Appendix F
Stream Inflows, Diversions and Discharges to Streams

1.0 Purpose

The South Platte Decision Support System (SPDSS) Alluvial Groundwater Model includes the South Platte River alluvial system that extends from below Chatfield Reservoir to the state line, including various tributaries that enter the river along its extent. In addition to the groundwater system, the model also incorporates surface water inflows and diversions.

The purpose of this appendix is to document the methodology used to incorporate stream inflows, diversions, and discharges to streams into the SPDSS Alluvial Groundwater Model. These are represented in the model in the MODFLOW Streamflow-Routing package (SFR2). These measured and estimated flows include the following:

1. *Stream inflows for streams explicitly modeled in the groundwater model.*
2. *Explicitly modeled and aggregated diversions within the groundwater model*
3. *Discharges to streams explicitly modeled in the groundwater model.*

Stream inflow, diversions, and discharge inputs are provided on a monthly basis for the study period 1950–2006.

2.0 Stream Inflows

These estimated flows are the amount of water that enters the model at the boundary as surface water. Monthly streamflows were determined for each stream explicitly represented in the model. Methods for obtaining streamflow data are described in Section 2.1. Gages used for estimating streamflow for each inflow are included in Table F-1, and displayed in Figures F-1a, F-1b, and F-1c.

Table F-1 Streamflow Gages Utilized in Groundwater Model

No.	Station ID	Gage Name
1	06711500	Bear Creek at Sheridan
2	06720820	Big Dry Creek at Westminster, CO
3	06741510	Big Thompson River at Loveland
4	06730200	Boulder Creek at North 75th Street near Boulder
5	06752260	Cache la Poudre River at Fort Collins, CO
6	06712000	Cherry Creek near Franktown
7	06719505	Clear Creek at Golden
8	06730300	Coal Creek near Plainview
9	06743500	Little Thompson River at Milliken, CO
10	06709500	Plum Creek near Louviers
11	06725450	St. Vrain Creek below Longmont
12	PLACHACO	South Platte River below Chatfield Reservoir

2.1 Data and Methods for Estimating Inflows

HydroBase was the primary source of data for the streamflow component of the model. Data from HydroBase was queried using the TSTool program. Using TSTool, a list of

commands was developed to extract data from HydroBase. These commands are included in the *P5_T48_SW_inflows.TSTool* file (Attachment 1).

Due to gage locations not being present at the model boundary, or gages not existing on a particular tributary, it was at times necessary to adjust the HydroBase data to estimate actual streamflows at the model boundary. The following discusses how model inflows for gaged tributaries and ungaged tributaries were determined.

2.1.1 Gaged Tributaries

The first step in estimating streamflow was to identify gages to be used for approximation of flows at the model boundary. Gages were selected based on their period of record and proximity to the model boundary. In some cases, gages had the entire desired period of record. In these instances, data from HydroBase for the specific gage was used without modification. However, some gages did not contain a full period of record; these gages required modification by using similar gages to fill the missing records. The process of estimating flows for missing records is discussed in the SPDSS Identify Key Streamflow Gages and Estimate Streamflows for Missing Records Technical Memorandum (TM) (SPDSS 2007).

2.1.2 Ungaged Tributaries

For ungaged tributaries, each was examined on a case-by-case basis to determine model inflows using nearby stream gages as a potential flow surrogate. For tributaries such as Beaver Creek and Kiowa Creek, hydrologic reports of stream basins (Burns 1980; Duke and Longenbaugh 1966) were examined for historical flow characteristics of each tributary. Upon review of these reports it was determined the groundwater model boundary is located far enough upstream on these tributaries to warrant not explicitly defining the surface water inflow. If hydrologic reports were not available, a Colorado Atlas and Gazetteer (Gazetteer) (DeLorme 2000) was used to provide insight for estimating flows.

The Gazetteer allowed for flow in tributaries to be determined by using a visual process. For example, streamflows were considered zero if the stream was not easily identifiable in the Gazetteer, or if the flow path could not easily be followed on the map. Stream characteristics such as these implied intermittent flow throughout the length of the tributary, i.e., an ephemeral channel. Tributaries with intermittent flow and ephemeral channels do not contribute a significant amount of flow on a monthly average to the cumulative flow of the model; therefore, these types of tributaries were assumed to have zero streamflow at the upstream edge of the model. Also, many of the tributaries originate near the model boundary, and therefore, the streamflow at the model boundary was estimated to be zero for these locations.

2.2 Estimated Flows for Streams Explicitly Represented in the Groundwater Model

Twelve streams were included in the SPDSS groundwater water model. Table F-2 presents the average annual surface water inflow into the model for each of these streams for the study period, as they were incorporated into the model. Descriptions of each inflow,

including adjustments by filling and to account for diversions, can be found following the table. These stream inflows are also shown on Figure F-2.

