- | 154.000 | 1.00000 | 460.000 | 10.3000 |
| 26 NOV 78 TIME 1100 | | 0. | 125.000 | ---------- | 1.00000 | 500.000 | 10.4000 |
| 22 DEC 78 TIME 1030 | | 0. | 120.000 | ---------- | 1.00000 | 540.000 | 9.70000 |
| 20 JAN 79 TIME 1200 | | 0. | 102.000 | ---------- | 1.00000 | 540.000 | 9.10000 |
| 25 FEB 79 TIME 1100 | | 0. | 104.000 | ---------- | 1.00000 | 590.000 | 9.50000 |
| 2 APR 79 TIME 1100 | | .500000E-05 | 140.000 | ---------- | 2.00000 | 570.000 | 10.3000 |
| 30 APR 79 TIME 1040 | | 6.00000 | ---------- | 435.000 | 4.00000 | 445.000 | 9.80000 |
| 4 JUN 79 TIME 1000 | | 11.0000 | ---------- | 882.000 | 3.00000 | 280.000 | 8.70000 |
| 25 JUN 79 TIME 1020 | | 13.5000 | ---------- | 968.000 | 2.00000 | 175.000 | 8.10000 |
| 4 AUG 79 TIME 915 | | 13.0000 | ---------- | 440.000 | 1.00000 | 205.000 | 8.20000 |
| 29 AUG 79 TIME 1300 | | 16.0000 | ---------- | 351.000 | 1.00000 | 245.000 | 8.20000 |
| 26 SEP 79 TIME 1300 | | 12.0000 | ---------- | 188.000 | 1.00000 | 360.000 | 10.4000 |
| 24 OCT 79 TIME 1400 | | 7.00000 | ---------- | 179.000 | 2.00000 | 440.000 | 9.40000 |
| 28 NOV 79 TIME 1400 | | .500000E-05 | ---------- | ---------- | 2.00000 | 560.000 | 10.0000 |
| 18 DEC 79 TIME 1430 | | .500000E-05 | ---------- | ---------- | 2.00000 | 600.000 | 10.6000 |
| 22 JAN 80 TIME 1500 | | .500000E-05 | ---------- | ---------- | 1.00000 | 520.000 | 9.30000 |
| 27 FEB 80 TIME 1500 | | .500005 | ---------- | ---------- | 1.00000 | 640.000 | 9.80000 |
| 19 MAR 80 TIME 1315 | | 0. | ---------- | 111.000 | 1.00000 | 660.000 | 11.0000 |
| 22 APR 80 TIME 1330 | | 0. | ---------- | 236.000 | ---------- | ---------- | 10.0000 |

| COLLECTED BY / TESTING LAB UNKNOWN / TREATMENT UNKNOWN | USGS | 43 FIELD PH STAND. UNITS | 44 CARBON DIOXIDE MG/L | 45 TOTAL ALKALINITY MG/L | 49 BICARBONATE ION MG/L | 50 CARBONATE ION MG/L | 78 DISSOLVED KJELDAHL NITROGEN MG/L |
|---|---|---|---|---|---|---|---|
| 22 JAN 78 TIME 1100 | | ---------- | ---------- | 110.000 | 140.000 | ---------- | ---------- |
| 19 FEB 78 TIME 1130 | | ---------- | ---------- | 120.000 | 150.000 | ---------- | ---------- |
| 18 MAR 78 TIME 1115 | | ---------- | ---------- | 120.000 | 150.000 | ---------- | ---------- |

LOAD

This program models a constituent's load in a stream. Assuming that there is a relationship between mean daily streamflow (obtained from the daily surface water quantity data file) and a constituent's concentrations (obtained from the grab water quality data file) at a particular station, LOAD determines a regression equation to correlate the two parameters for that station. This equation is then used to derive concentrations for those days on which streamflow was measured. Daily loads are calculated by the product of mean daily streamflow and derived constituent concentration.

The output of the model consists of the station headers for the station from both the surface water quantity and the water quality database. The pairs of values used to derive the regression equation are optionally printed. The equation and supporting statistics are then printed, followed by two tables: one of total monthly loads, and one of mean monthly concentrations. Up to eight plots can also be generated. The regression equation and data can be plotted. The computed daily load values can also be plotted, with the observed load values also plotted. Finally, histograms for all data, complete months of data, or complete years of data can be plotted for mean monthly load or mean monthly concentrations.

Two date ranges are needed for this program, one to specify the period used for the regression, and a second period for which load values are calculated. Often, mean flow data are available for a far longer period than water quality data for the station, and it is left to the user's discretion how much extrapolation should be performed.

LOAD (continued)

The program assumes a correlation between constituent concentrations in grab samples and mean daily flows. A more commonly accepted correlation is between concentrations in the grab samples and flows at the time the samples are taken. However, the purpose of the regression is to extend the constituent data base, and the most abundant flow data for regression are mean daily streamflows. The model is expected to perform adequately for large perennial streams, whose mean daily streamflows approximate the flow at the time of water quality sampling. For ephemeral streams and small perennial streams, whose mean daily flow may not approximate the flow at the time the grab sample was taken, the load model program will likely produce inaccurate output.

For each request, the user should specify:

Station number

Date range for regression with dates specified by year, month, and day (unless all grab data are to be used)

Water quality grab parameter to use (total dissolved solids, sum of constituents, is used otherwise)

Labs to exclude, if any (up to three)

Year range for which load values are to be estimated (unless all daily flow data are to be used)

Whether or not the regression data should be printed

LOAD (continued)

Which, if any, of the following plots are desired:
regression equation and data
daily loads, calculated and observed
histogram of mean monthly loads, all data
histogram of mean monthly loads, complete months
histogram of mean monthly loads, complete years
histogram of mean monthly concentrations, all data
histogram of mean monthly concentrations, complete months
histogram of mean monthly concentrations, complete years

Significance level of regression (.01, .02, .05, .1 or .2) (.05 is the default)

DEPENDENT HEADER

**STATION NO. 9188500 GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING
LATITUDE 43-01-00 LONGITUDE 110-07-20 IN SUBLETTE COUNTY ELEVATION 7468.00 FT.
1/4- 1/4 SECTION 8 TOWNSHIP 35N RANGE 111W 6TH P.M. DRAINAGE BASIN CODE 15620000
SITE TYPE STREAM USE MONITORING OR OBSERVATION USGS STN. NO. 9188500
DRAINAGE AREA 468.00 SQ. MI. NONCONTRIBUTING 0.00 SQ. MI.

INDEPENDENT HEADER

GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING STATION NO. 091885.00
LATITUDE 43-01-08 LONGITUDE 110-07-03 SE1/4SE1/4NE1/4 SECTION 8 TOWNSHIP 35 N,RANGE 111 W 6TH P.M.
ELEVATION 7468.09 FT DRAINAGE AREA 468.00 SQ MI NONCONTRIBUTING 0.00 SQ MI BASIN 15630000
SUBLETTE COUNTY DATA FROM USGS (P)

LOG Y= 3.46 -.4579LOG X
SAMPLE SIZE IS 39
STANDARD ERROR= .12
STANDARD ERROR SQUARED= .01
COEFFICIENT OF DETERMINATION, R SQUARED= .711
COEFFICIENT OF CORRELATION, R= -.843
FOR ALPHA= .050 B IS SIGNIFICANT
MINIMUM X= 1.81 CONFIDENCE LIMITS= 2.86 AND 2.39
MAXIMUM X= 3.32 CONFIDENCE LIMITS= 2.16 AND 1.69

**STATION NO. 9186500 GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING
LATITUDE 43-01-00 LONGITUDE 110-07-20 IN SUBLETTE COUNTY ELEVATION 7468.00 FT.
1/4- 1/4 SECTION 8 TOWNSHIP 35N RANGE 111W 6TH P.M. DRAINAGE BASIN CODE 15620000
SITE TYPE STREAM USE MONITORING OR OBSERVATION USGS STN. NO. 9186500
DRAINAGE AREA 468.00 SQ. MI. NONCONTRIBUTING 0.00 SQ. MI.

TOTAL MONTHLY LOAD IN TONS/MONTH

BY WATER YEAR

| YEAR | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | ANNUAL | MEAN % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1977 | 3952.8 | 2971.4 | 3039.1 | 2457.8 | 2401.7 | 2462.9 | 4219.1 | 4942.5 | 9941.9 | 7056.4 | 5695.0 | 4932.7 | 54069.4 | 84.8 |
| 1978 | 3812.0 | 3142.2 | 2957.1 | 2830.3 | 2554.6 | 3017.3 | 5131.5 | 9596.2 | 14208.2 | 13171.5 | 7683.7 | 5381.0 | 73485.6 | 115.2 |
| 1979 | 3945.4 | 3146.3 | 3106.8 | 2899.0 | 2756.7 | 3165.8 | 4748.3 | 9487.2 | 10728.7 | 8461.6 | 6922.8 | 4368.3 | 63736.8 | 100.0 |
| ALL DATA | | | | | | | | | | | | | | |
| N | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| MAX | 3952.8 | 3146.3 | 3106.8 | 2899.0 | 2756.7 | 3165.8 | 5131.5 | 9596.2 | 14208.2 | 13171.5 | 7683.7 | 5381.0 | 73485.6 | |
| MEAN | 3903.4 | 3086.6 | 3033.0 | 2729.0 | 2571.0 | 2882.0 | 4699.6 | 8008.6 | 11626.3 | 9563.1 | 6757.2 | 4894.0 | 63764.0 | |
| MIN | 3812.0 | 2971.4 | 2957.1 | 2457.8 | 2401.7 | 2462.9 | 4219.1 | 4942.5 | 9941.9 | 7056.4 | 5695.0 | 4368.3 | 54069.4 | |
| COMPLETE MONTHS | | | | | | | | | | | | | | |
| N | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| MAX | 3952.8 | 3146.3 | 3106.8 | 2899.0 | 2756.7 | 3165.8 | 5131.5 | 9596.2 | 14208.2 | 13171.5 | 7683.7 | 5381.0 | 73485.6 | |
| MEAN | 3903.4 | 3086.6 | 3033.0 | 2729.0 | 2571.0 | 2882.0 | 4699.6 | 8008.6 | 11626.3 | 9563.1 | 6757.2 | 4894.0 | 63764.0 | |
| MIN | 3812.0 | 2971.4 | 2957.1 | 2457.8 | 2401.7 | 2462.9 | 4219.1 | 4942.5 | 9941.9 | 7056.4 | 5695.0 | 4368.3 | 54069.4 | |
| COMPLETE YEARS | | | | | | | | | | | | | | |
| N | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| MAX | 3952.8 | 3146.3 | 3106.8 | 2899.0 | 2756.7 | 3165.8 | 5131.5 | 9596.2 | 14208.2 | 13171.5 | 7683.7 | 5381.0 | 73485.6 | |
| MEAN | 3903.4 | 3086.6 | 3033.0 | 2729.0 | 2571.0 | 2882.0 | 4699.6 | 8008.6 | 11626.3 | 9563.1 | 6757.2 | 4894.0 | 63764.0 | |
| MIN | 3812.0 | 2971.4 | 2957.1 | 2457.8 | 2401.7 | 2462.9 | 4219.1 | 4942.5 | 9941.9 | 7056.4 | 5695.0 | 4368.3 | 54069.4 | |

**STATION NO. 9189500 GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING
LATITUDE 43-01-00 LONGITUDE 110-07-20 IN SUBLETTE COUNTY ELEVATION 7468.00 FT.
1/4- 1/4 SECTION 8 TOWNSHIP 35N RANGE 111W 6TH P.M. DRAINAGE BASIN CODE 15620000
SITE TYPE STREAM USE MONITORING OR OBSERVATION USGS STN. NO. 9189500
DRAINAGE AREA 460.00 SQ. MI. NONCONTRIBUTING 0.00 SQ. MI.

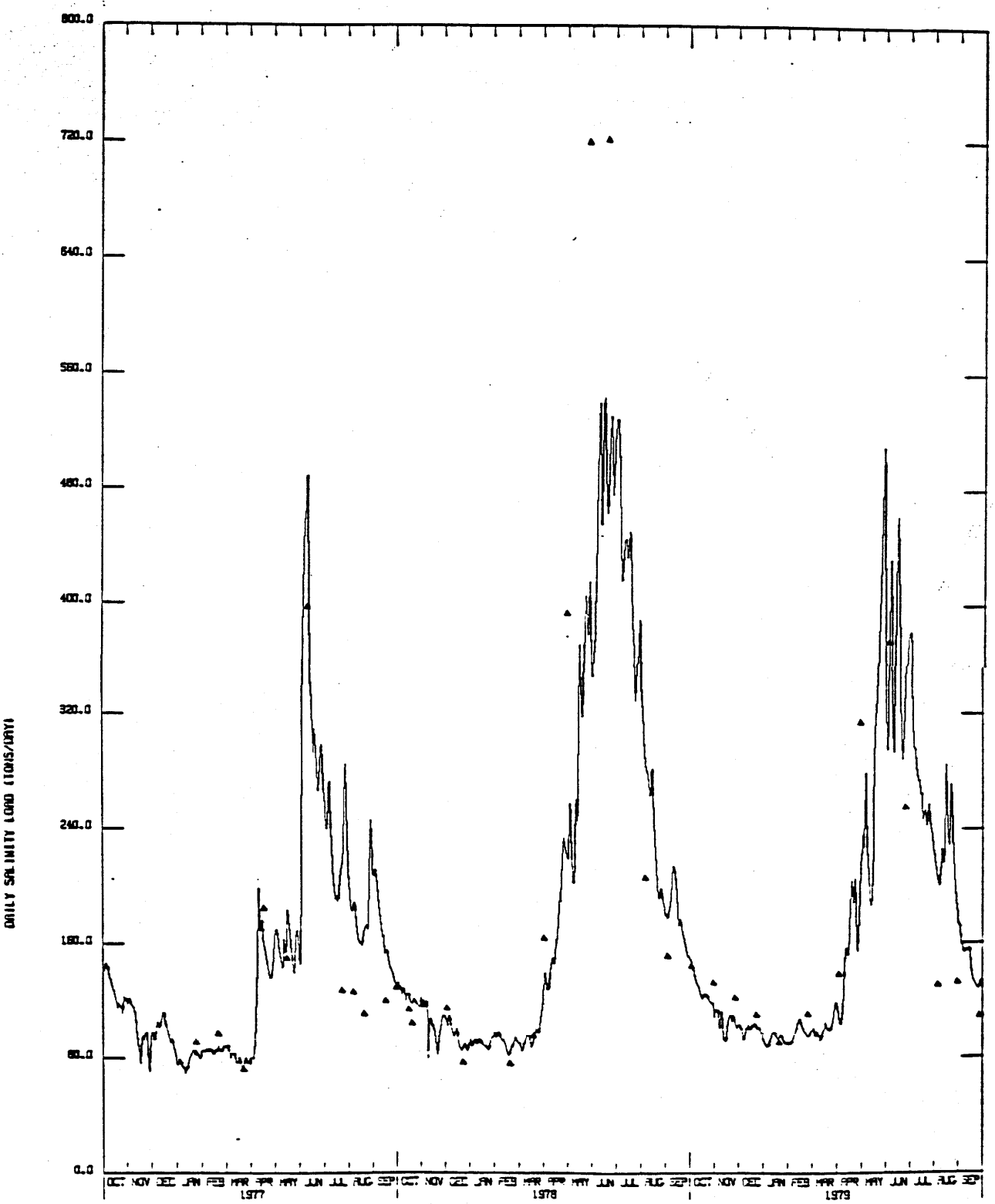
MEAN MONTHLY CONCENTRATIONS IN MG/L

BY WATER YEAR

| YEAR | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | ANNUAL MEAN | ? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1977 | 265.5 | 324.9 | 331.5 | 397.7 | 373.0 | 397.3 | 235.9 | 220.1 | 113.4 | 161.6 | 193.7 | 211.3 | 195.6 | 117.9 |
| 1978 | 274.9 | 312.8 | 339.4 | 353.7 | 353.4 | 332.5 | 201.4 | 121.2 | 87.1 | 95.3 | 147.5 | 198.4 | 135.5 | 81.7 |
| 1979 | 266.2 | 313.9 | 326.9 | 346.6 | 331.4 | 320.8 | 214.6 | 117.7 | 110.0 | 138.1 | 164.4 | 237.0 | 166.4 | 100.3 |
| ALL DATA | | | | | | | | | | | | | | |
| N | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| MAX | 274.9 | 324.9 | 339.4 | 397.7 | 373.0 | 397.3 | 235.9 | 220.1 | 113.4 | 161.6 | 193.7 | 237.0 | 195.6 | |
| MEAN | 268.9 | 317.2 | 332.6 | 366.0 | 352.6 | 350.2 | 217.3 | 153.0 | 103.5 | 131.7 | 168.5 | 215.6 | 165.9 | |
| MIN | 265.5 | 312.8 | 326.9 | 346.6 | 331.4 | 320.8 | 201.4 | 117.7 | 87.1 | 95.3 | 147.5 | 198.4 | 135.5 | |
| COMPLETE MONTHS | | | | | | | | | | | | | | |
| N | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| MAX | 274.9 | 324.9 | 339.4 | 397.7 | 373.0 | 397.3 | 235.9 | 220.1 | 113.4 | 161.6 | 193.7 | 237.0 | 195.6 | |
| MEAN | 268.9 | 317.2 | 332.6 | 366.0 | 352.6 | 350.2 | 217.3 | 153.0 | 103.5 | 131.7 | 168.5 | 215.6 | 165.9 | |
| MIN | 265.5 | 312.8 | 326.9 | 346.6 | 331.4 | 320.8 | 201.4 | 117.7 | 87.1 | 95.3 | 147.5 | 198.4 | 135.5 | |
| COMPLETE YEARS | | | | | | | | | | | | | | |
| N | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| MAX | 274.9 | 324.9 | 339.4 | 397.7 | 373.0 | 397.3 | 235.9 | 220.1 | 113.4 | 161.6 | 193.7 | 237.0 | 195.6 | |
| MEAN | 268.9 | 317.2 | 332.6 | 366.0 | 352.6 | 350.2 | 217.3 | 153.0 | 103.5 | 131.7 | 168.5 | 215.6 | 165.9 | |
| MIN | 265.5 | 312.8 | 326.9 | 346.6 | 331.4 | 320.8 | 201.4 | 117.7 | 87.1 | 95.3 | 147.5 | 198.4 | 135.5 | |

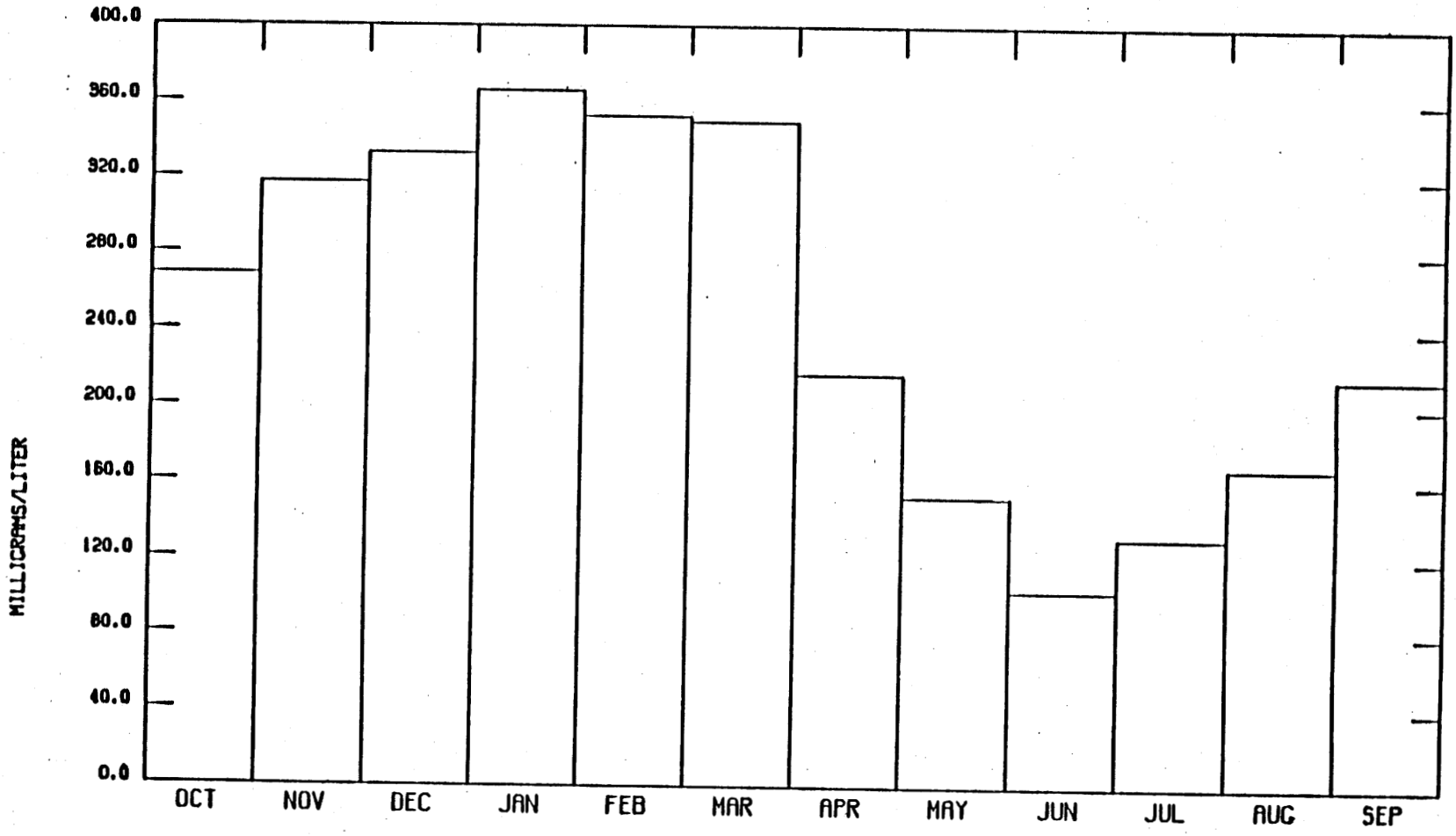
STATION NO. 9188500 GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING
LATITUDE 43-01-00 LONGITUDE 110-07-20 IN SUBLETTE COUNTY ELEVATION 7468.00 FT.
1/4- 1/4 SECTION 8 TOWNSHIP 35N RANGE 111W 6TH P.M. DRAINAGE BASIN CODE 15820000
SITE TYPE STREAM USE MONITORING OR OBSERVATION USGS STN. NO. 9188500
DRAINAGE AREA 468.00 SQ. MI. NONCONTRIBUTING 0.00 SQ. MI.

CALCULATED DAILY SALINITY LOAD VALUES



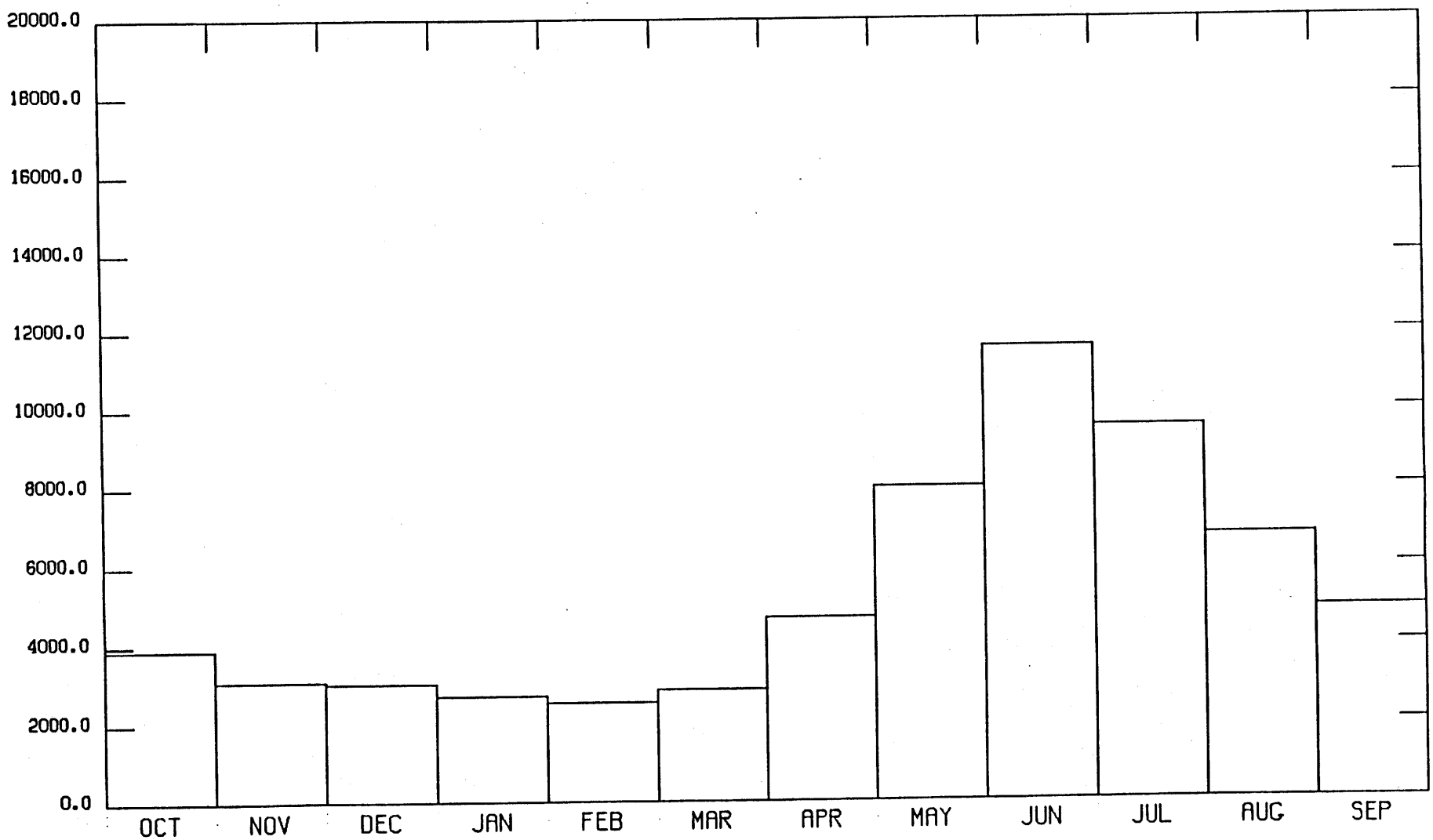
STATION NO. 9188500 GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING
LATITUDE 43-01-00 LONGITUDE 110-07-20 IN SUBLETTE COUNTY ELEVATION 7468.00 FT.
1/4- 1/4 SECTION 8 TOWNSHIP 35N RANGE 111W 6TH P.M. DRAINAGE BASIN CODE 15620000
SITE TYPE STREAM USE MONITORING OR OBSERVATION USGS STN. NO. 9188500
DRAINAGE AREA 468.00 SQ. MI. NONCONTRIBUTING 0.00 SQ. MI.

MEAN MONTHLY DISSOLVED SOLIDS CONCENTRATION
COMPLETE YEARS OF DATA



STATION NO. 9188500 GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING
LATITUDE 43-01-00 LONGITUDE 110-07-20 IN SUBLETTE COUNTY ELEVATION 7468.00 FT.
1/4- 1/4 SECTION 8 TOWNSHIP 35N RANGE 111W 6TH P.M. DRAINAGE BASIN CODE 15620000
SITE TYPE STREAM USE MONITORING OR OBSERVATION USGS STN. NO. 9188500
DRAINAGE AREA 468.00 SQ. MI. NONCONTRIBUTING 0.00 SQ. MI.

MEAN MONTHLY DISSOLVED SOLIDS LOAD VALUES
COMPLETE MONTHS OF DATA



LPARAM

This program lists the water quality grab parameters that are stored on WRDS and the codes associated with them. An alphabetic listing of the parameters appears as Table 4, after the introduction to this section. LPRAM lists the parameters in a different format, and parameter codes listed can be numbered according to the USGS WATSTORE system, the EPA STORET system, or the previous WRDS system. Currently the USGS parameter codes are stored on WRDS.

The system currently stores over 800 different parameters, and new parameters are added when necessary. While it is technically possible to analyze each sample for every possible parameter, it should be remembered that usually only a few parameters are analyzed for each sample. The number of parameters analyzed varies widely among the samples.

PLOTWQL

This program plots water quality grab data by location. Up to two parameter values can be plotted for each station. Areas to be plotted can be requested by latitude-longitude or by township-range. The stations plotted can be limited by one of six methods, and samples from specified labs can be excluded. Optionally, only values not meeting U.S. Public Health Department drinking water standards can be considered. It is suggested that the WRDS staff be consulted during request submittal if the user is unfamiliar with plot scaling.

Information to be plotted is specified through the selection of one of the following styles:

Style 1. Site type
Station number

Style 2. Number of samples available
Station number
Mean value of given parameter

Style 3. Number of samples available
Station number
Maximum value of given parameter
Minimum value of given parameter

Style 4. Number of samples available
Station number
Mean value of first parameter
Mean value of second parameter

Style 5. Number of samples available
Station number
Maximum value of first parameter
Maximum value of second parameter

Style 6. Number of samples available
Station number
Minimum value of first parameter
Minimum value of second parameter

PLOTWQL (continued)

To prevent overprinting of data from adjacent stations, the program can combine the data of these stations and plot instead an "overlap point", whose position is the weighted average of the points it replaces.

For each style, the program can optionally plot some information beside overlap points:

Style 1. Nothing is plotted beside the overlap point

Style 2. Mean value of given parameter

Style 3. Maximum value of given parameter

Style 4. Mean value of first parameter

Style 5. Maximum value of first parameter

Style 6. Minimum value of first parameter

Nothing can be plotted beside an overlap point if style 1 is desired, but the overlap point will reflect the number of stations overlapping.

For each plot, the user should specify:

Style of plot (see above)

Scale of plot (such as 1:250000 which is the default specification)

Whether or not overlap points should be created; if so, whether or not to print anything beside them

Primary retrieval method and value range:
- latitude-longitude
- township-range (Wyoming only)

Secondary retrieval method and value range:
- county-state
- drainage basin
- site type
- source organization
- use
- aquifer
- station number
- source organization station number

PLOTWQL (continued)

Date range, with date specified as year, month, and day (unless all are to be used)

First and second grab parameters to plot, as applicable

Labs to exclude, if any (up to three)

Whether or not to print only those values that do not meet U.S. Public Health Department drinking water standards

Print height (.1 or .06 inches)

SCALE -- 1 : 24000

POINTS PLOTTED REPRESENT

- ⊙ UNKNOWN
- △ WELL
- + SPRING
- × WELL OR SPRING
- ⊕ STREAM
- ⊹ LAKE OR RESERVOIR
- ⊠ DITCH
- Z PIPE OR TAP
- Y RETORT WATER
- ⊠ HAULED WATER
- [N] N OVERLAP POINTS
  (N=** FOR MORE THAN 99 POINTS)

VALUES PRINTED ARE

LINE 1
STATION NUMBER

14 DATA POINTS ARE REPRESENTED.

41.28' 0"
106.50' 0"

41.28' 0"
106.47' 0"

41.25' 0"
106.50' 0"

41.25' 0"
106.47' 0"

6627000

5779

LATITUDE (TICK = 10 MINUTES)

LONGITUDE (TICK = 10 MINUTES)

PLOTWQT

Trends and correlations in water quality data are more apparent when the data are plotted versus time. PLOTWQT can plot grab and daily water quality data versus time in a variety of styles. These are:

1. One to six grab parameters for a given station; each parameter is plotted with unique connected symbols

2. One to six daily parameters for a given station; each parameter is plotted with a unique dotted line pattern

3. One grab and one daily parameter for a given station; the grab parameter is plotted with connected symbols, the daily parameter has a dotted line

4. One grab or one daily parameter for up to three stations; the values for each station are plotted as unique connected symbols (grab data) or as unique dotted line patterns (daily data)

5. One to three grab parameters for a given station; all of the grab values are connected by the same line; only the symbols denote the separate parameters

For each style, the station header(s) is (are) printed above the plot, and all parameter symbols or patterns are also defined in the plot. When more than one parameter is plotted, the first parameter is plotted according to one scale (on the left edge of the plot), and the other parameters can be plotted according to a second scale (on the right edge of the plot). The y-axis scale can be selected by the program or pre-set by the user. A maximum of 10 years of data can be plotted at one time with a maximum plot length of 10 feet, and the time scale can be one of three sizes. Up to three labs can be excluded from consideration. An additional option exists to plot only values that do not meet U.S. Public Health Department drinking water standards.

PLOTWQT (continued)

For each plot, the user should specify:

Style of plot

Primary retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- site type
- source organization
- use
- township-range (Wyoming only)
- station number
- source organization station number

Secondary retrieval, if any, and value range:
- latitude-longitude
- county-state
- drainage basin
- site type
- source organization
- use
- township-range (Wyoming only)
- aquifer
- station number
- source organization station number

Year range (unless all available years of data are to be used)

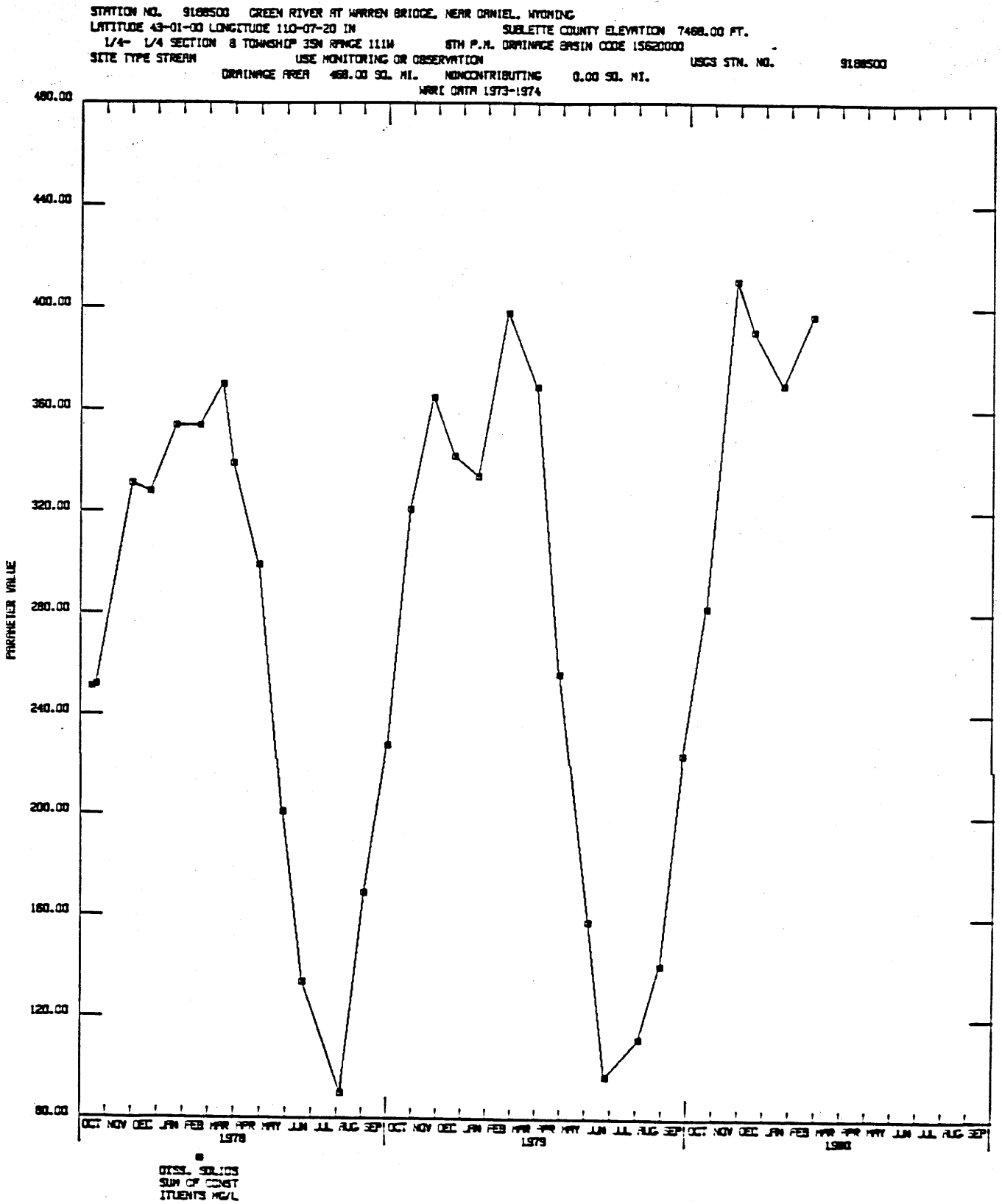
Parameter(s) to plot

x-axis interval size (3.6, 9, or 23.4 inches per year)

y-axis concentration range(s) (unless the automatic range(s) is (are) acceptable)

Labs to exclude, if any (up to three)

Whether or not to consider only concentrations that do not meet U.S. Public Health Department drinking water standards


STATION NO. 9188500 GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING
LATITUDE 43-01-00 LONGITUDE 110-07-20 IN SUBLETTE COUNTY ELEVATION 7468.00 FT.
1/4- 1/4 SECTION 8 TOWNSHIP 35N RANGE 111W 6TH P.M. DRAINAGE BASIN CODE 15620000
SITE TYPE STREAM USE MONITORING OR OBSERVATION USGS STN. NO. 9188500
DRAINAGE AREA 468.00 SQ. MI. NONCONTRIBUTING 0.00 SQ. MI.
WRRI DATA 1973-1974
480.00
440.00
400.00
360.00
320.00
280.00
240.00
200.00
160.00
120.00
80.00
PARAMETER VALUE
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP
1978
1979
1980
DISS. SOLIDS
SUM OF CONST
ITUENTS MG/L

REGRESWQ

This program generates a least squares regression analysis for either grab or daily water quality data. The regression can be one of six types:

1. Two grab parameters for a given station
2. Two daily parameters for a given station
3. Two daily parameters, averaged monthly, for a given station
4. One grab parameter for two stations
5. One daily parameter for two stations
6. One daily parameter, averaged monthly, for two stations

The regression fit can be linear or curvilinear. Data transformations ($\log_{10}$ or $\log_e$) may optionally be applied to either/both the independent and dependent values. The fit may be forced through the origin if requested. Plots of the data and regression curve are optional.

The dates of the dependent variable may optionally be offset by a given time period from the dates of the independent variable. This allows a regression analysis between stations when one is downstream of another.

Confidence limits are calculated and optionally plotted for linear regressions. Also on linear regressions, a test is made of the significance of the slope coefficient (b). The user may specify the significance level, alpha, to be used in the confidence limits and test of the slope coefficient significance (t test).

REGRESWQ (continued)

For each request, the user should specify:

Type of regression

Primary retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- site type
- source organization
- use
- township-range (Wyoming only)
- station number
- source organization station number

Secondary retrieval, if any, and value range:
- latitude-longitude
- county-state
- drainage basin
- site type
- source organization
- use
- township-range (Wyoming only)
- aquifer
- station number
- source organization station number

Date range (unless all are to be used), with date specified as:
- Water year, month, day for grab data
- Water year for daily data

Independent/dependent variables (parameters), as applicable

Independent station number, if applicable

Date offset (range between independent and dependent date)

Independent variable (parameter) transformation:
- none
- $\log_{10}$
- $\log_e$

Dependent variable (parameter) transformation:
- none
- $\log_{10}$
- $\log_e$

Significance level (.01, .02, .05, .1, or .2)

REGRESWQ (continued)

Whether or not the regression equation should be forced through the origin

Whether the equation should be linear or curvilinear

Whether or not to plot the data and regression line

Whether or not to use only concentrations that do not meet U.S. Public Health department drinking water standards

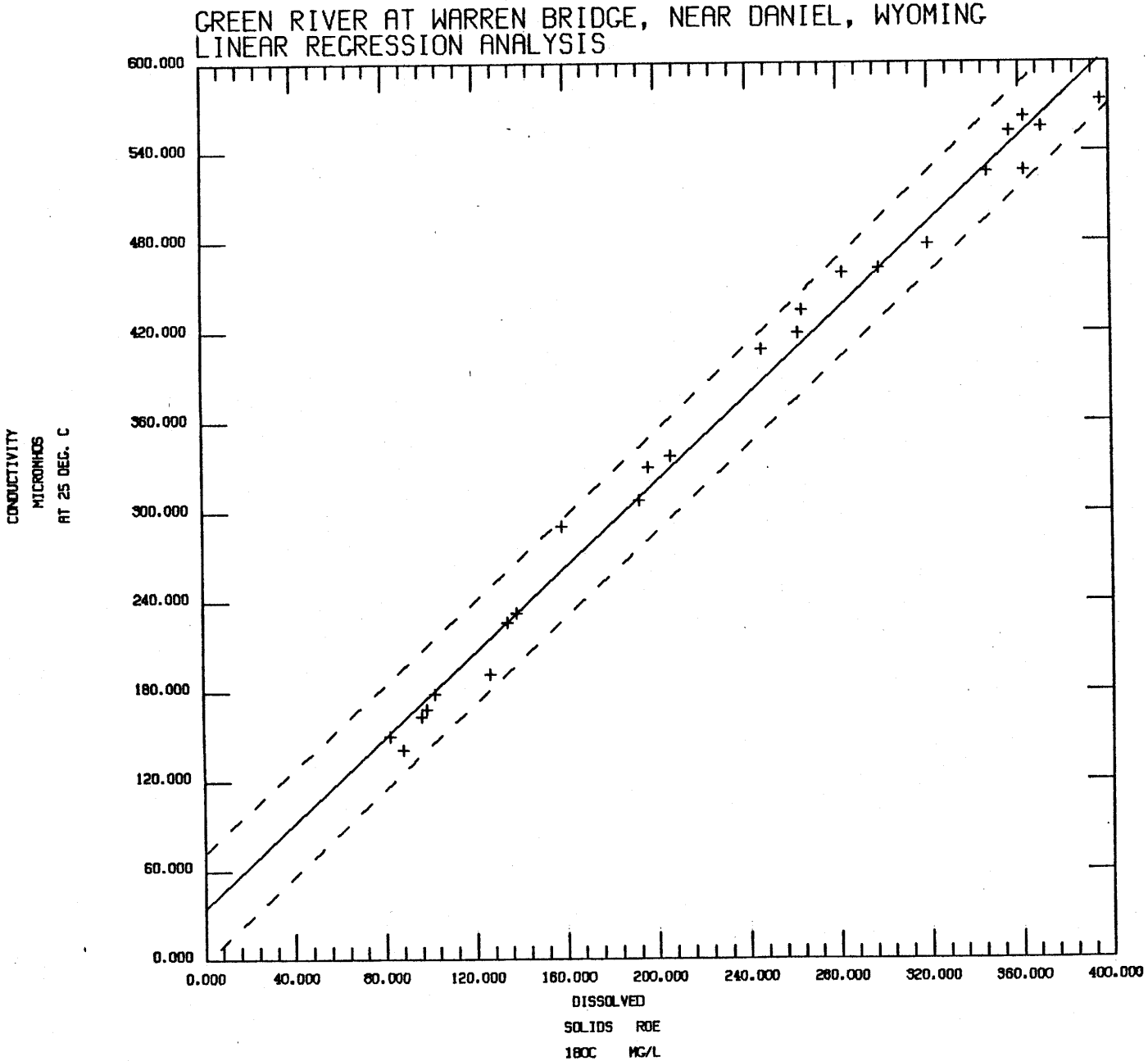
Labs to exclude, if any (up to three)

**STATION NO. 9188500 GREEN RIVER AT WARREN BRIDGE, NEAR DANIEL, WYOMING
LATITUDE 43-01-08 LONGITUDE 110-07-03 IN SUBLETTE COUNTY ELEVATION 7468.00 FT.
1/4- 1/4 SECTION 8 TOWNSHIP 35N RANGE 111W 6TH P.M. DRAINAGE BASIN CODE 15620000
SITE TYPE STREAM USE MONITORING OR OBSERVATION USGS STN. NO. 9188500
DRAINAGE AREA 468.00 SQ. MI.
NONCONTRIBUTING 0.00 SQ. MI.
WRRI DATA 1973-1974

*** LINEAR REGRESSION ANALYSIS ***
NO TRANSFORMATION APPLIED TO Y AXIS
NO TRANSFORMATION APPLIED TO X AXIS
1 OCT 71 - 31 DEC 73

| | DEPENDENT VARIABLE | INDEPENDENT VARIABLE |
|---|---|---|
| | SPEC CONDUCT MICROMHOS/CM AT 25 DEG. C | DISS. SOLIDS RES. ON EVAP AT 180C MG/L |
| | 408.00 | 246.00 |
| | 478.00 | 320.00 |
| | 553.00 | 356.00 |
| | 527.00 | 362.00 |
| | 574.00 | 396.00 |
| | 526.00 | 346.00 |
| | 329.00 | 196.00 |
| | 168.00 | 98.00 |
| | 163.00 | 96.00 |
| | 226.00 | 134.00 |
| | 307.00 | 192.00 |
| | 419.00 | 262.00 |
| | 462.00 | 298.00 |
| | 563.00 | 362.00 |
| | 150.00 | 82.00 |
| | 141.00 | 88.00 |
| | 178.00 | 102.00 |
| | 191.00 | 126.00 |
| | 232.00 | 138.00 |
| | 290.00 | 158.00 |
| | 337.00 | 206.00 |
| | 434.00 | 264.00 |
| | 459.00 | 282.00 |
| | 556.00 | 370.00 |
| ARITHMETIC MEAN | 361.29 | 228.33 |
| WEIGHTED ARITHMETIC MEAN | 429.06 | 271.17 |
| STANDARD DEVIATION | 152.72 | 106.29 |

Y= 34.90+ 1.4294X
SAMPLE SIZE IS 24
STANDARD ERROR= 15.86
STANDARD ERROR SQUARED= 251.55
COEFFICIENT OF DETERMINATION, R SQUARED= .990
COEFFICIENT OF CORRELATION, R= .995
FOR ALPHA= .050 B IS SIGNIFICANT
MINIMUM X= 82.00 CONFIDENCE LIMITS= 186.99 AND 117.24
MAXIMUM X= 396.00 CONFIDENCE LIMITS= 636.23 AND 565.69




1 OCT 71 - 31 DEC 73

REF. NUMBER = 9188500

Y= 34.90+ 1.4294X

SAMPLE SIZE IS 24

STANDARD ERROR= 15.86

STND. ERR. SQ.= 251.55

R SQUARED= .990

R= .995

ALPHA= .050 B IS SIG.

## 3.4 WELL LEVEL

### Data Available

The well level database contains two data types: the grab data contain the date the well was tested, the level, and sometimes the yield; the daily data file contains only well levels taken daily.