Table F-2 Average Annual Streamflow at Model Boundary (1950 to 2006)

No.	Stream	Gage Flow Contribution (AFY)	Diversion Flow (AFY)	Average Annual Streamflow (AFY)
1	Bear Creek	34,912	1,347	36,258
2	Big Dry Creek	11,160	0	11,160
3	Big Thompson River	53,226	31,058	84,284
4	Boulder Creek	80,258	0	80,258
5	Cache la Poudre River	119,935	103,825	223,760
6	Cherry Creek	6,318	365	5,953
7	Clear Creek	137,999	49,241	88,758
8	Coal Creek	2,881	636	2,245
9	Little Thompson River	26,730	1,556	28,286
10	Plum Creek	23,039	0	23,039
11	St. Vrain Creek	81,879	0	81,879
12	South Platte River	121,332	0	121,332

2.2.1 Bear Creek

The Bear Creek at Sheridan gage was used to estimate inflows. This inflow required the addition of the McBroom Ditch diversion due to the downstream gage location in relation to the model boundary. The gage contained a complete period of record.

2.2.2 Big Dry Creek

The Big Dry Creek at Westminster gage was used to estimate inflows. This inflow required modification due to an incomplete period of record. The St. Vrain Creek at Lyons gage was used as a secondary gage for regression due to the lack of other usable gages on Big Dry Creek. It was not necessary to account for diversions.

2.2.3 Big Thompson River

The Big Thompson River at Loveland gage was used to estimate inflows. This inflow required modification due to an incomplete period of record. The Big Thompson River at the mouth of the Canyon near Drake gage was used to complete the regression correlation. After filling the missing records, the following diversions were added due to the downstream gage location: Mariana Ditch, Loveland Greeley Canal, Farmer's Irrigation Canal, Big Thompson D MFG, and Rist Goss Ditch.

2.2.4 Boulder Creek

The Boulder Creek at North 75th Street near Boulder gage was used to estimate inflows. Due to the incomplete period of record for the primary gage, the Boulder Creek near Orodell gage was used as a secondary gage for regression filling. There were no diversions within the reach; therefore, no adjustments for diversions were necessary.

2.2.5 Cache la Poudre River

The Cache la Poudre River at Fort Collins gage was used to estimate inflows. This inflow required modification due to an incomplete period of record. The Cache la Poudre River at the mouth of the canyon near Fort Collins gage was used to complete the regression correlation. After filling the missing records, the following diversions were added due to the

downstream gage location: Lake Canal Ditch, Josh Ames Ditch, Larimer Weld Irrigation Canal, John G Coy Ditch, and Agg Ditch.

2.2.6 Cherry Creek

The Cherry Creek near Franktown gage was used to estimate inflows. This inflow required the subtraction of the John Jones Ditch diversion due to the upstream gage location in relation to the model boundary. The gage contained a complete period of record.

2.2.7 Clear Creek

The Clear Creek at Golden gage was used to estimate inflows. This gage did not contain a complete period of record; the Clear Creek near Golden gage was used to fill missing data. Due to the close proximity of the gages (Clear Creek near Golden was moved downstream in 1979), the data used to fill missing records was unmodified with the exception of the subtraction of the Church Ditch from the Clear Creek near Golden records. After combining the records, the following diversions were subtracted due to the upstream gage location from the model boundary: Agricultural Ditch, Farmer's Highline Canal, Wannemaker Ditch, and Lee Stewart Eskins Ditch.

2.2.8 Coal Creek

The Coal Creek near Plainview gage was used to estimate inflows. Due to the incomplete period of record for the primary gage, the missing data was filled using a combination of the South Boulder Creek near Eldorado Springs and South Boulder Creek Diversion near Eldorado Springs gages (South Boulder Creek near Eldorado Springs gage was moved to a new location and renamed to South Boulder Creek Diversion near Eldorado Springs within the study period) for regression filling. The combination of gages used for filling was required due to relocation of the gage. After filling the Coal Creek gage with the correlated gage data, the following diversions were subtracted due to the upstream location of the gage from the model boundary: Church Ditch (upper), Eggleston No 1 Ditch, and William C. Hake Ditch.

2.2.9 Little Thompson River

The Little Thompson River at Milliken gage was used to estimate inflows. This inflow required modification due to an incomplete period of record. The St. Vrain Creek at the mouth of the canyon near Platteville gage was used to complete the regression correlation due to lack of an appropriate gage on the Little Thompson. After filling the missing records, the following diversions were added due to the downstream gage location: Rockwell D Rockwell PP, Miner Longan Ditch, and Beeline Ditch.