Data items are listed below with their measurement units.

| Data Type: | Parameters: | Unit of Measurement: |
|---|---|---|
| Grab sample data | Water level below ground | feet |
| | Water level footnote: | none |
| | 0 no footnote | |
| | 1 well being pumped | |
| | 2 well pumped recently | |
| | 3 stage high in nearby stream | |
| | 4 water in nearby stream or ditch | |
| | 5 nearby well being pumped | |
| | 6 surface water on ground nearby | |
| | 8 well dry | |
| | 9 flowing well | |
| | 10 spring or seep | |
| | Yield | gallons per minute |
| | Yield footnote: | |
| | 0 no footnote | none |
| | 1 instantaneous yield | gallons per minute |
| | 2 flowing yield | gallons per minute |
| | 3 pumping yield | gallons per minute |
| Daily sample data | Water-level below ground: | |
| | once a day | feet |
| | daily maximum | feet |
| | daily minimum | feet |

A header exists for each well in the data base. It contains location information for the well, in the form of latitude-longitude, township-range, county-state, elevation, drainage basin, X-Y coordinates and zone, and aquifer, if known. The header also contains the well depth, well permit number, a use description, the transmissivity

and storage coefficient, if known. Up to eight lines of comments may also be contained in the header.

When water quality samples are taken from wells, the well level and/or the yield are sometimes also measured. Data for some wells are stored in both the water quality database and the well level database; the well level header provides space for cross-referencing the well by its water quality reference number. There are wells, however, whose level and/or yield values are stored only on the water quality database with other parameters. If the well level database does not yield an adequate number of sites for the area of interest, then the user could check the water quality database.

## Programs

### DATEWL

This program prints well level station headers, and the dates of grab samples and/or the water year range of daily samples that were taken there. A header contains the station reference number, name, location by latitude-longitude, township-range, county-state and aquifer (if known), and drainage basin, elevation, depth of well, well permit number, use, transmissivity, and storage coefficient.

For each listing, the user should specify:

Primary retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Secondary retrieval method, if any, and value range:
- aquifer
- source organization
- use

Whether grab and/or daily dates are desired

**** STN # 2052 AELCO PETROLEUM CORP. WELL, SOUTH OF BIG PINEY, WYOMING. THE WELL IS IN THE WASATCH FORMATION. DRILLED IN AUGUST, 1964. COMPLETED IN OCT., 1964. WATER PRODUCTION AT 735-95 FT. AND 845-880 FT. THE WELL HAS A 16 INCH CASING.

LATITUDE 42-23-00 LONGITUDE 110-10-00 SUBLETTE COUNTY ELEVATION 6896.00 FT. AQUIFER 0
SW1/4-SW1/4-SE1/4 SECTION 29 TOWNSHIP 28N RANGE 112W 6TH P.M. DRAINAGE BASIN CODE 15410000
WELL DEPTH 900.0 FT. WELL PERMIT NO. 0 DATA FROM USGS (P)
USE UNKNOWN W.Q. STN. NO. 0 TRANSMISSIVITY 0.0 FT3/DAY/FT
STORAGE COEFFICIENT 0.000000 X= 0.00 Y= 0.00 ZONE

****DATES OF GRAB SAMPLES****

16 OCT 64

**** STN # 6700 UNNAMED WELL, SOUTHWEST OF BIG PINEY, WYOMING. THE WELL IS IN THE WASATCH FORMATION.

LATITUDE 42-24-00 LONGITUDE 110-12-00 SUBLETTE COUNTY ELEVATION 7000.00 FT. AQUIFER 0
1/4-SW1/4-NE1/4 SECTION 19 TOWNSHIP 28N RANGE 112W 6TH P.M. DRAINAGE BASIN CODE 15001550
WELL DEPTH 153.0 FT. WELL PERMIT NO. 0 DATA FROM USGS (P)
USE ABANDONED OR UNUSED W.Q. STN. NO. 0 TRANSMISSIVITY 0.0 FT3/DAY/FT
STORAGE COEFFICIENT 0.000000 X= 0.00 Y= 0.00 ZONE

****DATES OF GRAB SAMPLES****

21 JUN 65 11 AUG 65 11 DEC 65 5 DEC 70 18 JAN 72 3 APR 72 27 SEP 72 8 FEB 73 10 MAY 73 9 SEP 73
7 NOV 73

****DATES OF DAILY WELL LEVELS****
JUN 1965 - JUN 1965
SEP 1965 - DEC 1965
FEB 1966 - DEC 1966
FEB 1967 - DEC 1967
FEB 1968 - DEC 1968
FEB 1969 - DEC 1969
FEB 1970 - FEB 1970

**** STN # 2310 BRINKERHOFF DRILLING COMPANY WELL, SOUTH OF BIG PINEY, WYOMING. TOP OF FORMATION, WASATCH-0, TRANSITION ZONE-3990 FT., MESAVERDE-4290 FT. DRILLED IN MAY THROUGH JUNE, 1959. DRILLED TO 4909 FT., PLUGGED AT 750 FT.

LATITUDE 42-26-00 LONGITUDE 110-08-00 SUBLETTE COUNTY ELEVATION 6750.00 FT. AQUIFER 0
NE1/4-NE1/4-SW1/4 SECTION 11 TOWNSHIP 28N RANGE 112W 6TH P.M. DRAINAGE BASIN CODE 15510000
WELL DEPTH 750.0 FT. WELL PERMIT NO. 0 DATA FROM USGS (P)
USE UNKNOWN W.Q. STN. NO. 0 TRANSMISSIVITY 0.0 FT3/DAY/FT
STORAGE COEFFICIENT 0.000000 X= 0.00 Y= 0.00 ZONE

****DATES OF GRAB SAMPLES****

6 JUN 56

**** STN # 2053 LINCOLN IDAHO OIL AND GAS CO WELL, SOUTHWEST OF BIG PINEY, WYOMING. THE SURFACE IS ALMY FORMATION. DRILLED IN 1919. WATER PRODUCTION AT 572-86 FT. THE WELL WAS CASED.

LATITUDE 42-26-00 LONGITUDE 110-20-00 SUBLETTE COUNTY ELEVATION 8250.00 FT. AQUIFER 0
NW1/4-NE1/4-NE1/4 SECTION 12 TOWNSHIP 28N RANGE 114W 6TH P.M. DRAINAGE BASIN CODE 15500000
WELL DEPTH 586.0 FT. WELL PERMIT NO. 0 DATA FROM USGS (P)
USE UNKNOWN W.Q. STN. NO. 0 TRANSMISSIVITY 0.0 FT3/DAY/FT
STORAGE COEFFICIENT 0.000000 X= 0.00 Y= 0.00 ZONE

****DATES OF GRAB SAMPLES****

1 JUL 19

LISTDATAWL

This program outputs well level station headers with grab and/or daily data. Values may be printed as feet below ground or as feet above sea level. A grab sample consists of the static water level and usually the well yield at the time. Daily samples have well levels only.

For each request, the user should specify:

Primary retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Secondary retrieval method, if any, and value range:
- aquifer
- source organization
- use

Date range (unless all available data are desired), with date specified as:
- Year, month, day for grab data
- Year for daily data

Whether to include grab and/or daily data

Whether to print levels as below ground or above sea level

**** STN # 5184 TOWN OF WHEATLAND WELL, WEST OF WHEATLAND, WYOMING. THE WELL WAS DRILLED IN 1933 AND IS 15 INCHES IN DIAMETER. THE CASING IS IRON OR STEEL PIPE. THE WELL IS IN SANDSTONE, IN THE ARIKAREE FORMATION. TOP OF FORMATION, SOIL-0, ARIKAREE FORMATION = ALTERNATING SAND AND SANDSTONE-16 FT., YELLOW CLAY-323 FT., ALTERNATING SAND AND SANDSTONE-328 FT., SAND AND CLAY-380 FT., WHITE CLAY-400 FT., ALTERNATING SANDSTONE AND SAND-405 TO 453 FEET.

LATITUDE 42-03-00 LONGITUDE 104-57-00 PLATTE COUNTY ELEVATION 4702.00 FT. AQUIFER 0
NW1/4-NW1/4-SE1/4 SECTION 12 TOWNSHIP 24N RANGE 68W 6TH P.M. DRAINAGE BASIN CODE 11060400
WELL DEPTH 453.0 FT. WELL PERMIT NO. 0 DATA FROM USGS (P)
USE INDUSTRIAL SUPPLY, NON-MINING W.Q. STN. NO. 0 TRANSMISSIVITY 0.0 FT3/DAY/FT
STORAGE COEFFICIENT 0.000000 X= 0.00 Y= 0.00 ZONE

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| STN # | 5184 | 1 JUN 54 | LEVEL = | 12.0 | FT BELOW REF PT, YIELD = | 560.0 | GPM, REF PT IS | 0.0 | FT ABOVE GROUND |
| STN # | 5184 | 8 JUL 58 | LEVEL = | 11.9 | FT BELOW REF PT, YIELD = | | GPM, REF PT IS | 0.0 | FT ABOVE GROUND |
| STN # | 5184 | 20 AUG 58 | LEVEL = | 11.9 | FT BELOW REF PT, YIELD = | | GPM, REF PT IS | 0.0 | FT ABOVE GROUND |
| STN # | 5184 | 3 SEP 58 | LEVEL = | 15.2 | FT BELOW REF PT, YIELD = | | GPM, REF PT IS | 0.0 | FT ABOVE GROUND |
| STN # | 5184 | 25 SEP 58 | LEVEL = | 11.6 | FT BELOW REF PT, YIELD = | 563.0 | GPM, REF PT IS | 0.0 | FT ABOVE GROUND |
| STN # | 5184 | 6 FEB 59 | LEVEL = | 15.0 | FT BELOW REF PT, YIELD = | | GPM, REF PT IS | 0.0 | FT ABOVE GROUND |
| STN # | 5184 | 22 MAY 59 | LEVEL = | 11.7 | FT BELOW REF PT, YIELD = | | GPM, REF PT IS | 0.0 | FT ABOVE GROUND |
| STN # | 5184 | 13 AUG 59 | LEVEL = | 11.7 | FT BELOW REF PT, YIELD = | | GPM, REF PT IS | 0.0 | FT ABOVE GROUND |

**** STN # 251 UNNAMED WELL NORTHWEST OF CASPER, WYOMING. WELL IS IN THE ALLUVIUM.
LATITUDE 42-52-20 LONGITUDE 106-25-45 NATRONA COUNTY ELEVATION 5250.00 FT. AQUIFER 0
NE1/4-NE1/4-NE1/4 SECTION 33 TOWNSHIP 34N RANGE 80W 6TH P.M. DRAINAGE BASIN CODE 11410000
WELL DEPTH 57.0 FT. WELL PERMIT NO. 0 DATA FROM USGS (P)
USE ABANDONED OR UNUSED L.O. STN. NO. 4669 TRANSMISSIVITY 0.0 FT3/DAY/FT
STORAGE COEFFICIENT 0.000000 X= 0.00 Y= 0.00 ZONE

**** DAILY WELL LEVEL DATA IN FEET BELOW GROUND ****
**** NEGATIVE VALUES INDICATE FEET ABOVE GROUND ****
FOR 1969 TIME 0
ONCE A DAY

| DAY | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 7.8 | 7.6 | 7.8 | 7.8 | 7.8 | 6.8 | 5.5 | 4.8 | 5.4 | 5.9 | 6.3 | 6.3 |
| 2 | 7.8 | 7.7 | 8.0 | 7.8 | 7.8 | 6.6 | 5.5 | 4.9 | 5.4 | 5.8 | 6.2 | 6.2 |
| 3 | 8.0 | 8.0 | 7.9 | 7.8 | 7.8 | 6.4 | 5.4 | 4.9 | 5.3 | 6.0 | 6.2 | 6.1 |
| 4 | 7.7 | 7.8 | 7.9 | 7.9 | 7.9 | 5.9 | 5.5 | 4.9 | 5.3 | ** | 6.0 | 6.0 |
| 5 | 7.6 | 7.7 | 7.8 | 7.9 | 8.0 | 5.7 | 5.5 | 5.0 | 5.4 | ** | 6.0 | 6.1 |
| 6 | 7.7 | 7.7 | 7.8 | 7.7 | 8.1 | 5.6 | 5.5 | 5.0 | 5.6 | 6.3 | 6.1 | ** |
| 7 | 7.3 | 7.7 | 7.8 | 7.7 | 8.1 | 5.7 | 5.6 | 5.2 | 5.9 | 6.1 | 6.0 | ** |
| 8 | 7.3 | 8.0 | 8.0 | 7.7 | 8.1 | 5.9 | 5.8 | 5.2 | 5.0 | 5.9 | 6.1 | ** |
| 9 | 7.7 | 7.9 | 8.0 | 8.1 | 8.0 | 5.6 | 5.9 | 5.4 | 4.9 | 6.0 | 6.2 | ** |
| 10 | 7.6 | 7.9 | 8.1 | 8.0 | 8.0 | 5.6 | 5.9 | 5.9 | 5.0 | 6.0 | 6.1 | ** |
| 11 | 7.6 | 7.9 | 7.9 | 8.0 | 7.9 | 5.3 | 5.2 | 5.9 | 5.2 | 6.4 | 6.2 | ** |
| 12 | 7.6 | 7.7 | 7.9 | 8.0 | 7.9 | 5.1 | 5.0 | 5.8 | 5.2 | 6.4 | 6.1 | ** |
| 13 | 7.8 | 7.7 | 8.0 | 7.8 | 7.9 | 5.1 | 5.0 | 5.6 | ** | 6.1 | 6.3 | ** |
| 14 | 7.7 | 7.7 | 8.0 | 7.8 | 7.9 | 5.1 | 5.1 | ** | 5.3 | 6.0 | 6.1 | ** |
| 15 | 7.7 | 7.9 | 8.0 | 7.9 | 7.9 | ** | 5.2 | ** | 5.4 | 6.2 | 5.8 | ** |
| 16 | 7.7 | 7.9 | 8.0 | 8.1 | 8.1 | ** | 5.4 | ** | 5.6 | 6.2 | 5.8 | ** |
| 17 | 7.7 | 8.1 | 8.0 | 7.9 | 8.0 | ** | 5.5 | ** | 5.7 | 6.2 | 6.1 | ** |
| 18 | 7.7 | 7.9 | 7.9 | 7.8 | 7.9 | ** | 5.5 | ** | 5.7 | 6.1 | 6.5 | ** |
| 19 | 7.5 | 7.8 | 7.9 | 7.8 | 7.9 | ** | 5.5 | 5.4 | 5.7 | 6.1 | 6.3 | ** |
| 20 | 7.5 | 7.8 | 8.1 | 7.8 | 8.1 | 5.1 | 5.2 | 5.4 | 5.7 | 6.3 | 6.2 | ** |
| 21 | 7.5 | 7.9 | 7.9 | 8.1 | 7.1 | ** | ** | 5.6 | ** | 6.3 | 6.0 | ** |
| 22 | 7.5 | 7.8 | 7.9 | 7.9 | 7.1 | 5.1 | ** | 5.7 | ** | 6.2 | 6.1 | ** |
| 23 | 7.7 | 7.8 | 7.7 | 7.8 | 7.1 | 5.1 | ** | 5.7 | ** | 6.2 | 6.2 | ** |
| 24 | 7.8 | 7.9 | 8.2 | 7.7 | 8.0 | ** | 4.2 | 5.7 | ** | 6.2 | 6.2 | ** |
| 25 | ** | 7.8 | 8.0 | 7.7 | 8.0 | ** | 4.1 | 5.7 | ** | 6.3 | 6.3 | ** |
| 26 | ** | 7.8 | 8.0 | 7.9 | 7.9 | ** | 4.1 | 5.3 | 6.0 | 6.3 | 6.3 | ** |
| 27 | ** | 8.0 | 7.8 | 8.1 | 7.7 | 5.3 | 4.4 | 5.0 | 6.0 | 6.0 | 6.3 | ** |
| 28 | ** | 7.9 | 7.8 | 7.9 | 7.5 | 5.3 | 4.5 | 5.0 | 6.0 | 5.9 | 6.3 | ** |
| 29 | 7.7 | | 8.1 | 7.7 | 6.9 | 5.5 | 4.6 | 5.0 | 6.0 | 6.2 | 6.3 | ** |
| 30 | 7.8 | | 8.0 | 7.8 | 6.6 | 5.5 | 4.6 | 5.1 | 5.9 | 6.3 | 6.3 | 6.4 |
| 31 | 7.8 | | 7.8 | | 7.8 | | 4.8 | 5.2 | | 6.2 | | 6.3 |

** INDICATES MISSING DATA

PLOTWLL

Plots of well level data are available in five styles, and for any scale. Well levels and depths can be printed as feet above sea level or feet below ground. A range of well depths can also be specified. Overlap points can be generated from two points whose data would otherwise overprint each other.

Information to be plotted is specified through selection of one of the following styles:

Style 1. Well location symbol only

Style 2. Number of samples available
Mean water level

Style 3. Number of samples available
Station number
Mean water level
Well depth

Style 4. Number of samples available
Station number
Mean water level
Aquifer

Style 5. Number of samples available
Well depth
Mean water level
Aquifer

To prevent overprinting of data from adjacent stations, the program can combine the data of these stations and plot instead an "overlap point", whose position is the weighted average of the points it replaces.

These overlap points can indicate either the number of wells represented (for style 1) or the total number of samples available at the well represented. For all but style 1, the maximum, minimum, and/or mean of the mean water levels of each well can be printed.

PLOTWLL (continued)

For each plot, the user should specify:

Style of plot

Scale of plot (such as 1:250000 which is the default scale)

Whether or not overlap points should be created, and whether or not to print anything beside them

Primary retrieval method and value range:
- latitude-longitude
- township-range (Wyoming only)

Secondary retrieval method, if any, and value range:
- aquifer
- source organization
- use

Date range (unless all available data are to be used), with dates specified as:
- Year, month, day for grab data
- Year for daily data

Well depth range (unless all depths are to be used)

Whether to include grab and/or daily data

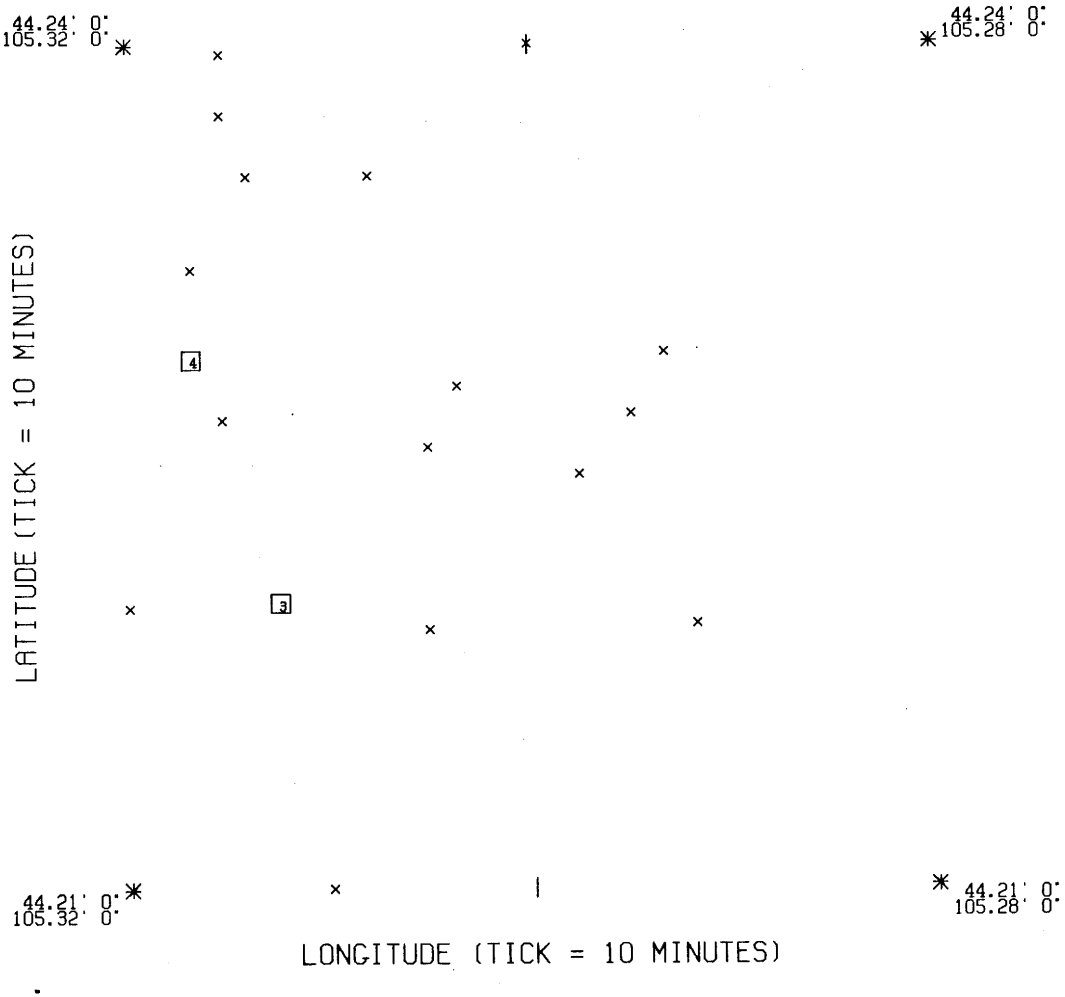
Whether to print values as below ground or above sea level

Print height (.1 or .06 inches)

WELL LEVEL DATA : 1800- 1999

SCALE -- 1 : 24000

POINTS PLOTTED REPRESENT
× WELL LOCATION
[N] N OVERLAP POINTS
(N=** FOR MORE THAN 99 POINTS)




23 DATA POINTS ARE REPRESENTED.

PLOTWLT

This program plots well levels and yields against time. The water levels in a well can be plotted in terms of feet below ground or as feet above sea level. Up to 3 grab stations, or 3 daily stations, or one grab and one daily station, can be plotted at a time. The water level and yield can also be plotted for a given station on the same graph.

For each request, the user should specify:

Station(s) to be plotted specified by station number

Year range (unless all dates are to be used)

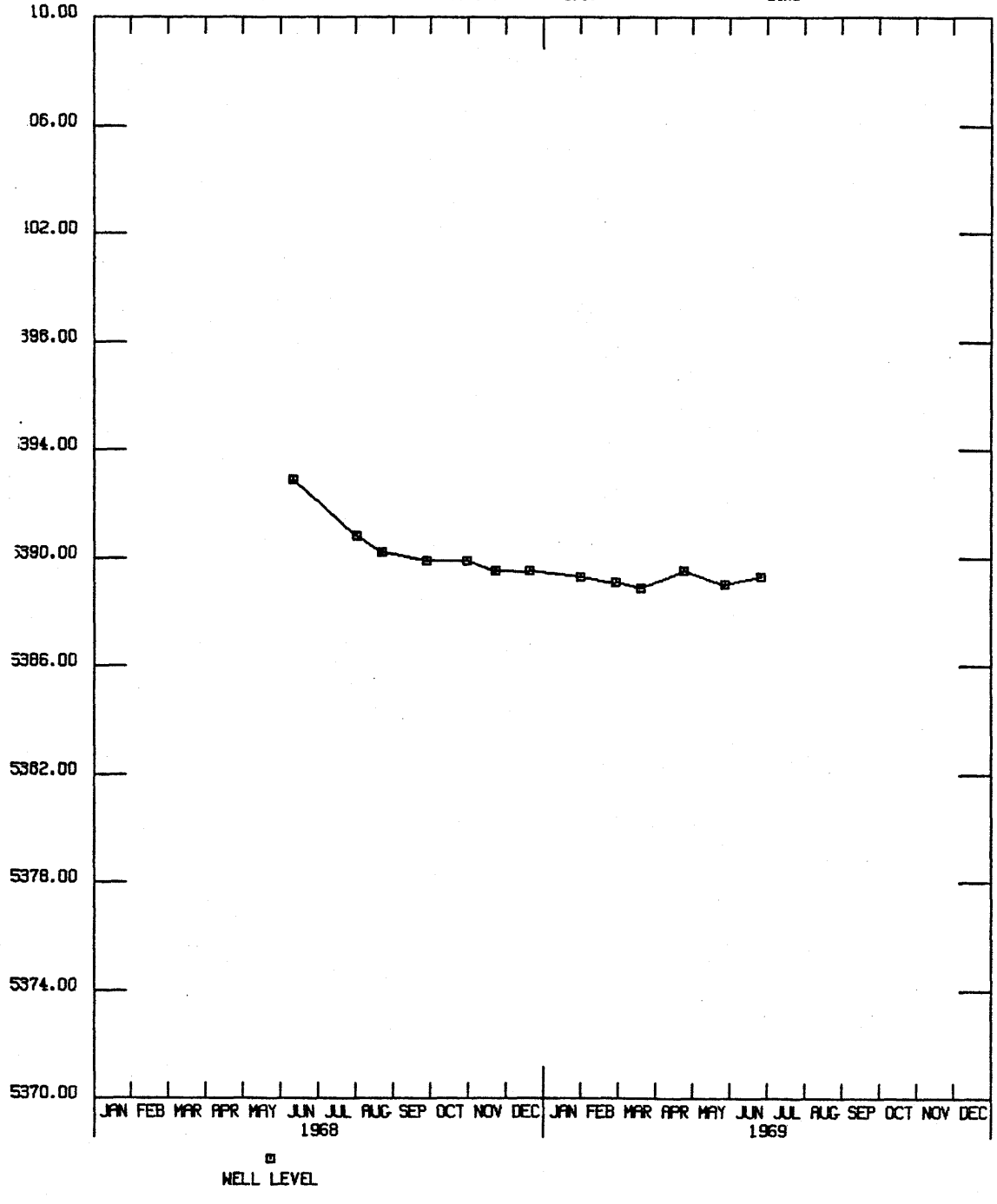
Whether to plot grab levels, yields, and/or daily levels

Whether to print levels as below ground or above sea level

x-axis interval size (3.6, 9, or 23.4 inches per year)

y-axis value range(s) (unless the automatic range(s) is (are) acceptable)

STN # 329 UNNAMED WELL NORTHWEST OF CASPER, WYOMING. THE WELL IS IN ALLUVIUM.
LATITUDE 43-04-40 LONGITUDE 106-35-00 NATRONA COUNTY ELEVATION 5400.00 FT. AQUIFER 0
NE1/4-SW1/4-NE1/4 SECTION 20 TOWNSHIP 36N RANGE 81W 6TH P.M. DRAINAGE BASIN CODE 11410300
WELL DEPTH 25.0 FT. WELL PERMIT NO. 0 DATA FROM USGS (P)
USE ABANDONED OR UNUSED W.Q. STN. NO. 4684 TRANSMISSIVITY 0.0 FT3/DAY/FT
STORAGE COEFFICIENT 0.000000 X= 0.00 Y= 0.00 ZONE



## 3.5 CLIMATE

### Data Available

The climatic data base divides the data into four types: daily climate, 6-hourly climate, hourly precipitation, and 1- & 3-hourly climate.

| Data Type: | Parameters: | | Unit of Measurement: |
|---|---|---|---|
| Daily data | 1 | maximum air temp. | °F |
| | 2 | minimum air temp. | °F |
| | 3 | mean air temp. | °F |
| | 4 | precipitation | inches |
| | 5 | snowfall | inches |
| | 6 | snowdepth | inches |
| | 7 | wind | miles/day |
| | 8 | evaporation | inches |
| | 9 | maximum evaporation pan temp. | °F |
| | 10 | minimum evaporation pan temp. | °F |
| | 11 | mean evaporation pan temp. | °F |
| 6-hourly data | Air temperature: | | |
| | | 6-hour | °F |
| | | daily maximum | °F |
| | | daily minimum | °F |
| | | monthly maximum | °F |
| | | monthly minimum | °F |
| | Relative humidity: | | |
| | | 6-hour | percent |
| | | at max. temp. for day | percent |
| | | at min. temp. for day | percent |
| | | mean per month | percent |
| | Atmospheric pressure[1]: | | |
| | | max. pressure for day | inches Hg |
| | | min. pressure for day | inches Hg |
| | | max. pressure for month | inches Hg |
| | | min. pressure for month | inches Hg |

[1] All pressures are adjusted to sea level

| Data Type: | Parameters: | Unit of Measurement: |
|---|---|---|
| Hourly precipitation data | Hourly precipitation | inches |
| | Monthly total precipitation | inches |
| 1- & 3-hourly data[1] | Dry bulb air temperature | °F |
| | Wet bulb air temperature | °F |
| | Dew-point temperature | °F |
| | Relative humidity | percent |
| | Wind speed | miles per hour |
| | Wind direction | 16 compass points |
| | NOTE: an hourly average computed per month is also stored for all 1- & 3-hourly items except wind direction | |

Header information for a given station includes latitude-longitude, township-range, county-state, elevation, drainage basin code and source organization.

Due to the large amount of daily climatic data stored, the daily data are physically separated from the other climatic data. This prevents all of the currently written programs from accessing daily climatic data concurrently with 1- & 3-hourly, or 6-hourly data.

[1]Frequency depends upon data availability

## DAILY

Sometimes daily data are necessary, regardless of the actual frequency of data collection. DAILY summarizes 6-hour, hourly precipitation, and 1- & 3-hour climatic data in a daily format, except for wind direction. Monthly and annual summary values are also computed. The data may be printed in the units in which the data are stored, or they can be converted to other units.

For each request, the user should specify:

Data type:
- 6-hour
- hourly precipitation
- 1- & 3-hour

Retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Source organization (unless all are to be used)

Year range (unless all data for years available are desired)

Parameters desired

Units of measure, if other than English:
- centimeters
- degrees centigrade
- kilometers
- knots

STATION NO. 24089 CASPER NATRONA COUNTY INTERNATIONAL AIRPORT
LATITUDE 42-55-00 LONGITUDE 106-28-00 ELEVATION 5336.00 FEET NATRONA COUNTY
SW1/4-SW1/4-NW1/4 SECTION 17 TOWNSHIP 34N RANGE 80W 6TH P.M.
WRRI IS THE DATA SOURCE (P) DRAINAGE BASIN CODE 14110100

DAILY CLIMATIC DATA FOR 1975 COMPUTED FROM HOURLY VALUES

DRY BULB TEMPERATURE DEGREES FAHRENHEIT

| DAY | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | DAY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 19.50 | 22.38 | 39.88 | 10.63 | 41.13 | 51.75 | 75.50 | 64.25 | 68.88 | 50.88 | 43.25 | 38.38 | 1 |
| 2 | 16.25 | 31.50 | 35.88 | 18.75 | 42.75 | 61.00 | 70.25 | 65.25 | 65.13 | 57.63 | 47.88 | 43.50 | 2 |
| 3 | 19.00 | 25.63 | 35.63 | 33.63 | 53.38 | 60.75 | 74.50 | 70.75 | 58.63 | 60.25 | 50.25 | 44.63 | 3 |
| 4 | 26.38 | 3.13 | 37.88 | 42.38 | 60.75 | 58.00 | 74.75 | 71.88 | 58.75 | 62.25 | 50.38 | 46.63 | 4 |
| 5 | 22.63 | -3.63 | 36.25 | 39.50 | 44.88 | 62.25 | 74.50 | 73.38 | 59.00 | 55.13 | 53.38 | 30.88 | 5 |
| 6 | 32.38 | 13.50 | 24.75 | 37.00 | 36.63 | 62.25 | 73.75 | 77.63 | 64.25 | 66.38 | 53.13 | 37.38 | 6 |
| 7 | 22.38 | 21.25 | 16.63 | 26.50 | 41.63 | 56.13 | 70.00 | 78.88 | 62.63 | 62.75 | 46.00 | 40.00 | 7 |
| 8 | 30.25 | .88 | 33.13 | 23.13 | 43.88 | 52.13 | 69.63 | 68.13 | 65.63 | 39.50 | 33.63 | 39.00 | 8 |
| 9 | 18.50 | 30.63 | 28.88 | 29.25 | 47.50 | 45.75 | 71.25 | 70.25 | 67.00 | 47.00 | 27.63 | 44.75 | 9 |
| 10 | 9.75 | 34.00 | 28.50 | 28.38 | 46.50 | 47.75 | 68.13 | 73.38 | 68.63 | 58.38 | 37.88 | 44.13 | 10 |
| 11 | -8.63 | 30.38 | 20.63 | 30.75 | 49.38 | 54.00 | 66.50 | 71.88 | 48.25 | 55.50 | 25.00 | 28.00 | 11 |
| 12 | 6.63 | 35.25 | 19.38 | 34.75 | 50.25 | 61.50 | 66.25 | 69.50 | 49.88 | 48.00 | 27.63 | 37.50 | 12 |
| 13 | 30.38 | 38.63 | 30.75 | 37.00 | 53.63 | 62.00 | 73.50 | 61.75 | 54.75 | 43.00 | 42.25 | 20.38 | 13 |
| 14 | 35.13 | 26.88 | 33.50 | 43.13 | 58.13 | 56.50 | 77.63 | 60.88 | 63.00 | 37.88 | 47.75 | 7.88 | 14 |
| 15 | 28.38 | 14.38 | 35.13 | 41.38 | 62.00 | 61.50 | 76.00 | 61.13 | 65.13 | 45.50 | 50.88 | 21.63 | 15 |
| 16 | 27.38 | 20.50 | 39.50 | 46.13 | 66.75 | 52.88 | 71.13 | 61.88 | 66.13 | 41.38 | 45.63 | 12.75 | 16 |
| 17 | 32.75 | 12.63 | 34.88 | 33.88 | 60.25 | 46.63 | 72.88 | 64.63 | 58.38 | 48.75 | 31.13 | 4.75 | 17 |
| 18 | 34.75 | 13.63 | 42.00 | 31.38 | 63.75 | 51.50 | 72.75 | 70.75 | 42.88 | 55.88 | 29.13 | 25.50 | 18 |
| 19 | 29.13 | 24.13 | 49.00 | 41.38 | 52.00 | 54.75 | 67.38 | 72.75 | 44.25 | 51.13 | 21.75 | 27.38 | 19 |
| 20 | 35.88 | 29.00 | 45.38 | 41.63 | 31.50 | 57.88 | 70.50 | 68.38 | 42.75 | 56.13 | 15.50 | 27.88 | 20 |
| 21 | 19.63 | 13.75 | 36.75 | 43.38 | 34.13 | 53.25 | 73.50 | 69.38 | 46.00 | 52.88 | 17.75 | 28.88 | 21 |
| 22 | 25.50 | 7.00 | 42.63 | 51.88 | 42.25 | 57.88 | 73.50 | 68.38 | 51.38 | 37.38 | 33.88 | 22.63 | 22 |
| 23 | 35.50 | 27.00 | 25.00 | 49.88 | 47.00 | 62.63 | 69.13 | 69.63 | 54.38 | 26.38 | 30.25 | 20.63 | 23 |
| 24 | 31.38 | 32.38 | 27.88 | 49.00 | 51.63 | 68.75 | 70.88 | 61.63 | 56.38 | 23.75 | 32.25 | 24.88 | 24 |
| 25 | 25.25 | 24.38 | 30.13 | 56.00 | 40.75 | 63.13 | 74.13 | 58.38 | 58.25 | 29.75 | 16.00 | 31.63 | 25 |
| 26 | 27.75 | 25.50 | 17.25 | 47.63 | 48.50 | 58.88 | 74.25 | 62.75 | 55.63 | 45.25 | 16.25 | 32.25 | 26 |
| 27 | 5.50 | 33.13 | 5.75 | 42.75 | 52.75 | 67.63 | 76.38 | 70.38 | 48.00 | 30.25 | 22.50 | 28.38 | 27 |
| 28 | 12.38 | 36.38 | 6.50 | 40.75 | 42.88 | 68.63 | 78.50 | 72.38 | 52.25 | 31.75 | 11.88 | 22.75 | 28 |
| 29 | 11.88 | | 13.75 | 35.13 | 49.38 | 71.75 | 79.00 | 65.38 | 47.13 | 43.88 | -1.13 | 27.00 | 29 |
| 30 | 5.50 | | 32.63 | 35.00 | 51.00 | 71.88 | 73.88 | 69.25 | 45.38 | 51.38 | 8.63 | 31.75 | 30 |
| 31 | 16.38 | | 23.00 | | 49.75 | | 68.63 | 71.88 | | 41.75 | | 14.13 | 31 |
| MAX | 35.88 | 38.63 | 49.00 | 56.00 | 66.75 | 71.88 | 79.00 | 78.88 | 68.88 | 66.38 | 53.38 | 46.63 | |
| MIN | -8.63 | -3.63 | 5.75 | 10.63 | 31.50 | 45.75 | 66.25 | 58.38 | 42.75 | 23.75 | -1.13 | 4.75 | |
| MEAN | 22.11 | 22.29 | 29.96 | 37.40 | 48.99 | 58.71 | 72.53 | 68.28 | 56.29 | 47.02 | 32.28 | 29.29 | |

MAXIMUM FOR THE YEAR: 79.00 29 JUL
MINIMUM FOR THE YEAR: -8.63 11 JAN
MEAN FOR THE YEAR: 43.91

* INDICATES PARTIAL VALUES
** INDICATES MISSING DATA

DATECL

Climate dates can be obtained for any of the four data files: daily climate, 6-hour climate, hourly precipitation, or 1- & 3-hour climate. Dates for any or all parameters within a data file can be listed below the station headers. A header is printed only if it has data for the specified parameter. Station headers contain the station number, name, elevation, source organization, and location by latitude-longitude, township-range, county-state and drainage basin.

For each listing, the user should specify:

Data type:
- daily
- 6-hour
- hourly precipitation
- 1- & 3-hour

Parameters (unless all are to be reported)

Retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Source organization (unless all are to be used)

Whether or not dates, in addition to headers, are to be printed

**********

DAILY CLIMATE
YEAR RANGES OF DATA AVAILABLE ON THE
WATER RESOURCES DATA SYSTEM
WYOMING WATER RESEARCH CENTER, LARAMIE, WY

**********

STATION NO. 481610 CENTENNIAL
LATITUDE 41-19-00 LONGITUDE 106-08-00 ELEVATION 8140.00 FEET ALBANY COUNTY
SW1/4-SW1/4-SE1/4 SECTION 27 TOWNSHIP 16N RANGE 78W 6TH P.M.
NOAA IS THE DATA SOURCE (P) DRAINAGE BASIN CODE 11062020

MAXIMUM TEMPERATURE
1899 - 1903
1914 - 1919
1948 - 1970
1977 - 1980
MINIMUM TEMPERATURE
1899 - 1903
1914 - 1919
1948 - 1970
1977 - 1980
MEAN TEMPERATURE
1899 - 1903
1914 - 1919
1948 - 1970
1977 - 1980
PRECIPITATION
1899 - 1907
1911 - 1942
1944 - 1970
1977 - 1980
SNOWFALL
1948 - 1970
1977 - 1980
SNOWDEPTH
1948 - 1970
1977 - 1980

1- AND 3-HOUR CLIMATE
YEAR RANGES OF DATA AVAILABLE ON THE
WATER RESOURCES DATA SYSTEM
WYOMING WATER RESEARCH CENTER, LARAMIE, WY

STATION NO. 24016 CASPER WARDWELL FIELD
LATITUDE 42-55-00 LONGITUDE 106-20-00 ELEVATION 5287.00 FEET NATRONA COUNTY
NE1/4-NE1/4-SW1/4 SECTION 16 TOWNSHIP 34N RANGE 79W 6TH P.M.
NOAA IS THE DATA SOURCE (P) DRAINAGE BASIN CODE 11380000

DRY BULB TEMPERATURE
JAN 1948 - MAR 1950
WET BULB TEMPERATURE
JAN 1948 - MAR 1950
DEWPOINT TEMPERATURE
JAN 1948 - MAR 1950
RELATIVE HUMIDITY
JAN 1948 - MAR 1950
WIND SPEED
JAN 1948 - MAR 1950
WIND DIRECTION
JAN 1948 - MAR 1950

STATION NO. 24018 CHEYENNE MUNICIPAL AIRPORT
LATITUDE 41-09-00 LONGITUDE 104-49-00 ELEVATION 6126.00 FEET LARAMIE COUNTY
NW1/4-NW1/4-NE1/4 SECTION 31 TOWNSHIP 14N RANGE 66W 6TH P.M.
NOAA IS THE DATA SOURCE (P) DRAINAGE BASIN CODE 12010100

DRY BULB TEMPERATURE
JAN 1948 - DEC 1980
WET BULB TEMPERATURE
JAN 1948 - DEC 1980
DEWPOINT TEMPERATURE
JAN 1948 - DEC 1980
RELATIVE HUMIDITY
JAN 1948 - DEC 1980
WIND SPEED
JAN 1948 - DEC 1980
WIND DIRECTION
JAN 1948 - DEC 1980

EXTREMECL

This program prints and plots extreme monthly values for a given range of years for daily, 6-hour, hourly precipitation, and 1- & 3-hour climatic data (excluding wind direction). A table of monthly maximum values may be printed for each type of data. A table of minimum values can be printed for all types of data except daily precipitation, snowfall, snow depth, wind and hourly precipitation. An overall maximum and minimum value will be printed for the range of years.

A histogram depicting mean extreme values for each month of the range of years will be generated. The range of values on the vertical axis of the plot can optionally be input if more detail is desired than is afforded by the preset ranges.

For each plot, the user should specify:

Data type:
- daily
- 6-hour
- hourly precipitation
- 1- & 3-hour

Retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Source organization (unless all sources are to be used)

Year range (unless all available data are to be used)

Parameters desired

Conversion units, if any:
- centimeters
- degrees centigrade
- kilometers
- knots

Vertical axis value range (if not to be automatically preset)

STATION NO. 24089 CASPER NATRONA COUNTY INTERNATIONAL AIRPORT
LATITUDE 42-55-00 LONGITUDE 106-28-00 ELEVATION 5338.00 FEET NATRONA COUNTY
SW1/4-SW1/4-NW1/4 SECTION 17 TOWNSHIP 34N RANGE 80W 6TH P.M.
WRRI IS THE DATA SOURCE (P) DRAINAGE BASIN CODE 14110100

MAXIMUM MONTHLY VALUES FOR 1955 - 1975

DRY BULB TEMPERATURE DEGREES FAHRENHEIT

| YEAR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | MEAN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1955 | 47.00* | 44.00 | 55.00 | 74.00 | 81.00* | 86.00 | 96.00 | 95.00 | 90.00 | 77.00 | 61.00 | 52.00 | 71.50* |
| 1956 | 53.00 | 51.00 | 69.00 | 69.00 | 81.00 | 94.00 | 95.00 | 90.00 | 88.00 | 81.00 | 60.00 | 50.00 | 73.41 |
| 1957 | 44.00 | 55.00 | 60.00 | 69.00 | 76.00 | 88.00 | 94.00 | 94.00 | 84.00 | 85.00 | 50.00 | 50.00 | 70.75 |
| 1958 | 47.00 | 64.00 | 55.00 | 74.00 | 86.00 | 93.00 | 93.00 | 96.00 | 90.00 | 80.00 | 65.00 | 56.00 | 74.91 |
| 1959 | 53.00 | 48.00 | 57.00* | 77.00 | 80.00 | 93.00* | 98.00* | 94.00 | 92.00 | 70.00* | 63.00 | 53.00 | 73.16* |
| 1960 | 45.00* | 44.00 | 69.00 | 73.00* | 86.00* | 92.00 | 96.00 | 93.00 | 92.00 | 77.00 | 59.00 | 54.00 | 73.33* |
| 1961 | 52.00 | 54.00 | 66.00 | 72.00* | 84.00 | 95.00* | 92.00 | 95.00 | 83.00 | 74.00 | 53.00* | 49.00* | 72.41* |
| 1962 | 47.00 | 64.00 | 62.00 | 80.00 | 81.00 | 92.00 | 94.00 | 92.00 | 83.00 | 80.00 | 64.00 | 58.00 | 74.75 |
| 1963 | 50.00 | 62.00 | 66.00 | 73.00 | 80.00 | 94.00 | 95.00 | 90.00 | 87.00 | 83.00 | 64.00 | 50.00 | 74.50 |
| 1964 | 47.00 | 45.00 | 63.00 | 70.00 | 86.00 | 90.00 | 95.00 | 93.00 | 85.00 | 76.00 | 63.00 | 52.00 | 72.25 |
| 1965 | 50.00 | 53.00 | 59.00 | 73.00 | 78.00 | 82.00 | 91.00 | 94.00 | 81.00 | 79.00 | 70.00 | 58.00 | 72.33 |
| 1966 | 50.00 | 46.00 | 71.00 | 67.00 | 83.00 | 92.00 | 98.00 | 92.00 | 86.00 | 74.00 | 60.00 | 52.00 | 72.58 |
| 1967 | 48.00 | 53.00 | 68.00 | 72.00 | 83.00 | 86.00 | 94.00 | 94.00 | 89.00 | 75.00 | 59.00 | 42.00 | 71.91 |
| 1968 | 47.00 | 51.00 | 67.00 | 73.00 | 77.00 | 89.00 | 92.00 | 94.00 | 86.00 | 74.00 | 58.00 | 52.00 | 71.66 |
| 1969 | 51.00 | 52.00 | 65.00 | 78.00 | 90.00 | 90.00 | 96.00 | 97.00 | 89.00 | 70.00 | 62.00 | 53.00 | 74.41 |
| 1970 | 55.00 | 56.00 | 61.00 | 68.00 | 80.00 | 99.00 | 92.00 | 94.00 | 85.00 | 81.00 | 56.00 | 53.00 | 73.33 |
| 1971 | 59.00 | 56.00 | 68.00 | 72.00 | 80.00 | 92.00 | 93.00 | 93.00 | 88.00 | 81.00 | 55.00 | 50.00 | 73.91 |
| 1972 | 45.00 | 60.00 | 69.00 | 67.00 | 83.00 | 90.00 | 91.00 | 95.00 | 83.00 | 75.00 | 50.00 | 46.00 | 71.16 |
| 1973 | 48.00 | 49.00 | 54.00 | 66.00 | 81.00 | 90.00 | 97.00 | 93.00 | 84.00 | 79.00 | 66.00 | 61.00 | 72.33 |
| 1974 | 55.00 | 48.00 | 64.00 | 74.00 | 79.00 | 94.00 | 93.00 | 90.00 | 86.00 | 78.00 | 58.00 | 52.00 | 72.58 |
| 1975 | 47.00 | 47.00 | 60.00 | 74.00 | 80.00 | 89.00 | 95.00 | 94.00 | 90.00 | 83.00 | 68.00 | 56.00 | 73.58 |
| MEAN | 49.52* | 52.47 | 63.23* | 72.14* | 81.76* | 90.95* | 94.28* | 93.42 | 86.71 | 77.71* | 60.19* | 52.33* | 72.89* |

MAXIMUM VALUE: 99.00* 27 JUN, 1970

E INDICATES ESTIMATED VALUE
* INDICATES PARTIAL VALUES
** INDICATES MISSING DATA

STATION NO. 24089 CASPER NATRONA COUNTY INTERNATIONAL AIRPORT
LATITUDE 42-55-00 LONGITUDE 106-28-00 ELEVATION 5338.00 FEET NATRONA COUNTY
SW1/4-SW1/4-NW1/4 SECTION 17 TOWNSHIP 34N RANGE 80W 6TH P.M.
WRRI IS THE DATA SOURCE (P) DRAINAGE BASIN CODE 14110100

MINIMUM MONTHLY VALUES FOR 1955 - 1975

DRY BULB TEMPERATURE DEGREES FAHRENHEIT

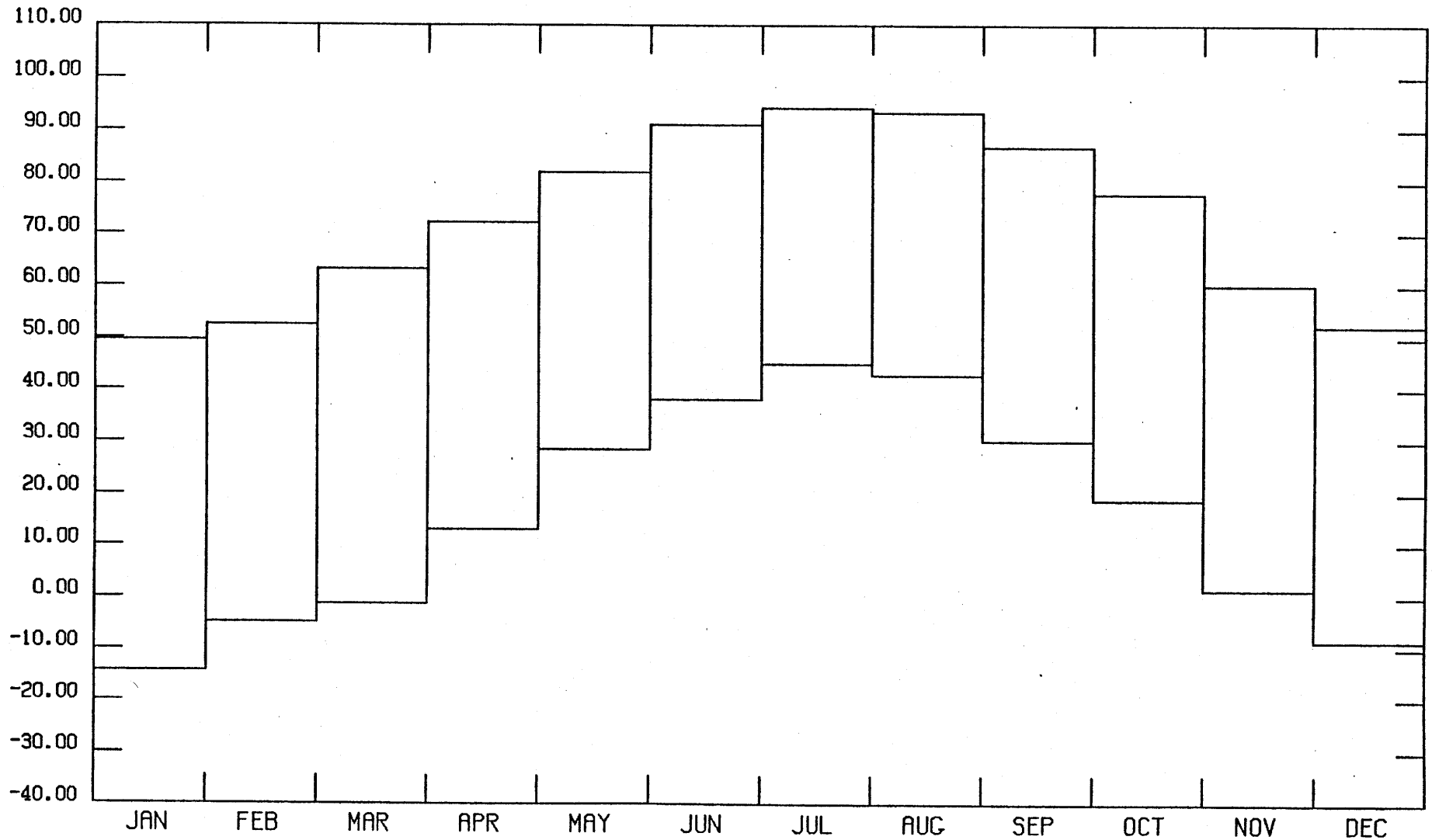
| YEAR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | MEAN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1955 | -4.00* | -9.00 | -11.00 | 10.00 | 35.00* | 38.00 | 45.00 | 49.00 | 32.00 | 22.00 | -11.00 | -5.00 | 15.91* |
| 1956 | -5.00 | -11.00 | -12.00 | 16.00 | 29.00 | 43.00 | 49.00 | 37.00 | 32.00 | 24.00 | -5.00 | -7.00 | 15.83 |
| 1957 | -20.00 | -1.00 | -1.00 | 10.00 | 33.00 | 40.00 | 46.00 | 47.00 | 32.00 | 23.00 | 6.00 | 3.00 | 18.16 |
| 1958 | 6.00 | -6.00 | -2.00 | 16.00 | 27.00 | 43.00 | 44.00 | 41.00 | 31.00 | 20.00 | -6.00 | 0.00 | 17.83 |
| 1959 | -22.00 | -1.00 | 6.00* | 15.00 | 33.00 | 39.00* | 40.00* | 46.00 | 26.00 | 22.00* | -10.00 | 4.00 | 16.50* |
| 1960 | -9.00* | -17.00 | -16.00 | 17.00* | 30.00* | 39.00 | 51.00 | 41.00 | 36.00 | 22.00 | 6.00 | -2.00 | 16.50* |
| 1961 | -4.00 | 9.00 | 12.00 | 17.00* | 30.00 | 45.00* | 47.00 | 51.00 | 24.00 | 15.00 | 3.00* | -16.00* | 19.41* |
| 1962 | -28.00 | -13.00 | -2.00 | 20.00 | 34.00 | 35.00 | 46.00 | 37.00 | 29.00 | 26.00 | 19.00 | -11.00 | 16.00 |
| 1963 | -26.00 | -4.00 | 4.00 | 23.00 | 33.00 | 45.00 | 49.00 | 49.00 | 42.00 | 17.00 | 12.00 | -12.00 | 19.33 |
| 1964 | -5.00 | -1.00 | -4.00 | 15.00 | 31.00 | 38.00 | 51.00 | 38.00 | 23.00 | 21.00 | -3.00 | -30.00 | 14.50 |
| 1965 | -4.00 | -12.00 | -18.00 | 26.00 | 28.00 | 39.00 | 46.00 | 35.00 | 22.00 | 28.00 | 18.00 | -8.00 | 16.83 |
| 1966 | -15.00 | -8.00 | -1.00 | -2.00 | 26.00 | 32.00 | 50.00 | 37.00 | 34.00 | 16.00 | -7.00 | -6.00 | 13.00 |
| 1967 | -6.00 | 4.00 | -1.00 | 14.00 | 22.00 | 39.00 | 48.00 | 41.00 | 36.00 | 19.00 | -1.00 | -13.00 | 16.83 |
| 1968 | -16.00 | 1.00 | 7.00 | 2.00 | 18.00 | 37.00 | 38.00 | 40.00 | 32.00 | 21.00 | 8.00 | -27.00 | 13.41 |
| 1969 | -9.00 | 4.00 | -5.00 | 23.00 | 28.00 | 29.00 | 44.00 | 44.00 | 36.00 | 11.00 | 2.00 | 1.00 | 17.33 |
| 1970 | -19.00 | 3.00 | 0.00 | 8.00 | 27.00 | 35.00 | 46.00 | 48.00 | 29.00 | 14.00 | 0.00 | -6.00 | 15.41 |
| 1971 | -13.00 | -12.00 | -3.00 | 8.00 | 30.00 | 41.00 | 39.00 | 46.00 | 26.00 | -1.00 | 3.00 | -3.00 | 13.41 |
| 1972 | -38.00 | -13.00 | 3.00 | 6.00 | 26.00 | 41.00 | 30.00 | 44.00 | 21.00 | 3.00 | -4.00 | -27.00 | 7.66 |
| 1973 | -24.00 | -9.00 | 13.00 | 5.00 | 28.00 | 33.00 | 45.00 | 46.00 | 30.00 | 24.00 | 4.00 | -9.00 | 15.50 |
| 1974 | -24.00 | 1.00 | 2.00 | 22.00 | 24.00 | 32.00 | 45.00 | 40.00 | 30.00 | 27.00 | 7.00 | -1.00 | 17.08 |
| 1975 | -16.00 | -9.00 | 0.00 | -1.00 | 24.00 | 37.00 | 45.00 | 41.00 | 29.00 | 20.00 | -12.00 | -8.00 | 12.50 |
| MEAN | -14.33* | -4.95 | -1.38* | 12.95* | 28.38* | 38.09* | 44.95* | 42.76 | 30.09 | 18.76* | 1.38* | -8.71* | 15.66* |

MINIMUM VALUE: -38.00* 14 JAN, 1972

E INDICATES ESTIMATED VALUE
* INDICATES PARTIAL VALUES
** INDICATES MISSING DATA

STATION NO. 24089 CASPER NATRONA COUNTY INTERNATIONAL AIRPORT
LATITUDE 42-55-00 LONGITUDE 106-28-00 ELEVATION 5338.00 FEET NATRONA COUNTY
SW1/4-SW1/4-NW1/4 SECTION 17 TOWNSHIP 34N RANGE 80W 6TH P.M.
WRRI IS THE DATA SOURCE (P) DRAINAGE BASIN CODE 14110100

MEAN EXTREME VALUES FOR JAN 1955 - DEC 1975
DRY BULB TEMPERATURE




3.5-11

3/83

LISTDATACL

This program prints out the requested climatic data in a tabular format. Daily data are printed one year per page; the other data files are printed one month per page. Retrieval can be by any of five methods, and can be further limited by source organization. Data items can be specified for each data file.

For each request, the user should specify:

Data type:
- daily
- 6-hour
- hourly precipitation
- 1- & 3-hour

Parameter (unless all parameters are to be used)

Retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Source organization (unless all sources are to be used)

Date range (unless all available data are to be used), with dates specified as:
- Year for daily data
- Year and month for 6-hour, hourly precipitation and 1- & 3-hour data

Conversion units, if any:
- centimeters
- degrees centigrade
- kilometers
- knots

STATION NO. 481570 CASPER WB AP (MOVED 7 MILES IN 1950)
LATITUDE 42-55-00 LONGITUDE 106-28-00 ELEVATION 5338.00 FEET NATRONA COUNTY
SE1/4-SW1/4-SW1/4 SECTION 17 TOWNSHIP 34N RANGE 80W 6TH P.M.
NOAA IS THE DATA SOURCE (P) DRAINAGE BASIN CODE 11410100

DAILY VALUES FOR 1975

MEAN TEMPERATURE DEGREES FAHRENHEIT

| DAY | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | DAY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 20.00 | 18.00 | 41.50 | 8.50 | 41.00 | 52.50 | 76.50 | 65.00 | 65.50 | 51.00 | 45.50 | 35.50 | 1 |
| 2 | 14.50 | 31.50 | 42.00 | 14.00 | 42.50 | 57.00 | 71.50 | 65.00 | 62.50 | 59.00 | 50.00 | 45.50 | 2 |
| 3 | 19.00 | 22.00 | 38.50 | 33.00 | 52.00 | 62.00 | 75.00 | 71.00 | 59.00 | 61.50 | 53.00 | 46.50 | 3 |
| 4 | 23.50 | 2.50 | 39.50 | 41.50 | 57.00 | 58.00 | 74.00 | 70.00 | 59.50 | 60.50 | 54.50 | 49.50 | 4 |
| 5 | 20.50 | -3.50 | 38.50 | 43.50 | 46.00 | 61.00 | 74.50 | 72.00 | 60.00 | 56.50 | 54.00 | 32.50 | 5 |
| 6 | 32.00 | 11.50 | 23.50 | 40.00 | 35.50 | 63.00 | 73.00 | 76.50 | 65.00 | 66.00 | 55.00 | 36.50 | 6 |
| 7 | 22.50 | 21.00 | 12.50 | 28.00 | 43.00 | 60.50 | 73.50 | 76.00 | 63.00 | 61.50 | 44.50 | 36.50 | 7 |
| 8 | 28.50 | 0.00 | 35.50 | 23.50 | 46.00 | 52.00 | 72.00 | 67.50 | 64.50 | 40.50 | 36.50 | 38.00 | 8 |
| 9 | 15.00 | 12.50 | 31.00 | 27.50 | 48.50 | 48.00 | 71.00 | 69.50 | 66.00 | 46.50 | 29.50 | 47.50 | 9 |
| 10 | 7.50 | 34.50 | 29.50 | 28.00 | 50.00 | 48.00 | 67.50 | 73.00 | 67.00 | 59.50 | 36.00 | 42.50 | 10 |
| 11 | -8.00 | 30.50 | 14.00 | 32.00 | 48.00 | 53.00 | 66.50 | 71.00 | 49.50 | 56.50 | 23.50 | 29.00 | 11 |
| 12 | 4.50 | 35.50 | 16.50 | 36.00 | 48.50 | 60.50 | 63.50 | 69.00 | 50.50 | 51.50 | 28.50 | 36.50 | 12 |
| 13 | 29.50 | 38.50 | 30.00 | 36.00 | 54.00 | 62.00 | 71.50 | 63.00 | 55.00 | 43.50 | 45.00 | 17.00 | 13 |
| 14 | 36.50 | 26.00 | 35.00 | 40.50 | 56.50 | 57.50 | 76.50 | 64.50 | 62.50 | 39.00 | 50.50 | 7.00 | 14 |
| 15 | 25.00 | 15.50 | 35.50 | 41.00 | 60.50 | 61.50 | 77.00 | 65.50 | 65.50 | 45.00 | 51.50 | 23.00 | 15 |
| 16 | 25.50 | 19.50 | 41.50 | 47.50 | 64.50 | 55.50 | 73.50 | 63.50 | 65.00 | 42.50 | 46.00 | 5.00 | 16 |
| 17 | 29.00 | 15.00 | 36.50 | 36.00 | 60.00 | 46.50 | 73.00 | 65.00 | 61.00 | 47.00 | 33.50 | 2.00 | 17 |
| 18 | 35.50 | 13.00 | 42.50 | 31.50 | 62.50 | 52.50 | 74.00 | 68.50 | 45.50 | 58.00 | 28.50 | 21.00 | 18 |
| 19 | 28.50 | 23.50 | 49.50 | 42.00 | 51.50 | 55.50 | 69.50 | 69.50 | 45.00 | 51.00 | 20.00 | 27.50 | 19 |
| 20 | 35.00 | 27.00 | 45.00 | 45.00 | 31.50 | 58.50 | 71.00 | 68.50 | 42.50 | 57.00 | 18.00 | 27.50 | 20 |
| 21 | 20.00 | 7.00 | 38.50 | 42.50 | 34.50 | 54.50 | 73.00 | 69.50 | 47.00 | 50.50 | 18.50 | 28.50 | 21 |
| 22 | 24.50 | 5.50 | 41.50 | 51.00 | 43.50 | 59.50 | 73.50 | 71.00 | 53.00 | 43.50 | 34.00 | 20.50 | 22 |
| 23 | 37.50 | 25.50 | 21.50 | 50.50 | 46.50 | 62.00 | 69.50 | 69.50 | 55.50 | 26.00 | 30.00 | 20.00 | 23 |
| 24 | 31.00 | 34.00 | 26.50 | 49.00 | 51.00 | 65.50 | 71.00 | 59.00 | 57.00 | 24.00 | 29.50 | 23.00 | 24 |
| 25 | 24.00 | 26.50 | 27.50 | 55.50 | 41.50 | 65.50 | 74.50 | 57.50 | 58.50 | 26.50 | 11.50 | 32.50 | 25 |
| 26 | 29.00 | 23.00 | 21.50 | 50.50 | 48.00 | 60.00 | 73.00 | 63.00 | 54.50 | 46.50 | 12.00 | 30.50 | 26 |
| 27 | 5.00 | 32.50 | 6.50 | 43.50 | 53.50 | 65.50 | 75.50 | 69.50 | 51.00 | 32.50 | 21.00 | 24.50 | 27 |
| 28 | 10.00 | 35.00 | 7.00 | 41.00 | 44.00 | 66.00 | 82.50 | 71.00 | 54.50 | 31.00 | 9.50 | 23.00 | 28 |
| 29 | 11.00 | | 13.50 | 37.50 | 50.00 | 71.00 | 77.00 | 66.00 | 49.50 | 43.50 | -2.50 | 27.00 | 29 |
| 30 | 5.50 | | 30.50 | 34.00 | 52.50 | 70.50 | 75.00 | 69.00 | 46.00 | 54.50 | 6.50 | 31.00 | 30 |
| 31 | 13.50 | | 25.00 | | 50.00 | | 70.50 | 70.50 | | 42.50 | | 14.00 | 31 |
| MEAN | 21.13 | 20.82 | 30.24 | 37.67 | 48.84 | 58.83 | 72.89 | 68.03 | 56.68 | 47.56 | 32.45 | 28.40 | |

MEAN FOR THE YEAR 1975: 43.79
MAXIMUM VALUE FOR 1975: 82.50 26 JUL
MINIMUM VALUE FOR 1975: -8.00 11 JAN

* INDICATES PARTIAL VALUES
** INDICATES MISSING DATA
*** INDICATES TOTAL MONTH'S DATA MISSING
E INDICATES ESTIMATED VALUE

STATION NO. 481570 CASPER WB AP (MOVED 7 MILES IN 1950)
LATITUDE 42-55-00 LONGITUDE 106-28-00 ELEVATION 5338.00 FEET NATRONA COUNTY
SE1/4-SW1/4-SW1/4 SECTION 17 TOWNSHIP 34N RANGE 80W 6TH P.M.
NOAA IS THE DATA SOURCE (P) DRAINAGE BASIN CODE 11410100

APRIL 1975

HOURLY PRECIPITATION INCHES

| DAY | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | DAILY TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .01 | .01 | .01 | .01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .05 |
| 2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7 | 0.00 | 0.00 | .01 | .01 | .03 | 0.00 | 0.00 | 0.00 | .01 | .11 | .11 | .03 | .02 | .03 | .01 | .01 | .05 | 0.00 | 0.00 | .01 | 0.00 | 0.00 | 0.00 | 0.00 | .44 |
| 8 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .01 |
| 9 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .01 |
| 11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .01 | .01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .02 |
| 12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .01 | .19 | .06 | .01 | .01 | .01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .29 |
| 18 | 0.00 | .01 | .01 | .02 | 0.00 | 0.00 | 0.00 | .01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .05 |
| 19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | .10 |
| 21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 22 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 23 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 24 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 25 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 26 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 27 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 29 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 31 | | | | | | | | | | | | | | | | | | | | | | | | | |

MONTHLY TOTAL = .97
MAXIMUM AMOUNT IN ONE DAY = .44 DAY = 7
MAXIMUM AMOUNT IN ONE HOUR = .19 DAY = 17 HOUR = 10
NUMBER OF EVENTS IN MONTH = 33

* INDICATES PARTIAL VALUES
** INDICATES MISSING DATA
*** INDICATES TOTAL DAY'S DATA MISSING
T INDICATES TRACE
NEXT INDICATES VALUE ACCUMULATED IN NEXT DAY'S VALUE

STATION NO. 24089 CASPER NATRONA COUNTY INTERNATIONAL AIRPORT
LATITUDE 42-55-00 LONGITUDE 106-28-00 ELEVATION 5338.00 FEET NATRONA COUNTY
SW1/4-SW1/4-NW1/4 SECTION 17 TOWNSHIP 34N RANGE 80W 6TH P.M.
WRRI IS THE DATA SOURCE (P) DRAINAGE BASIN CODE 14110100

HOURLY CLIMATE VALUES FOR RELATIVE HUMIDITY PERCENT

NOV 1978

| DAY | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | DAILY AVE | DAY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | 60 | | | 67 | | | 51 | | | 35 | | | 23 | | | 33 | | | 49 | | | 51 | 46 | 1 |
| 2 | | | 51 | | | 55 | | | 46 | | | 30 | | | 25 | | | 36 | | | 43 | | | 65 | 44 | 2 |
| 3 | | | 67 | | | 73 | | | 65 | | | 34 | | | 26 | | | 29 | | | 51 | | | 43 | 49 | 3 |
| 4 | | | 47 | | | 37 | | | 34 | | | 31 | | | 16 | | | 20 | | | 36 | | | 34 | 32 | 4 |
| 5 | | | 43 | | | 48 | | | 47 | | | 36 | | | 35 | | | 39 | | | 55 | | | 68 | 46 | 5 |
| 6 | | | 65 | | | 65 | | | 47 | | | 28 | | | 18 | | | 24 | | | 34 | | | 39 | 40 | 6 |
| 7 | | | 36 | | | 33 | | | 34 | | | 26 | | | 23 | | | 23 | | | 23 | | | 23 | 28 | 7 |
| 8 | | | 21 | | | 24 | | | 27 | | | 22 | | | 19 | | | 18 | | | 21 | | | 23 | 22 | 8 |
| 9 | | | 27 | | | 78 | | | 73 | | | 68 | | | 76 | | | 82 | | | 78 | | | 78 | 70 | 9 |
| 10 | | | 81 | | | 80 | | | 80 | | | 77 | | | 73 | | | 80 | | | 76 | | | 83 | 79 | 10 |
| 11 | | | 83 | | | 83 | | | 80 | | | 77 | | | 77 | | | 81 | | | 84 | | | 84 | 81 | 11 |
| 12 | | | 84 | | | 92 | | | 88 | | | 84 | | | 81 | | | 85 | | | 88 | | | 84 | 86 | 12 |
| 13 | | | 84 | | | 84 | | | 74 | | | 68 | | | 62 | | | 73 | | | 83 | | | 91 | 77 | 13 |
| 14 | | | 87 | | | 75 | | | 87 | | | 70 | | | 60 | | | 77 | | | 77 | | | 84 | 77 | 14 |
| 15 | | | 77 | | | 67 | | | 71 | | | 65 | | | 60 | | | 60 | | | 71 | | | 67 | 67 | 15 |
| 16 | | | 65 | | | 62 | | | 60 | | | 66 | | | 58 | | | 55 | | | 60 | | | 60 | 61 | 16 |
| 17 | | | 62 | | | 62 | | | 68 | | | 64 | | | 59 | | | 61 | | | 66 | | | 66 | 64 | 17 |
| 18 | | | 66 | | | 92 | | | 88 | | | 81 | | | 72 | | | 78 | | | 91 | | | 92 | 83 | 18 |
| 19 | | | 87 | | | 91 | | | 87 | | | 80 | | | 70 | | | 79 | | | 79 | | | 83 | 82 | 19 |
| 20 | | | 83 | | | 83 | | | 83 | | | 73 | | | 67 | | | 73 | | | 80 | | | 76 | 77 | 20 |
| 21 | | | 76 | | | 84 | | | 88 | | | 71 | | | 63 | | | 88 | | | 81 | | | 100 | 81 | 21 |
| 22 | | | 100 | | | 100 | | | 84 | | | 49 | | | 57 | | | 70 | | | 67 | | | 75 | 75 | 22 |
| 23 | | | 78 | | | 69 | | | 69 | | | 59 | | | 45 | | | 28 | | | 56 | | | 72 | 60 | 23 |
| 24 | | | 75 | | | 75 | | | 69 | | | 64 | | | 55 | | | 72 | | | 92 | | | 80 | 73 | 24 |
| 25 | | | 92 | | | 92 | | | 88 | | | 72 | | | 85 | | | 88 | | | 84 | | | 88 | 86 | 25 |
| 26 | | | 88 | | | 96 | | | 88 | | | 88 | | | 78 | | | 92 | | | 92 | | | 84 | 88 | 26 |
| 27 | | | 71 | | | 84 | | | 81 | | | 75 | | | 78 | | | 62 | | | 74 | | | 65 | 74 | 27 |
| 28 | | | 68 | | | 60 | | | 72 | | | 72 | | | 67 | | | 82 | | | 84 | | | 80 | 73 | 28 |
| 29 | | | 68 | | | 71 | | | 60 | | | 61 | | | 69 | | | 69 | | | 75 | | | 69 | 66 | 29 |
| 30 | | | 69 | | | 75 | | | 81 | | | 64 | | | 57 | | | 82 | | | 78 | | | 78 | 73 | 30 |
| 31 | | | | | | | | | | | | | | | | | | | | | | | | | | 31 |

AVERAGE FOR NOV 1978: 65.35

* INDICATES PARTIAL VALUES
** INDICATES MISSING DATA
*** INDICATES TOTAL DAY'S DATA MISSING

MONTHLY

For those times when only monthly summary values are needed, MONTHLY computes monthly values from any climatic data except wind direction. The total will represent total or mean values, depending upon the parameter. For example, monthly precipitation will be printed as a total, monthly temperature as a mean value. Also computed are annual summaries and statistics, including mean and standard deviation, for: (1) all months with at least some data, (2) complete months only, and (3) complete years only.

For each request, the user should specify:

Data type:
- daily
- 6-hour
- hourly precipitation
- 1- & 3-hour

Retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Source organization (unless all sources are to be used)

Year range (unless all data are desired)

Parameter(s) desired

Conversion units (if desired):
- centimeters
- degrees centigrade
- kilometers
- knots

STATION NO. 24089 CASPER NATRONA COUNTY INTERNATIONAL AIRPORT
LATITUDE 42-55-00 LONGITUDE 106-28-00 ELEVATION 5338.00 FEET NATRONA COUNTY
SW1/4-SW1/4-NW1/4 SECTION 17 TOWNSHIP 34N RANGE 80W 6TH P.M.
WRRI IS THE DATA SOURCE (P) DRAINAGE BASIN CODE 14110100

MEAN MONTHLY VALUES FOR 1955 - 1975

DRY BULB TEMPERATURE DEGREES FAHRENHEIT

| YEAR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANNUAL | PERCENT OF MEAN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1955 | 23.12* | 21.07 | 26.34 | 43.13 | 54.86* | 59.51 | 74.28 | 73.05 | 60.47 | 50.05 | 26.58 | 27.73 | 45.01* | ** |
| 1956 | 27.02 | 23.64 | 33.27 | 39.84 | 55.21 | 69.91 | 71.01 | 67.22 | 61.23 | 50.33 | 30.54 | 28.67 | 46.49 | 103.16 |
| 1957 | 16.59 | 32.11 | 34.51 | 38.30 | 51.01 | 61.03 | 72.57 | 70.53 | 56.32 | 45.84 | 29.29 | 32.55 | 45.05 | 99.96 |
| 1958 | 28.08 | 30.92 | 28.43 | 39.90 | 59.17 | 62.99 | 65.49 | 71.62 | 60.35 | 49.35 | 34.34 | 28.98 | 46.63 | 103.47 |
| 1959 | 24.73 | 23.35 | 32.50* | 41.77 | 50.30 | 67.21* | 71.46* | 71.28 | 56.84 | 43.86* | 30.88 | 31.35 | 45.46* | ** |
| 1960 | 23.11* | 18.84 | 32.98 | 44.75* | 54.55* | 64.60 | 72.78 | 68.62 | 60.31 | 47.08 | 33.67 | 25.93 | 45.60* | ** |
| 1961 | 28.49 | 30.94 | 36.16 | 40.44* | 53.77 | 66.69* | 70.58 | 72.24 | 50.99 | 44.49 | 30.49* | 22.74* | 45.66* | ** |
| 1962 | 16.29 | 27.02 | 29.78 | 46.13 | 54.04 | 61.42 | 68.05 | 68.12 | 58.01 | 50.40 | 39.47 | 30.34 | 45.75 | 101.52 |
| 1963 | 14.13 | 32.40 | 34.96 | 42.30 | 55.28 | 64.69 | 72.52 | 70.48 | 63.66 | 53.82 | 38.12 | 25.43 | 47.31 | 104.98 |
| 1964 | 24.15 | 21.90 | 25.46 | 39.38 | 53.78 | 60.78 | 74.64 | 66.73 | 56.31 | 47.03 | 32.09 | 24.97 | 43.93 | 97.48 |
| 1965 | 30.28 | 23.92 | 21.18 | 45.32 | 49.69 | 59.63 | 69.36 | 66.81 | 47.25 | 50.91 | 39.28 | 30.11 | 44.47 | 98.68 |
| 1966 | 23.04 | 25.01 | 36.47 | 38.73 | 56.48 | 61.92 | 75.19 | 66.39 | 61.26 | 44.70 | 36.07 | 25.92 | 45.93 | 101.92 |
| 1967 | 27.14 | 27.85 | 35.54 | 42.32 | 48.29 | 57.99 | 68.95 | 68.92 | 60.16 | 48.03 | 31.50 | 19.14 | 44.73 | 99.25 |
| 1968 | 24.72 | 29.73 | 35.51 | 37.80 | 47.67 | 60.16 | 68.90 | 64.61 | 56.21 | 47.72 | 32.22 | 20.42 | 43.84 | 97.28 |
| 1969 | 26.97 | 28.96 | 27.85 | 46.65 | 55.20 | 56.58 | 71.15 | 72.06 | 63.45 | 37.42 | 34.56 | 28.15 | 45.75 | 101.52 |
| 1970 | 23.96 | 32.06 | 27.96 | 37.23 | 52.81 | 62.72 | 70.99 | 72.70 | 54.03 | 40.87 | 34.54 | 25.50 | 44.60 | 98.97 |
| 1971 | 25.56 | 24.87 | 31.13 | 40.61 | 49.25 | 64.13 | 67.24 | 71.52 | 53.45 | 41.96 | 31.12 | 23.76 | 43.71 | 96.99 |
| 1972 | 18.41 | 28.75 | 28.20 | 42.13 | 51.35 | 64.34 | 65.69 | 67.06 | 56.00 | 43.24 | 30.33 | 18.15 | 43.63 | 96.81 |
| 1973 | 19.83 | 24.93 | 32.75 | 35.87 | 51.19 | 62.94 | 68.25 | 70.74 | 53.77 | 47.79 | 32.89 | 27.44 | 44.03 | 97.70 |
| 1974 | 19.86 | 27.95 | 36.09 | 43.07 | 51.32 | 65.21 | 72.65 | 64.08 | 53.43 | 47.51 | 34.13 | 24.79 | 45.00 | 99.85 |
| 1975 | 22.11 | 22.29 | 29.96 | 37.40 | 48.99 | 58.71 | 72.53 | 68.28 | 56.29 | 47.02 | 32.28 | 29.28 | 43.76 | 97.10 |
| ALL MONTHS WITH AT LEAST SOME DATA | | | | | | | | | | | | | | |
| MEAN | 23.19* | 26.59 | 31.85* | 41.09* | 52.58* | 62.53* | 70.68* | 69.19 | 57.13 | 46.63* | 33.06* | 26.25* | 45.06* | |
| STDEV | 4.34 | 4.00 | 4.46 | 3.05 | 3.01 | 3.29 | 2.76 | 2.68 | 4.15 | 3.81 | 3.25 | 3.87 | 1.05 | |
| N | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | |
| ALL COMPLETE MONTHS | | | | | | | | | | | | | | |
| MEAN | 23.19 | 26.59 | 31.82 | 40.94 | 52.35 | 62.06 | 70.64 | 69.19 | 57.13 | 46.77 | 33.19 | 26.43 | 44.97 | |
| STDEV | 4.57 | 4.00 | 4.58 | 3.09 | 3.08 | 3.10 | 2.83 | 2.68 | 4.15 | 3.85 | 3.28 | 3.89 | 1.15 | |
| N | 19 | 21 | 20 | 19 | 19 | 19 | 20 | 21 | 21 | 20 | 20 | 20 | 17 | |
| ALL COMPLETE YEARS | | | | | | | | | | | | | | |
| MEAN | 22.79 | 27.31 | 31.82 | 40.76 | 52.39 | 62.06 | 70.30 | 68.69 | 57.12 | 46.70 | 33.69 | 26.09 | 44.97 | |
| STDEV | 4.63 | 3.46 | 4.66 | 3.22 | 3.21 | 3.16 | 2.87 | 2.63 | 4.23 | 4.08 | 3.07 | 4.63 | 1.15 | |
| N | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | |

MAXIMUM DAILY VALUE: 99.00* 27 JUN, 1970
MINIMUM DAILY VALUE: -38.00* 14 JAN, 1972

F INDICATES ESTIMATED VALUE
* INDICATES PARTIAL VALUES
** INDICATES MISSING DATA

PLOTCLL

PLOTCLL plots climatic stations by location. The retrieval can be specified in terms of latitude-longitude or township-range. Overlap points can be generated to prevent the overprinting of data from adjacent stations. Using a larger scale or the small print size can also reduce overprinting. It is suggested that the WRDS staff be consulted during request submittal if the user is unfamiliar with plot scaling.

Information to be plotted is specified through the selection of one of the following styles:

Style 1. Type of data available (daily, 6-hour, hourly precipitation, 1- & 3-hour)
Station number

Style 2. Number of months or years of data available
Station number
Mean value of parameter

Style 3. Number of months or years of data available
Station number
Maximum value of parameter
Minimum value of parameter

Style 4. Number of months or years of data available
Station number
Mean value of parameter 1
Mean value of parameter 2

Style 5. Number of months or years of data available
Station number
Maximum value of parameter 1
Maximum value of parameter 2

Style 6. Number of months or years of data available
Station number
Minimum value of parameter 1
Minimum value of parameter 2

Style 1 cannot plot the location of daily climatic stations with stations from the other data files.

PLOTCLL (continued)

For styles 4 through 6, the parameters specified must be from the same data file. The number of years of data is plotted for daily climatic data; the number of months of data is plotted for 6-hour, hourly precipitation, and 1- & 3-hour data.

To prevent overprinting of data from adjacent stations, the program can combine the data of these stations and plot instead an "overlap point", whose position is the weighted average of the points it replaces.

Overlap points can optionally have the following printed beside them for each style:

1. Nothing beside overlap point for style 1
2. Mean value of parameter for all stations represented by point
3. Maximum value of parameter for all stations represented by point
4. Mean value of parameter 1 for all stations represented by point
5. Maximum value of parameter 1 for all stations represented by point
6. Minimum value of parameter 1 for all stations represented by point

For each plot, the user should specify:

Style of plot

Scale of plot (such as 1:250000, which is the default specification)

Whether or not overlap points are to be created, and what to print beside them, if anything

Data type(s), for style 1

PLOTCLL (continued)

Retrieval method and value range:
latitude-longitude
township-range (Wyoming only)

Source organization (unless all sources are to be used)

Year range (unless all available data are desired)

First and second parameters, as applicable

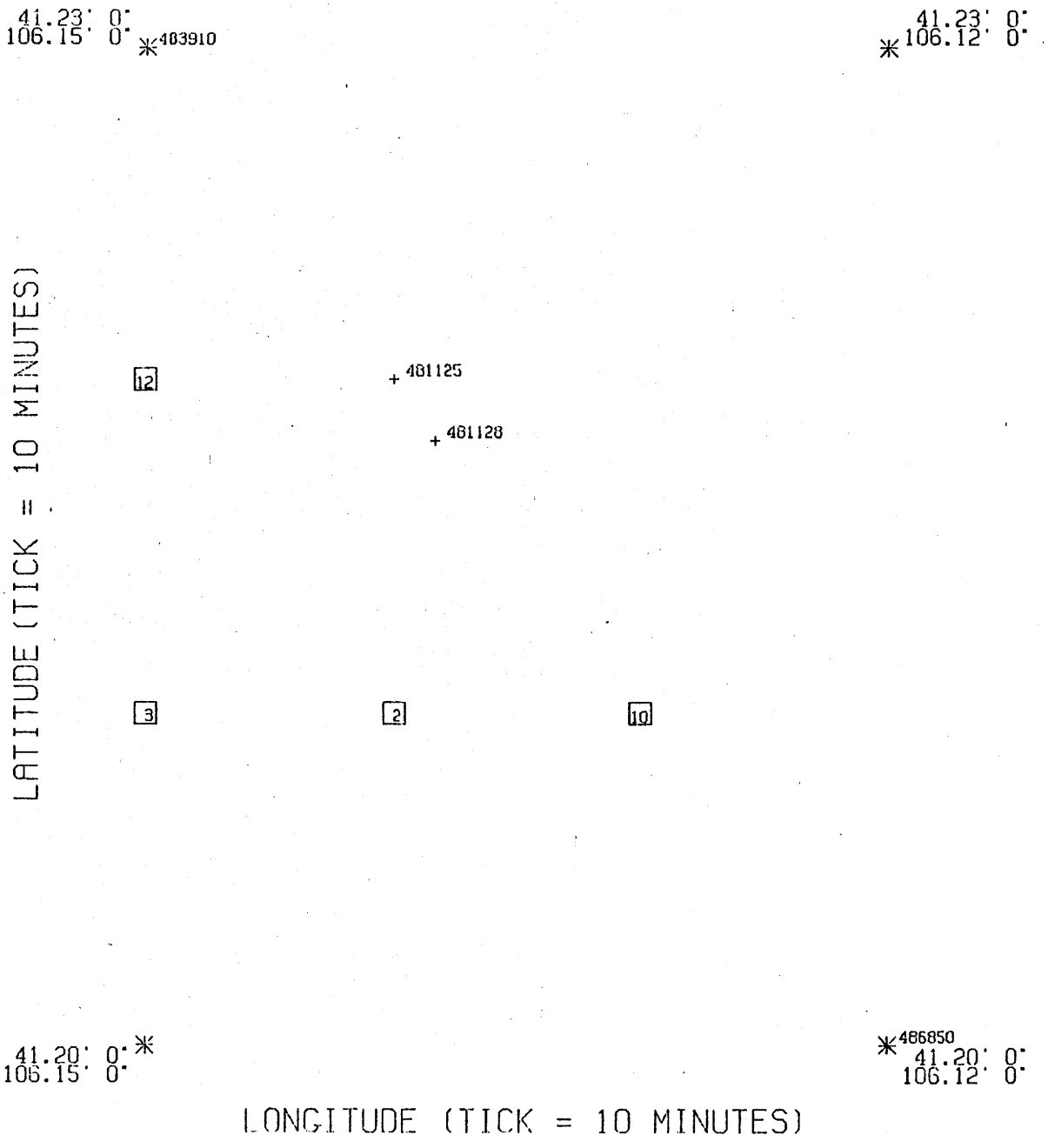
Print height (.1 or .06 inches)

SCALE -- 1 : 24000

POINTS PLOTTED REPRESENT
⊙ DAILY CLIMATE STATION
△ 6 HOUR CLIMATE STATION
+ HOURLY PRECIPITATION STATION
× 1,3 HOUR CLIMATE STATION
⊕ DAILY CLIMATE, HOURLY PRECIP.
⊹ 1,3 HOUR & 6 HOUR CLIMATE
[N] N OVERLAP POINTS
(N=** FOR MORE THAN 99 POINTS)

VALUES PRINTED ARE
LINE 1
STATION NUMBER

31 DATA POINTS ARE REPRESENTED.



STORM

This program summarizes storm events from hourly precipitation data for a specific station and year range. A precipitation occurrence of one hour or longer constitutes a storm. For each storm, the occurrence date, beginning hour, duration in hours, total amount of precipitation and average intensity (inches/hour) are computed and printed. Missing values and trace values are assumed to have a value of zero.

In some cases, it may be preferable to analyze the storms that occur during a portion of the year (e.g., April through August) rather than the entire year. For those instances, an option exists to analyze any month range (inclusive) within the year.

For each request, the user should specify:

Retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Source organization (unless all sources are to be used)

Year range (unless all years are to be used)

Month range (unless January through December is to be used)

Units of measure (inches or centimeters)

STATION NO. 481570 CASPER WR AP (MOVED 7 MILES IN 1950)
LATITUDE 42-55-00 LONGITUDE 106-28-00 ELEVATION 5338.00 FEET NATRONA COUNTY
SE1/4-SE1/4-SW1/4 SECTION 17 TOWNSHIP 34N RANGE 80W 6TH P.M.
NOAA IS THE DATA SOURCE (P) DRAINAGE BASIN CODE 11401CO

STORM SUMMARY FOR HOURLY PRECIPITATION VALUES
MAY 1972 - JUL 1972

| BEGINNING DATE | BEGINNING HOUR | DURATION IN HOURS | AMOUNT IN INCHES | INTENSITY INCHES/HOUR |
|---|---|---|---|---|
| 6 MAY 1972 | 6 | 4 | .05 | .01 |
| 6 MAY 1972 | 11 | 1 | .01 | .01 |
| 7 MAY 1972 | 18 | 4 | .07 | .02 |
| 8 MAY 1972 | 16 | 1 | .04 | .04 |
| 8 MAY 1972 | 18 | 2 | .03 | .02 |
| 8 MAY 1972 | 21 | 1 | .01 | .01 |
| 9 MAY 1972 | 20 | 7 | .22 | .03 |
| 10 MAY 1972 | 8 | 1 | .01 | .01 |
| 10 MAY 1972 | 13 | 2 | .05 | .03 |
| 10 MAY 1972 | 16 | 1 | .01 | .01 |
| 10 MAY 1972 | 20 | 1 | .02 | .02 |
| 11 MAY 1972 | 10 | 1 | .01 | .01 |
| 11 MAY 1972 | 19 | 2 | .05 | .03 |
| 13 MAY 1972 | 4 | 1 | .05 | .05 |
| 19 MAY 1972 | 14 | 2 | .11 | .06 |
| 19 MAY 1972 | 21 | 1 | .02 | .02 |
| 1 JUN 1972 | 22 | 1 | .01 | .01 |
| 2 JUN 1972 | 21 | 3 | .22 | .07 |
| 3 JUN 1972 | 19 | 2 | .02 | .01 |
| 4 JUN 1972 | 19 | 6 | .26 | .04 |
| 5 JUN 1972 | 3 | 1 | .01 | .01 |
| 5 JUN 1972 | 5 | 4 | .08 | .02 |
| 7 JUN 1972 | 16 | 2 | .04 | .02 |
| 18 JUN 1972 | 22 | 2 | .03 | .02 |
| 19 JUN 1972 | 6 | 1 | .01 | .01 |
| 22 JUN 1972 | 18 | 3 | .09 | .03 |
| 23 JUN 1972 | 16 | 1 | .03 | .03 |
| 25 JUN 1972 | 15 | 1 | .03 | .03 |
| 2 JUL 1972 | 2 | 1 | .01 | .01 |
| 2 JUL 1972 | 5 | 4 | .05 | .01 |
| 7 JUL 1972 | 14 | 1 | .01 | .01 |
| 20 JUL 1972 | 18 | 1 | .54 | .54 |
| 27 JUL 1972 | 20 | 2 | .28 | .14 |
| 31 JUL 1972 | 7 | 4 | .11 | .03 |
| 31 JUL 1972 | 21 | 2 | .04 | .02 |

NO MISSING DATA WERE ENCOUNTERED

ASSUMPTIONS:
(1) MISSING DATA AND TRACE VALUES ARE ASSUMED TO HAVE A VALUE OF ZERO.
(2) VALUES DISPLAYED MAY REPRESENT AN ACCUMULATION OF PREVIOUS VALUES.
(3) IN THE EVENT AN ACCUMULATED VALUE IS DETECTED, THE BEGINNING HOUR OF THE STORM IS GIVEN BY THE HOUR ACCUMULATION BEGAN.
(4) IF A STORM WAS DETECTED IN THE GIVEN DATE RANGE BUT BEGAN IN A MONTH NOT REQUESTED, IT IS ASSUMED THAT THE STORM ACTUALLY BEGAN DURING THE FIRST HOUR OF THE GIVEN DATE RANGE.

WINDROSE

Prevailing wind patterns can be difficult to discern from tabular data. This program plots a windrose which graphically presents this information. Two tables of wind speed classes versus direction depict the percent of time that wind speed is within given ranges, and the percent of time that wind speed is less than 4 given wind speed values. Wind data are computed for a range of months over a range of years.

For each plot, the user should specify:

Retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Source organization (unless all sources are to be used)

Year range (unless all years are to be used)

Month range (unless all months are to be used)

Units (mph or kph)

STATION NO. 24089 CASPER NATRONA COUNTY INTERNATIONAL AIRPORT
LATITUDE 42-55-00 LONGITUDE 106-28-00 ELEVATION 5338.00 FEET NATRONA COUNTY
SW1/4-SW1/4-NW1/4 SECTION 17 TOWNSHIP 34N RANGE 80W 6TH P.M.
WRRI IS THE DATA SOURCE (P) DRAINAGE BASIN CODE 14110100

CROSS-CORRELATION OF WIND SPEED AND DIRECTION
FROM MAY TO DEC FOR 1970 TO 1978
PERCENT OF TIME WIND IS WITHIN CLASS SIZE

| | CLASS SIZE IN MILES PER HOUR | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 00-04 | 05-09 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-UP |
| N | .2 | 2.4 | .9 | .3 | .2 | .0 | .0 | 0.0 | 0.0 | 0.0 | 0.0 |
| NNE | .2 | 4.3 | 2.1 | 1.3 | .4 | .1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| NE | .2 | 2.1 | 1.1 | .4 | .1 | 0.0 | .0 | 0.0 | 0.0 | 0.0 | 0.0 |
| ENE | .1 | 1.7 | .8 | .2 | .1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| E | .3 | 2.9 | 1.6 | .8 | .2 | .0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| ESE | .1 | 1.1 | .5 | .1 | .1 | .0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SE | .2 | 1.0 | .2 | .1 | .0 | .0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SSE | .2 | 1.2 | .2 | .0 | .0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| S | .1 | 1.0 | .3 | .1 | .1 | .0 | .0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SSW | .2 | 2.1 | 2.6 | 3.1 | 3.2 | 1.0 | .3 | .1 | .0 | .0 | .0 |
| SW | .2 | 2.9 | 3.8 | 4.1 | 3.5 | 1.1 | .4 | .1 | 0.0 | 0.0 | 0.0 |
| WSW | .3 | 4.7 | 4.4 | 2.1 | 1.3 | .4 | .2 | .0 | 0.0 | .0 | 0.0 |
| W | .4 | 6.0 | 3.0 | 1.6 | 1.0 | .3 | .1 | .0 | 0.0 | .0 | 0.0 |
| WNW | .2 | 2.0 | .7 | .5 | .2 | .0 | .0 | .0 | 0.0 | 0.0 | 0.0 |
| NW | .1 | 2.1 | .6 | .3 | .1 | .0 | .0 | .0 | 0.0 | 0.0 | 0.0 |
| NNW | .3 | 3.3 | .8 | .3 | .1 | .0 | .0 | 0.0 | 0.0 | 0.0 | 0.0 |
| VAR | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CALM | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| TOT | 5.1 | 40.8 | 23.6 | 15.6 | 10.7 | 3.0 | .9 | .3 | .0 | .0 | .0 |

52920 HOURS OF DATA
0 HOURS OF NO DATA
52920 TOTAL HOURS

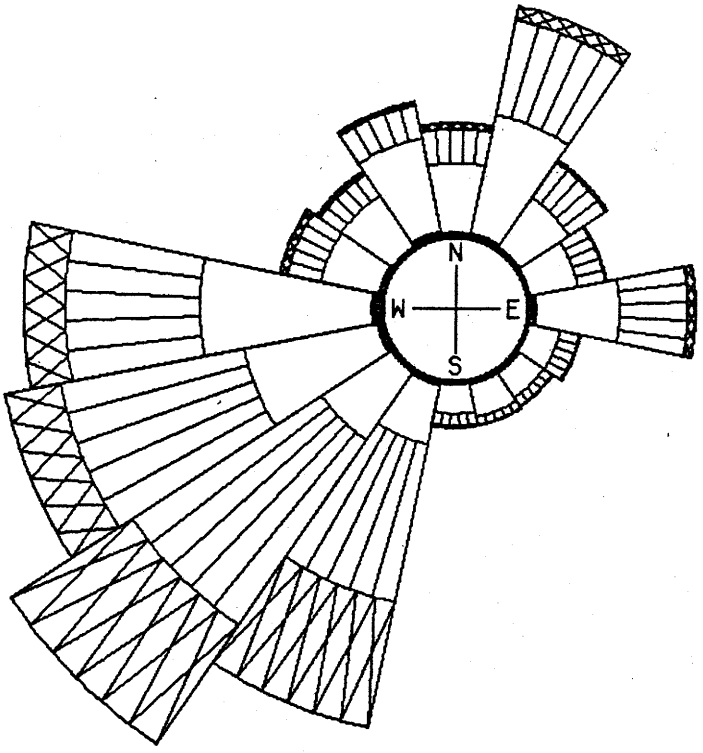
STATION NO. 24089 CASPER NATRONA COUNTY INTERNATIONAL AIRPORT
LATITUDE 42-55-CC LONGITUDE 106-28-00 ELEVATION 5338.00 FEET NATRONA COUNTY
SW1/4-SW1/4-NW1/4 SECTION 17 TOWNSHIP 34N RANGE 80W 6TH P.M.
WRRI IS THE DATA SOURCE (P) DRAINAGE BASIN CODE 14111C1CO

FROM MAY TO DEC FOR 1970 TO 1978
PERCENT OF TIME WIND SPEED IS LESS THAN INDICATED AMOUNT

| | AMOUNT IN MILES PER HOUR 5 | 10 | 20 | INFINITY |
|---|---|---|---|---|
| N | .2 | 2.6 | 3.8 | 4.1 |
| NNE | .2 | 4.5 | 7.9 | 8.4 |
| NE | .2 | 2.2 | 3.7 | 3.9 |
| ENE | .1 | 1.8 | 2.8 | 2.9 |
| E | .3 | 3.2 | 5.6 | 5.9 |
| ESE | .1 | 1.2 | 1.9 | 2.0 |
| SE | .2 | 1.2 | 1.5 | 1.6 |
| SSE | .2 | 1.3 | 1.6 | 1.7 |
| S | .1 | 1.2 | 1.6 | 1.7 |
| SSW | .2 | 2.3 | 8.0 | 12.5 |
| SW | .2 | 3.0 | 10.9 | 16.0 |
| WSW | .3 | 5.0 | 11.5 | 13.4 |
| W | .4 | 6.4 | 11.0 | 12.5 |
| WNW | .2 | 2.3 | 3.4 | 3.7 |
| NW | .1 | 2.3 | 3.2 | 3.3 |
| NNW | .3 | 3.6 | 4.8 | 4.9 |
| VAR | 0.0 | 0.0 | 0.0 | 0.0 |
| CALM | 1.7 | 1.7 | 1.7 | 1.7 |
| TOT | 5.1 | 45.9 | 85.1 | 100.0 |

52920 HOURS OF DATA
0 HOURS OF NO DATA
52920 TOTAL HOURS

# WIND ROSE
## CASPER NATRONA COUNTY INTERNATIONAL AIRPORT
## FROM MAY TO DEC FOR 1970 TO 1978

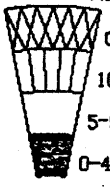



**WINDS VARIABLE**

| PERCENT OF TIME | AT SPEEDS LESS THAN |
|---|---|
| 0.0 | 5 MPH |
| 0.0 | 10 MPH |
| 0.0 | 20 MPH |
| 0.0 | INF. |

CALM 1.7 PERCENT OF TIME
NO WINDS GREATER THAN 52. MPH

KEY



OVER 19 MPH
10-19 MPH
5-9 MPH
0-4 MPH

ONE INCH EQUALS
5 PERCENT OF TIME

WINTER

WINTER computes precipitation data for a particular station for the winter seasons (from fall to spring) for a range of years. Fall and spring dates are uniquely defined for each station based on the latitude and elevation of the station. Specifically,

Fall date = 523.6 - .00686*E - 3.8299*L

Spring date = -199.0 + .01012*E + 5.1413*L

where:

E = elevation (feet)

L = latitude (degrees north)

These equations yield the seasons' Julian dates which are then converted to the Gregorian dates. The precipitation data between the two dates are then totaled to define total winter precipitation for the given year.

Mean total winter precipitation is computed for the range of years specified. Maximum and minimum values, standard deviation, coefficient of skewness and degree of kurtosis are computed based on the observed values (total precipitation for each winter) divided by the mean. The Kolmogorov-Smirnov test is applied to test the hypothesis that the data are normally distributed. For this test, a significance level of .10, .05, .025, .01 or .005 may be used.

This program was developed in cooperation with the United States Forest Service Experimental Station in Laramie, Wyoming. Additional questions regarding theoretical assumptions should be referred to Ron Tabler, Rocky Mountain Forest & Range Experiment Station, Laramie, Wyoming 82070.

WINTER (continued)

For each request, the user should specify:

Retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Source organization (unless all sources are to be used)

Year range (unless all available data are to be used)

Significance level for Kolmogorov-Smirnov test
(.10, .05, .025, .01 or .005)

STATION NO. 486440 MORAN 5WNW (MORAN 1911-1961)
LATITUDE 43-51-00 LONGITUDE 110-35-00 ELEVATION 6789.00 FEET TETON COUNTY
NE1/4-NW1/4-NE1/4 SECTION 19 TOWNSHIP 45N RANGE 114W 6TH P.M.
NOAA IS THE DATA SOURCE (P) DRAINAGE BASIN CODE 1723CCCO

WINTER PRECIPITATION VALUES

| LATITUDE | LONGITUDE | ELEVATION | FALL | SPRING | YEAR | TOTAL PRECIP. | PRECIP./MEAN |
|---|---|---|---|---|---|---|---|
| 43-52-CO | 110-35-00 | 674C.00 | 5 NOV | 5 APR | 1950-1951 | 11.66 | .90 |
| | | | | | 1952-1953 | 10.56 | .81 |
| | | | | | 1953-1954 | 9.78 | .75 |
| 43-52-CO | 110-35-00 | 6798.00 | | | 1954-1955 | 8.93 | .69 |
| | | | | | 1955-1956 | 19.56 | 1.51 |
| 43-51-CO | 110-35-00 | 6798.00 | | | 1956-1957 | 12.19 | .94 |
| | | | | | 1957-1958 | 11.96 | .92 |
| | | | | | 1958-1959 | 14.09 | 1.09 |
| | | | | | 1959-1960 | 9.51 | .73 |
| | | | | | 1960-1961 | 9.14 | .71 |
| | | | | | 1961-1962 | 14.25 | 1.10 |
| | | | | | 1962-1963 | 10.24 | .79 |
| | | | | | 1963-1964 | 12.20 | .94 |
| | | | | | 1964-1965 | 18.10 | 1.40 |
| | | | | | 1965-1966 | 10.17 | .78 |
| | | | | | 1966-1967 | 14.05 | 1.08 |
| | | | | | 1967-1968 | 11.73 | .90 |
| | | | | | 1968-1969 | 13.60 | 1.05 |
| | | | | | 1969-1970 | 12.67 | .98 |
| | | | | | 1970-1971 | 19.51 | 1.50 |
| | | | | | 1971-1972 | 17.43 | 1.34 |
| | | | | | 1972-1973 | 8.80 | .68 |
| | | | | | 1973-1974 | 18.54 | 1.43 |
| | | | | | 1974-1975 | 14.79 | 1.14 |
| 43-51-00 | 110-35-00 | 6789.00 | | | 1976-1977 | 5.97 | .46 |
| 43-40-CO | 110-43-00 | 647C.00 | | 1 APR | 1977-1978 | 17.63 | 1.36 |

| | | |
|---|---|---|
| SAMPLE SIZE : | 26 | |
| MEAN : | 12.96 | |
| MINIMUM : | | .46 |
| MAXIMUM : | | 1.51 |
| STANDARD DEV. : | | .28 |
| COEFFICIENT OF SKEWNESS : | | .35 |
| DEGREE OF KURTOSIS : | | 2.62 |
| KOLMOGOROV-SMIRNOV TEST RESULT FOR ALPHA = .005 : | | NORMAL |

## 3.6 SNOW COURSE

### Data Available

The snow course database contains data collected and published by the Soil Conservation Service. Parameters stored on the system are shown below.

| Data Type: | Parameters: | Unit of Measurement: |
|---|---|---|
| Snow course | Snow depth | Inches |
| | Water equivalent | Inches |
| | Snow density | Percent |

The data consist of measurements generally made on or near the first of the month for January through June. Supplemental measurements are sometimes made in the middle of a given month. The header for each measurement site includes latitude-longitude, township-range, elevation, county-state, and drainage basin code, along with the SCS station number.

## Programs

### DATESC

This program prints the headers for the snow course measurement sites and, optionally, the range of dates for available data.

For each listing, the user should specify:

Retrieval method and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Whether or not dates, in addition to headers, are to be printed

SNOW COURSE DATA
YEAR RANGES OF DATA AVAILABLE ON THE
WATER RESOURCES DATA SYSTEM
WYOMING WATER RESOURCES RESEARCH INSTITUTE, LARAMIE, WY

STATION NO. 160002 ARRASTRE LAKE SNOW COURSE IN NORTH PLATTE RIVER BASIN, SCS NO. 6H21H
LATITUDE 41-22-00 LONGITUDE 106-23-00 ELEVATION 10280.00 FEET UNKNOWN COUNTY
SECTION 9 TOWNSHIP 16N RANGE 80W 6TH P.M. (P) DRAINAGE BASIN CODE 00000000

1975 - 1976

STATION NO. 160003 CASPER MOUNTAIN PILLOW SNOW COURSE IN NORTH PLATTE RIVER BASIN, NO.
LATITUDE 00-00-00 LONGITUDE 0-00-00 ELEVATION 7900.00 FEET UNKNOWN COUNTY
SECTION 0 TOWNSHIP 0 RANGE 0 P.M. (P) DRAINAGE BASIN CODE 00000000

1976 - 1977

STATION NO. 160004 BOTTLE CREEK SNOW COURSE IN NORTH PLATTE RIVER BASIN, SCS NO. 6H8
LATITUDE 41-11-00 LONGITUDE 106-53-00 ELEVATION 8700.00 FEET UNKNOWN COUNTY
SECTION 13 TOWNSHIP 14N RANGE 85W 6TH P.M. (P) DRAINAGE BASIN CODE 00000000

1938 - 1977

STATION NO. 160005 BOXELDER SNOW COURSE IN NORTH PLATTE RIVER BASIN, SCS NO. 5G1
LATITUDE 42-33-00 LONGITUDE 105-53-00 ELEVATION 7280.00 FEET UNKNOWN COUNTY
SECTION 19 TOWNSHIP 30N RANGE 75W 6TH P.M. (P) DRAINAGE BASIN CODE 00000000

1950 - 1977

STATION NO. 160006 BUCK CREEK SNOW COURSE IN NORTH PLATTE RIVER BASIN, SCS NO. 5G3
LATITUDE 42-38-00 LONGITUDE 105-58-00 ELEVATION 7900.00 FEET UNKNOWN COUNTY
SECTION 8 TOWNSHIP 30N RANGE 76W 6TH P.M. (P) DRAINAGE BASIN CODE 00000000

1972 - 1977

LISTDATASC

This program prints snow course data in a 3-table format. The first table contains snow depth data, the second, water equivalent data, and the third, snow density data. In each table, the date of the first-of-month measurement is printed above the measured value, and the day of any supplemental data is printed above that value. Annual maximum values are also printed. Statistics, consisting of maximum, mean, minimum values, and standard deviation, are available optionally.

For each request, the user should specify:

Retrieval method, and value range:
- latitude-longitude
- county-state
- drainage basin
- township-range (Wyoming only)
- station number

Year range (unless all available data are to be used)

Whether or not statistics are also to be printed

STATION NO. 160008 CASPER MOUNTAIN SNOW COURSE IN NORTH PLATTE RIVER BASIN, SCS NO. 601MP
LATITUDE 42-44-00 LONGITUDE 106-18-00 ELEVATION 7850.00 FEET UNKNOWN COUNTY
SECTION 21 TOWNSHIP 32N RANGE 79W 6TH P.M. (P) DRAINAGE BASIN CODE 00000000

SNOW COURSE DATA : DEPTH OF SNOW (INCHES)

| YEAR | JANUARY FIRST DATE | JANUARY SUPP. DAY | FEBRUARY FIRST DATE | FEBRUARY SUPP. DAY | MARCH FIRST DATE | MARCH SUPP. DAY | APRIL FIRST DATE | APRIL SUPP. DAY | MAY FIRST DATE | MAY SUPP. DAY | JUNE FIRST DATE | JUNE SUPP. DAY | ANNUAL MAX DATE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1972 | JAN 4 | 17 | FEB 1 | 14 | FEB 29 | 15 | MAR 31 | 14 | APR 28 | 17 | | | APR 28 |
| | 36. | 39. | 39. | 48. | 40. | 44. | 52. | 53. | 59. | 42. | | | 59. |
| 1973 | JAN 5 | | FEB 2 | | FEB 28 | | MAR 30 | | MAY 2 | 15 | JUN 4 | | MAY 2 |
| | 38. | | 42. | | 45. | | 71. | | 119. | 84. | 53. | | 119. |
| 1974 | JAN 4 | | JAN 30 | | FEB 27 | | APR 1 | | APR 30 | 14 | | | APR 30 |
| | 30. | | 36. | | 52. | | 42. | | 60. | 41. | | | 60. |
| 1975 | DEC 31 | | FEB 3 | | FEB 28 | | APR 1 | | APR 30 | | MAY 29 | | APR 1 |
| | 33. | | 37. | | 36. | | 54. | | 52. | | 30. | | 54. |
| 1976 | DEC 30 | | JAN 30 | | FEB 28 | | MAR 31 | | APR 30 | | JUN 1 | | APR 30 |
| | 28. | | 37. | | 43. | | 48. | | 54. | | 0. | | 54. |
| 1977 | JAN 5 | | JAN 25 | | FEB 28 | | MAR 30 | | APR 29 | | | | MAR 30 |
| | 24. | | 24. | | 39. | | 77. | | 45. | | | | 77. |
| N | 6 | 1 | 6 | 1 | 6 | 1 | 6 | 1 | 6 | 3 | 3 | | 6 |
| MAX | 38.0 | 39.0 | 42.0 | 48.0 | 52.0 | 44.0 | 77.0 | 53.0 | 119.0 | 84.0 | 53.0 | | 119.0 |
| MEAN | 31.5 | 39.0 | 35.8 | 48.0 | 42.5 | 44.0 | 57.3 | 53.0 | 64.8 | 55.7 | 27.7 | | 70.5 |
| MIN | 24.0 | 39.0 | 24.0 | 48.0 | 36.0 | 44.0 | 42.0 | 53.0 | 45.0 | 41.0 | 0.0 | | 54.0 |
| S DEV | 5.2 | | 6.2 | | 5.6 | | 13.7 | | 27.1 | 24.5 | 26.6 | | 25.2 |

E INDICATES ESTIMATED DATA

STATION NO. 160008 CASPER MOUNTAIN SNOW COURSE IN NORTH PLATTE RIVER BASIN. SCS NO. 6G1MP
LATITUDE 42-44-00 LONGITUDE 106-18-00 ELEVATION 7850.00 FEET UNKNOWN COUNTY
SECTION 21 TOWNSHIP 32N RANGE 79W 6TH P.M. (P) DRAINAGE BASIN CODE 00000000

SNOW COURSE DATA : WATER EQUIVALENT (INCHES)

| | JANUARY | | FEBRUARY | | MARCH | | APRIL | | MAY | | JUNE | | ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR | FIRST DATE | SUPP. DAY | FIRST DATE | SUPP. DAY | FIRST DATE | SUPP. DAY | FIRST DATE | SUPP. DAY | FIRST DATE | SUPP. DAY | FIRST DATE | SUPP. DAY | MAX DATE |
| 1972 | JAN 4 | 17 | FEB 1 | 14 | FEB 29 | 15 | MAR 31 | 14 | APR 28 | 17 | | | APR 28 |
| | 8.6 | 9.6 | 10.6 | 12.5 | 12.1 | 12.6 | 15.0 | 16.9 | 18.2 | 16.8 | | | 18.1 |
| 1973 | JAN 3 | | FEB 2 | | FEB 28 | | MAR 30 | | MAY 2 | 15 | JUN 4 | | MAY 2 |
| | 8.2 | | 11.9 | | 13.0 | | 20.3 | | 35.8 | 32.0 | 22.1 | | 35.7 |
| 1974 | JAN 4 | | JAN 30 | | FEB 27 | | APR 1 | | APR 30 | 14 | | | APR 30 |
| | 6.8 | | 9.2 | | 13.7 | | 13.4 | | 22.1 | 15.6 | | | 22.0 |
| 1975 | DEC 31 | | FEB 3 | | FEB 28 | | APR 1 | | APR 30 | | MAY 29 | | APR 30 |
| | 6.0 | | 9.6 | | 10.8 | | 12.9 | | 16.8 | | 9.1 | | 15.7 |
| 1976 | DEC 30 | | JAN 30 | | FEB 28 | | MAR 31 | | APR 30 | | JUN 1 | | APR 30 |
| | 7.4 | | 11.5 | | 12.0 | | 12.8 | | 18.8 | | 0.0 | | 18.7 |
| 1977 | JAN 5 | | JAN 25 | | FEB 28 | | MAR 30 | | APR 29 | | | | APR 29 |
| | 4.2 | | 6.3 | | 9.7 | | 14.5 | | 16.7 | | | | 16.6 |
| N | 6 | 1 | 6 | 1 | 6 | 1 | 6 | 1 | 6 | 3 | 3 | | 6 |
| MAX | 8.6 | 9.6 | 11.9 | 12.5 | 13.7 | 12.6 | 20.3 | 16.9 | 35.8 | 32.0 | 22.1 | | 35.8 |
| MEAN | 6.9 | 9.6 | 9.9 | 12.5 | 11.9 | 12.6 | 14.8 | 16.9 | 21.4 | 21.5 | 10.4 | | 21.4 |
| MIN | 4.2 | 9.6 | 6.3 | 12.5 | 9.7 | 12.6 | 12.8 | 16.9 | 16.7 | 15.6 | 0.0 | | 16.7 |
| S DEV | 1.6 | | 2.0 | | 1.5 | | 2.8 | | 7.3 | 9.1 | 11.1 | | 7.3 |

E INDICATES ESTIMATED DATA

STATION NO. 160008 CASPER MOUNTAIN SNOW COURSE IN NORTH PLATTE RIVER BASIN, SCS NO. 661NP
LATITUDE 42-44-00 LONGITUDE 106-18-00 ELEVATION 7850.00 FEET UNKNOWN COUNTY
SECTION 21 TOWNSHIP 32N RANGE 79W 6TH P.M. (P) DRAINAGE BASIN CODE 00000000

SNOW COURSE DATA : DENSITY OF SNOW (%)

| | JANUARY | | FEBRUARY | | MARCH | | APRIL | | MAY | | JUNE | | ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR | FIRST DATE | SUPP. DAY | FIRST DATE | SUPP. DAY | FIRST DATE | SUPP. DAY | FIRST DATE | SUPP. DAY | FIRST DATE | SUPP. DAY | FIRST DATE | SUPP. DAY | MAX DATE |
| 1972 | JAN 4 | 17 | FEB 1 | 14 | FEB 29 | 15 | MAR 31 | 14 | APR 28 | 17 | | | MAY 17 |
| | 23.9 | 24.6 | 27.2 | 26.0 | 30.3 | 28.6 | 28.8 | 31.9 | 30.8 | 40.0 | | | 40.0 |
| 1973 | JAN 3 | | FEB 2 | | FEB 28 | | MAR 30 | | MAY 2 | 15 | JUN 4 | | JUN 4 |
| | 21.6 | | 28.3 | | 28.9 | | 28.6 | | 30.1 | 38.1 | 41.7 | | 41.6 |
| 1974 | JAN 4 | | JAN 30 | | FEB 27 | | APR 1 | | APR 30 | 14 | | | MAY 14 |
| | 22.7 | | 25.6 | | 26.3 | | 31.9 | | 36.8 | 38.0 | | | 38.0 |
| 1975 | DEC 31 | | FEB 3 | | FEB 28 | | APR 1 | | APR 30 | | MAY 29 | | APR 30 |
| | 18.2 | | 25.9 | | 30.0 | | 23.9 | | 32.3 | | 30.3 | | 32.3 |
| 1976 | DEC 30 | | JAN 30 | | FEB 28 | | MAR 31 | | APR 30 | | JUN 1 | | APR 30 |
| | 26.4 | | 31.1 | | 27.9 | | 26.7 | | 34.8 | | | | 34.8 |
| 1977 | JAN 5 | | JAN 25 | | FEB 28 | | MAR 30 | | APR 29 | | | | APR 29 |
| | 17.5 | | 26.3 | | 24.9 | | 18.8 | | 37.1 | | | | 37.1 |
| N | 6 | 1 | 6 | 1 | 6 | 1 | 6 | 1 | 6 | 3 | 2 | | 6 |
| MAX | 26.4 | 24.6 | 31.1 | 26.0 | 30.3 | 28.6 | 31.9 | 31.9 | 37.1 | 40.0 | 41.7 | | 41.7 |
| MEAN | 21.7 | 24.6 | 27.4 | 26.0 | 28.0 | 28.6 | 26.5 | 31.9 | 33.7 | 38.7 | 36.0 | | 37.3 |
| MIN | 17.5 | 24.6 | 25.6 | 26.0 | 24.9 | 28.6 | 18.8 | 31.9 | 30.1 | 38.0 | 30.3 | | 32.3 |
| S DEV | 3.4 | | 2.1 | | 2.1 | | 4.6 | | 3.0 | 1.1 | 8.0 | | 3.4 |

E INDICATES ESTIMATED DATA

# REFERENCES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# APPENDIX A

# MAGNETIC TAPE OUTPUT OPTIONS

## MAGNETIC TAPE OUTPUT OPTIONS

Program TAPE writes the data requested to a tape in the format in which the data are stored on WRDS. Data from any or all of the databases can be output to one tape. The tape is written in fixed length records, 80 characters per record. The blocking factor is optional, and each database is written to a separate file on the tape. The program outputs surface water data, followed by water quality, well level, and finally climatic data. For each station retrieved, a header record is written to tape, followed by the data records for that station. The header record contains the station name, number, location, and other information used to describe the station.

TAPE retrieves data similarly to the LISTDATA programs for each database. For each tape requested, the user should specify:

Database(s) to access

Specifications as described for each database's LISTDATA

7-track (even parity) or 9-track (odd parity)

556 or 800 BPI for 7-track
800, 1600, or 6250 BPI for 9-track

Number of 80-character records per block

EBCDIC or ASCII

Unlabeled or standard ANSI labels

Record format documentation is included with the output tape. Tapes supplied by us are guaranteed if read within 90 days. If the tape is user-supplied, it is not guaranteed.

# APPENDIX B

# STATISTICAL ASSUMPTIONS

## STATISTICAL ASSUMPTIONS

Some of the analyses written for WRDS involve numerous statistical calculations and a few of these make intrinsic assumptions about the data. In this section we would like to explain the methods used in these programs, and specify assumptions made and program limitations. While we cannot guarantee the accuracy or reliability of any WRDS output, we do make every effort to use standard techniques in our programming and to correct deficiencies when they are found.

### The Estimating or Regression Equation

For linear regression analyses, the estimating equation is given by $y_c = a + bx$, and for second degree regression analyses, the equation is given by $y_c = a + bx + cx^2$, where x represents the independent variable (observed value) and y the dependent variable (computed value). The method of least squares regression analysis provides a means of determining the coefficients a, b, and c (for second degree) where the "line has been so fitted, that the sum of the squares of the y deviations from it is less than those from any other straight line. A curve fitted in this manner is usually considered by statisticians to be the best with which to estimate values of one variable when values of the other variable are known" (Croxton, pg. 393).

For a linear fit, the coefficients are determined by solving the following normal equations simultaneously:

$$\Sigma y = N*a + b*\Sigma x$$

$$\Sigma x*y = a*\Sigma x + b*\Sigma x^2$$

where: x represents observed values of the independent variable

y represents observed values of the dependent variable

N represents the sample size

For a curvilinear fit, the coefficients are determined by solving the following normal equations simultaneously:

$$\Sigma y = N*a + b*\Sigma x + c*\Sigma x^2$$

$$\Sigma x*y = a*\Sigma x + b*\Sigma x^2 + c*\Sigma x^3$$

$$\Sigma x^2*y = a*\Sigma x^2 + b*\Sigma x^3 + c*\Sigma x^4$$

where: x, y, and N are described above.

## Standard Error

The standard error provides a means of measuring the dispersion of the y values about the estimating equation. It may be interpreted as a measure of the dependability of the estimate, yielding an approximation of the range within which values can be expected to fall if the distribution is normal. It is computed as follows:

$$\sqrt{\frac{\Sigma y^2 - a*\Sigma y - b*\Sigma x*y - c*\Sigma x*\Sigma y}{N - KDEGREE - 1}}$$

where: x represents observed values of the independent variable

y represents observed values of the dependent variable

a,b,c represent the coefficients of the regression equation (c = 0 for linear analyses)

N represents the sample size

KDEGREE = 1 for first degree (linear) analyses
= 2 for second degree (curvilinear) analyses

## Coefficient of Correlation and Coefficient of Determination

The correlation coefficient provides a measure of the degree of relationship between the two variables being analyzed. The sign of the coefficient is the same as the sign of the second coefficient (b) in the estimating equation. The magnitude of the coefficient (always between -1 and +1) describes the degree to which the two variables are related. A correlation coefficient of zero indicates no relationship exists between the two variables. A correlation coefficient close to positive or negative one indicates the two variables are highly related.

The coefficient of determination is the square of the correlation coefficient. The correlation coefficient is computed as follows:

$$\frac{N*\Sigma x*y - \Sigma x*\Sigma y}{\sqrt{(N*\Sigma x^2 - \Sigma x*\Sigma x)\ (N*\Sigma y^2 - \Sigma y*\Sigma y)}}$$

where: x represents observed values of the independent variable

y represents observed values of the dependent variable

N represents the sample size

## Significance of b and Confidence Limits

The significance of b is a measure of the degree to which b differs from zero. For small samples, the test statistic is given by:

$$t = \sqrt{\frac{NR*\Sigma x^2 - \Sigma x*\Sigma x}{NR}} * \frac{b}{SE}$$

This value is compared to $T_{\alpha/2}$, where $T_{\alpha/2}$ is the t-table value for a given significance level (alpha) and degrees of freedom. For $|t| > T_{\alpha/2}$, one can conclude that b is significant, i.e., that the accuracy of the formulated slope of the estimating equation is not just a chance occurrence. For $|t| < T_{\alpha/2}$, one can conclude that b is not significant and the formulated estimating equation has questionable predictability.

Construction of confidence limits for an individual value of y, given an x value, provides an interval within which the y value may be expected to fall. The width of the interval is a function of alpha. The upper and lower limits of the interval are given by:

$$a + b*x_o \pm T_{\alpha/2}*SE* \sqrt{1. + \frac{1.}{NR} + \frac{\left(NR*x_o - \frac{\Sigma x}{NR}\right)^2}{NR*\Sigma x^2 - \Sigma x*\Sigma x}}$$

where: a,b represent the coefficients of the estimating equation

$x_o$ represents an observed value of the independent variable

x represents observed values of the independent variable

$T_{\alpha/2}$ represents the t-table value for a given alpha and degrees of freedom

SE represents the standard error

NR represents the sample size

## Skewness and Kurtosis

Skewness and kurtosis are measures that provide information describing two characteristics of a given frequency distribution, symmetry and peakedness. A normal frequency is an example of a distribution symmetric about the mean. The skewness coefficient describes the symmetry (or asymmetry) for a particular distribution, whether it tends to "tail off" to the left or right. A skew coefficient of zero implies a symmetric distribution. A coefficient of less than zero implies a negative or left skewness while a coefficient greater than zero implies a positive or right skewness. Skewness is computed as follows:

$$SK = \frac{(N^2*\Sigma y^3 - 3*N*\Sigma y\Sigma y^2 + 2*(\Sigma y)^3)}{N*(N-1)*(N-2)*S_y^3}$$

where: N = sample size

y = observed values

$S_y$ = standard deviation of the observed values

Kurtosis is a measure of the peakedness of the distribution. It is intended to describe the scatter of observations close to the central value versus those at the ends of the distribution. The estimated kurtosis of a normal distribution is 3. More peaked distributions have values greater than 3, while flatter distributions have values less than 3. Kurtosis is computed as follows:

$$K = \frac{N^3*\Sigma y^4 - 4*N^2*\Sigma y\Sigma y^3 + 6*N*(\Sigma y)^2*\Sigma y^2 - 3*(\Sigma y)^4}{N*(N-1)*(N-2)*(N-3)*S_y^4}$$

where: N, y, and $S_y$ are described above.

## Kolmogorov-Smirnov One-Sample Test

The Kolmogorov-Smirnov test is used to test the supposition that a set of observed data is drawn from an hypothesized distribution, e.g., normal, binomial, Poisson, etc. To test for a normal distribution, the following procedure is employed:

Obtain the test statistic D:

$$D = \sup|S(x) - F_o(x)|$$

where for each x:

$$S(x) = \frac{\text{number of sample observations less than or equal to } x}{N}$$

$$F_o(x) = P(0 \leq Z \leq z)$$

where: $z = (x - \bar{x})/\sigma$

$\bar{x}$ = sample mean

$\sigma$ = standard deviation of the observed values

N = sample size

(Note: z may be interpreted as the standard normal variate variable for a given observed value x. $P(0 \leq Z \leq z)$ is the area under the normal curve between 0 and z.)

Reject the hypothesis that the data are drawn from a normal distribution at a given significance level, alpha ($\alpha$), if D exceeds the $1 - \alpha$ quantile given in the table of "Quantiles of the Kolmogorov-test statistic" (Daniel, 1978). If D does not exceed the $1 - \alpha$ quantile, accept the hypothesis.

A similar procedure may be used to test other hypothesized distributions.

CAUTION: The value obtained by computing $|S(x_i) - F_o(x_i)|$ may not be the largest vertical distance between $S(x_i)$ and $F_o(x_i)$, i.e., this may not occur at an observed value of x. It has been shown that

$\sup|S(x_{i-1}) - F_o(x_i)|$ for all x must also be considered in the determination of D. ($S(x_{i-1})$ numerically precedes $S(x_i)$.)

## Log-Pearson Type III Distribution

This probability analysis method involves transforming flow values to logarithmic values (base 10), and computing the mean, standard deviation and skew coefficient used to index a table of Skew Curve Factors, which was taken from the Water Resources Council Bulletin No. 15 (1967). The equations used are:

$$\gamma = \frac{n^2 \Sigma x^3 - 3n \Sigma x \Sigma x^2 + 2(\Sigma x)^3}{n(n-1)(n-2)\sigma^3}$$

$$X_T = \log^{-1} (\bar{x} + K_T T)$$

where: $x$ = log transformed flow value

$\sigma$ = standard deviation

$\gamma$ = coefficient of skewness

$X_T$ = flow magnitude for recurrence interval T

K = Skew Curve Factor for a given $\gamma$ and recurrence interval T

## Gumbel Distribution

Gumbel's method employs the Fisher-Tippett Extreme Value Type I distribution function. In this technique, recurrence intervals are computed using the equation:

$$X_T = \bar{x} - 0.45005\sigma - 0.7797\sigma \ln(\ln(T/T-1))$$

where: $X_T$ = flow magnitude for recurrence interval T

$\bar{x}$ = mean flow value

T = recurrence interval

$\sigma$ = standard deviation of flow values

## Hazen Distribution

Hazen's method for estimating flood flows computes the skew coefficient using the equation:

$$\gamma = \frac{\Sigma (x - \bar{x})^3}{(n - 1)\ \sigma^3}$$

where: $\gamma$ = skew coefficient

x = flow values

$\bar{x}$ = mean flow value

n = number of years of data

$\sigma$ = standard deviation

This value is then adjusted by the factor (1 + (8.5/n)), and is then used to index a table of frequency factor values. The magnitude is calculated by:

$$X_T = \bar{x} + \sigma\ K_T$$

where: $X_T$ = flow magnitude for recurrence interval T

$K_T$ = frequency factor

## Program LOAD

The load modeling program operates with a number of assumptions. The first is that a correlation exists between a constituent concentration and instantaneous streamflow. The assumption has been examined and found to be an accurate one for total dissolved solids (Steele, 1973; DeLong, 1977). This dilution model approach assumes that streamflow, Q, and constituent concentration, C, are related by the equation:

$$c = a_o * Q^b$$

or its equivalent form:

$$\log C = a_1 + b \log Q$$

where: $a_o$, $a_1$ and b are regression parameters, and $a_1 = \log a_o$.

A further assumption made in this program is that there is a correlation between instantaneous streamflow and mean daily streamflow. This assumption is valid for large perennial streams, those which are not affected by short-term flow changes, such as flash floods. Ephemeral streams, which are usually characterized by highly variable flow rates during the day would not meet this assumption. The LOAD program produces a regression equation using constituent concentration and mean daily streamflow as the dependent and independent variables, respectively. This correlation only exists at sites where the flow rate is relatively constant over a particular day.

The derived equation is then applied in the load model to calculate daily load values from the mean daily streamflow values. The equation is

$$L = 0.002696 \cdot a_o \, Q^{b+1}$$

Flows are then accumulated into monthly values and printed as total loads and as mean concentrations.

# APPENDIX C

# DATA SOURCES

## DATA SOURCES

The Water Resources Data System (WRDS) has been in existence since the mid-1960s. During that period, various state and federal agencies and private companies have used the system for storage and retrieval of data. This haphazard approach has resulted in many different sources for the data in some of our databases, primarily in water quality. The discussion below briefly summarizes the sources and types of data in WRDS by database.

If public agencies or private groups continue to fund WRDS, new water resources data will be entered onto the system as they are published or sent to WWRC. Climatic, streamflow, and water quality data from federal agencies will be loaded onto the system as they become available on tape, usually one year after collection. The intention of WWRC is to keep the databases up to date and to maintain their usefulness for those interested in water resources.

WRDS users should be cautioned that WWRC considers it the responsibility of each agency or private concern that reports data to ensure that its data are precise and accurate. WWRC will not correct errors, obvious or subtle, in published data before entering them onto the system. The water quality data listings specify the laboratory which conducted the analyses, and printouts from all databases list the agency or private company responsible for the data, if the information is available. Therefore, if a user suspects the validity of some data, he can question those who supplied the data to WRDS.

## Surface Water Quantity

### USGS WATSTORE Data

The United States Geological Survey maintains streamflow gaging stations throughout the state. All mean daily flow data collected are available, both historical and current.

### WWRC Snowy Range Data

WWRC has an ongoing research project in the Snowy Range of the Medicine Bow Mountains west of Laramie. Daily streamflow has been measured since 1965 at various locations in the area.

### State Water Commissioners' Data

Daily streamflow and reservoir storage data from the State Engineer's annual reports have been encoded on WRDS. This includes data for canals and ditches in addition to natural streams.

### WWRC EPA Data

WWRC currently collects streamflow data under an EPA grant at three gages on the Little Thunder Creek.

## Water Quality and Well Levels

### WWRC Research Data

WWRC conducts several water quality studies each year. The types of water quality data collected depend on the objectives of the studies. Past studies include a reconnaissance of ground drinking water quality in Wyoming, an acid precipitation investigation in Albany County, and a limnology study in the upper Green River Basin.

BLM Data

The U.S. Bureau of Land Management submits data collected during routine monitoring programs and for preparing environmental statements on grazing. The data include approximately 30 major species, toxic heavy metals, nutrients, and bacteria.

USGS WATSTORE Data

The United States Geological Survey collects data and places them on WATSTORE data tapes. Water quality data typically include the major constituents, such as calcium, magnesium, sodium, bicarbonate, sulfate, and chloride. Some inorganic species subject to primary drinking water standards are monitored occasionally.

USGS Oil and Gas Data

Some oil and gas drillers submit water quality data to USGS on major species, pH, total dissolved solids, and occasionally other species. These data are principally from oil- and gas-bearing formations, but may include drill stem tests from overlying and underlying formations.

EPA Public Water Supply Survey

The U.S. Environmental Protection Agency has monitored approximately 200 of the 300 community public water systems in Wyoming for the ten inorganic species subject to primary drinking water standards. They have also monitored approximately 20 of the 300 community public water supply systems for six of the seven organic species subject to primary drinking water standards. This database represents the most

comprehensive information available on organic chemicals and inorganic species.

LETC Data

The U.S. Department of Energy's (DOE) Laramie Energy Technology Center (LETC) collects water quality data from its synfuels sites and stores them on WRDS. These data are from a coal gasification project near Hanna, an oil shale project near Rock Springs, and a tar sands project near Vernal, Utah. Water quality is described by a large number of typical and atypical constituents.

DOE NURE Data

DOE has undertaken a National Uranium Resource Evaluation (NURE) to assess domestic uranium areas and identify areas favorable for commercial exploration. NURE includes sampling of wells, springs, and streams primarily for temperature, pH, specific conductance, and dissolved uranium.

DOE Oil and Gas Tape

DOE has collected water quality data, primarily during oil and gas drilling. Some of the data have come from DOE sampling programs, while the remainder have come principally from drillers and energy companies. Data cover a broad spectrum of constituents and are concentrated in the Powder River Basin.

State Lab Data

The Wyoming Department of Agriculture has conducted hundreds of volunteer potability studies for private well owners. The data include total dissolved solids, hardness, sulfate, nitrate, total coliform, and occasionally sodium or other constituents.

DEQ Mine Plans

The Wyoming Department of Environmental Quality has permitted over 60 uranium and coal mine plans in the state, many of which contain data on water quality and water levels. The plans generally include quarterly to annual monitoring of a concentration of wells in a section or few sections. A broad spectrum of constituents is analyzed at each site.

Department of Health Data

The Wyoming Department of Health has conducted water quality surveys of public water supplies for fluoride and selenium. Eighty-eight systems have been monitored at least once for fluoride, and an equal number have been monitored at least once for selenium.

State Engineer Data

The Wyoming State Engineer's Office requests one water quality sample as part of its permitting process for drinking water wells. Water quality analyses typically include total dissolved solids, hardness, sulfate, nitrate, and total coliform. Occasionally the analyses include other major species.

### Bureau of Reclamation Data

The U.S. Bureau of Reclamation maintains a water quality monitoring program, primarily in the Green River area. These data typically include dissolved solids, sulfate, nitrate, and turbidity.

## Climate Data

### NOAA Data

The National Oceanic and Atmospheric Administration (NOAA) collects and encodes daily, hourly, and 3-hourly climatic data.

### WWRC Data

The Wyoming Water Research Center collects and encodes hourly, 3-hourly, and 6-hourly climatic data for the Snowy Range area, the Pole Mountain area, and various mine sites in the northeast portion of the state.

## Snow Course Data

### SCS Data

The Soil Conservation Service maintains over 200 snow pack monitoring locations. Their first-of-month and supplemental measurements have been encoded.

# APPENDIX D

# REQUEST PROCEDURES

# REQUEST PROCEDURES

## Request Submittal and Processing

Users should request reports from, and direct questions concerning option specification to:

Water Resources Data System (WRDS)
Wyoming Water Research Center
P. O. Box 3067, University Station
Laramie, Wyoming 82071-3067
(307) 766-2143

The following information is required for request submittal:

--Organization name, address, and phone number;

--Name of requesting individual;

--Program(s) to be accessed; and

--Option and retrieval specifications as listed in the program descriptions.

Barring unforeseen difficulties, single printed reports are mailed within one working day after a request is received. Requests for plots and large numbers of printed reports can require up to three full working days to process, depending upon their complexity and volume.

## Request Charges

Wyoming State employees are entitled to reasonable access to WRDS without charge in direct support of their job functions. Other requestors are charged based on the following items: the amount of personnel time needed to process the request, the amount of support services required, the amount of materials used (output media, etc.), and overhead charges.

Personnel charges are calculated by multiplying the actual amount (minimum time on all requests is ½ hour) of personnel time required to fill the request by the hourly rate of the person(s) filling the request. A 20 percent fringe is then added to obtain the total amount for personnel charges.

Support services consist of the total resources required to fill a request. This charge is based on the number of permanent files, the mass storage utilized, and magnetic tape usage.

The cost of the materials used to fill a request are passed on to the requestor at cost. Examples of items used to fill a request are magnetic tapes and floppy disks.

After calculating charges for personnel time, support services, and materials used in the request, overhead is added based on indirect cost rates as determined by the University of Wyoming Office of Research. The overhead percentage is based on the classification of the requestor. For example, a federal agency is charged at an overhead rate of 39 percent.

# APPENDIX E

# WRDS UPDATE BULLETINS

WRDS BULLETIN NO. 1

July 7, 1983

TO: WRDS Users

FROM: Barbara Drury - WRDS Coordinator

SUBJECT: Surface Water Data

The following updates and corrections have recently been completed for WRDS surface water data:

- Revisions and addition of header information for all surface water data sources.
- Revision and addition of USGS WATSTORE historical daily and peak data through water year 1980.
- Addition of USGS WATSTORE provisional daily and peak data for water years 1981 and 1982.
- Addition of USGS reservoir contents data for water years 1976 through 1981.

Please insert this memo in the back of your copy of the WRDS User's Guide.

Wyoming Water Research Center

WRDS BULLETIN NO. 2

September 24, 1984

TO: WRDS Users

FROM: Janet Wiley - WCIS/WRDS Coordinator

SUBJECTS: Water Quality, Snow Course and Climate Database Correction and Updates; Reorganization of WRDS; New WRDS Staff

The following revisions, corrections and enhancements have been completed for the water quality database:

- Questionable data values from all data sources were verified by original source documents and expert opinion for all existing data.

- Water quality parameter codes were converted to the USGS (WATSTORE) numbering system.

- The USGS identification number was loaded onto the header as source organization station number for ground water quality sites. It is now possible to request a retrieval by source organization station number.

- Correction and addition of USGS WATSTORE water quality data from grab samples was recently completed through 1982.

The snow course database has been updated through 1983 with data obtained from the Soil Conservation Service (SNOTEL). Header information has been completed and all data values have been verified.

The climate database has been updated through 1982 for daily climatological parameters. These data are obtained from the National Oceanographic and Atmospheric Administration (NOAA).

The functions of the WRDS staff are expanding to meet the needs of the Wyoming Water Research Center and the hydrological research community at large. The staff will be referred to as Water Center Information Services (WCIS). Management of the Water Resources Data System (WRDS) will remain as the primary responsibility of WCIS. It is the goal of WCIS to develop its capacity to provide an assortment of services useful to water researchers, especially in the areas of modeling and color graphics.

Barbara Drury, Anne Travis and Laura Kohnert have all recently left the WRDS staff and Laramie. Janet Wiley has replaced Barbara Drury as

the coordinator for WCIS/WRDS and Connie Basom has joined Susan Cox as a Data Assistant for WCIS/WRDS. Barry Lawrence is an new full-time Programmer/Analyst and Kent Samford was recently hired as a part-time Programmer/Analyst. It is the desire of WCIS/WRDS to continue to provide excellent service to the research community and to expand our capabilities to meet your needs.

Please insert this memo in the back of your copy of the WRDS User's Guide.

Wyoming Water Research Center

WRDS BULLETIN NO. 3
March, 1986

TO: WRDS USERS

SUBJECTS: UPDATES FOR SURFACE WATER, SNOW COURSE AND CLIMATE DATABASES; CHANGES IN WRDS BILLING SCHEDULE

The Surface Water database has been updated with USGS historical daily and peak data for water years 1982, 1983 and 1984. All new data has been verified with USGS publications. The latitude boundary for the Surface Water database has been extended from 45 degrees, 25 minutes to 45 degrees, 45 minutes into Montana. Period of record data for the extended area, which includes 38 new stations, have been added and are now available to users.

The Snow Course database is currently in the process of being updated with 1984 data from the Soil Conservation Service. This data will be available to users during the second quarter of 1986.

Preparations are now underway to begin the Climate database update with hourly precipitation data for 1979 to October, 1985 and daily data for 1983 to November, 1985 with data from the National Oceanographic and Atmospheric Administration. This data will be available to users during the second quarter of 1986.

In addition, WRDS is now providing data entry and custom programming on a limited basis to state agencies.

The WRDS billing schedule has recently been reorganized. Request charges will now be computed from special service costs incurred while processing each individual request rather than on a retrieved output basis. We feel that this new schedule will be more equitable to users and will result in a dramatic reduction in request costs by as much as 50 percent in most cases. Personnel charges and cost of materials will remain the same. Overhead for in-state requests will be 20 percent with the overhead for out-of-state requests at 39 percent. The new billing schedule will go into effect immediately.

PLEASE INSERT THIS MEMO IN THE BACK OF YOUR USER'S GUIDE
(APPENDIX E)

WRDS BULLETIN NO. 4
January, 1987

TO: WRDS USERS

SUBJECT: UPDATES FOR SURFACE WATER, SNOW COURSE AND CLIMATIC DATABASES; GUEST ACCOUNT FOR USERS

The Surface Water database has been updated with USGS historical daily, reservoir, and peak data for water year 1985. All new data have been verified with USGS publications and are now available to users. Provisional daily data (data that have not been verified against published documents) for water year 1986 have also been added to WRDS.

The Snow Course database has been updated with 1984 and 1985 data from the Soil Conservation Service. All new data have been verified with SCS publications and are now available to users.

The Daily Climate database has been updated with 1983, 1984 and 1985 data from the National Oceanographic and Atmospheric Administration. All new data have been verified with NOAA publications and are now available to users.

A guest account has been created for WRDS users on the University of Wyoming Cyber 760 computer, giving users the option of "picking up" their own data via terminal and modem. Response to this new feature has been very favorable since it drastically reduces request turn-around time. If you are interested in accessing this account, please contact us for further information.

WRDS is continuing to provide data entry and custom programming on a limited basis to state agencies.

PLEASE INSERT THIS MEMO IN THE BACK OF YOUR USER'S GUIDE
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*The WRDS Bulletin #1 dated March, 1986 should have been WRDS Bulletin No. #3.