2.2.10 Plum Creek

The Plum Creek near Louviers gage was used to estimate inflows. This inflow required modification due to an incomplete period of record. The Plum Creek near Sedalia gage was used to fill the missing records without regression due to proximity of the gages.

2.2.11 St. Vrain Creek

The St. Vrain Creek below Longmont gage was used to estimate inflows. This inflow required modification due to an incomplete period of record. The St. Vrain Creek at the mouth near Platteville gage was used to complete the regression correlation.

2.2.12 South Platte River

The South Platte River below Chatfield Reservoir gage was used to estimate inflows on the South Platte entering the model. This inflow required modification due to an incomplete period of record. A combination of four other gages, one diversion, and regression correlations was used to fill the missing data. The flow data from South Platte River at Union Avenue at Englewood gage (06710245) developed in SPDSS Task 2 (SPDSS, 2007a) was used to create a regression correlation to fill the South Platte River below Chatfield gage.

3.0 Explicitly Modeled Diversions

Diversions explicitly modeled in the groundwater model include key diversion structures identified in the SPDSS Task 3 Key Diversion Structures TM (SPDSS 2007). These diversions account for approximately 85 percent of the net absolute decreed surface water rights in Water Divisions 1 and District 47 in Water Division 6. Due to the large amounts of water leaving various stream segments through stream diversions, it was integral to account for these effects in order to properly calibrate to streamflow in the groundwater model. The process for selecting the proper stream diversions to include in the groundwater model is described in Section 3.1. The process for preparing the diversion data for the MODFLOW Streamflow-Routing (SFR2) package is described in Section 3.2.

3.1 Stream Diversion Selection

All key diversions within the groundwater model domain were selected in an ArcGIS coverage created in SPDSS Task 3 (SPDSS 2007). This selection was visually inspected to ensure that the proper diversions were selected and exported into another GIS shapefile. This exported shapefile contained 131 diversions, which are summarized in Table F-3; these represent the key diversions within the groundwater model removing water from modeled stream segments.

3.2 Converting Diversion Data to MODFLOW Inputs

A data file (DDH) created in SPDSS Task 3 (SPDSS 2007) containing filled monthly diversion records for all key diversions was used to represent historical diversions for the 1950-2006 study period. The data were imported into *Excel* and filtered by the diverting structure Water District ID (WDID) number. The data were then reformatted and uploaded to the SPDSS groundwater database. The SPDSS groundwater database is a geodatabase developed specifically for the groundwater model to store groundwater information. In addition, diversion locations were used to assign diversions to a specific reach of the SFR2 stream network. The DDH file did not contain any diversion data for two structures, GRAY LAKES FDR D and FOSSIL CREEK INLET DITCH. A list of key diversions identified in SPDSS Task 3 which are within the groundwater model are shown in Table F-3. Key diversions included in the groundwater model are shown in Figures F-1a, F-1b, and F-1c.

Table F-3 Key Diversions within the Groundwater Model Domain

Diversion Name	Structure WDID	Diversion Name	Structure WDID
MILTON RES	203876	LOVELAND GREELEY CANAL	400532
EMPIRE DITCH	100501	MARIANA DITCH	400534
RIVERSIDE CANAL	100503	RIST GOSS DITCH	400541
BIJOU CANAL	100507	BEELINE DITCH	400587
WELDON VALLEY DITCH	100511	MINER LONGAN DITCH	400599
JACKSON LAKE INLET DITCH	100513	ROCKWELL D ROCKWELL P P	400601
FT MORGAN CANAL	100514	GREELEY FLTR PLNT/BOYD L	400702
UPPER PLATTE BEAVER CNL	100515	LAST CHANCE DITCH	500589
DEUEL SNYDER CANAL	100517	COLE SEEPAGE DITCH	500942
LOWER PLATTE BEAVER D	100518	BOULDER WELD CTY DITCH	600515
TREMONT DITCH	100519	DELEHANT DITCH	600523
GILL STEVENS DITCH	100520	GODDING DAILEY PLUMB D	600527
TROWELL DITCH	100524	HIGHLAND S SIDE DITCH	600532
TETSEL DITCH	100525	HOUCK 2 DITCH	600534
JOHNSON EDWARDS DITCH	100526	HOWELL DITCH	600536
NORTH STERLING CANAL	100687	LEGGETT DITCH	600537
UNION DITCH	100688	LOWER BOULDER DITCH	600538
PREWITT INLET CANAL	100829	RURAL DITCH	600551
FARMERS GARDNERS DITCH	200800	SMITH EMMONS DITCH	600553
BURLINGTON D RIVER HG	200802	ERIE COAL CR DITCH	600610
DENVER-HUDSON CNL	200805	HARRIS DITCH	600611
GARDENERS DITCH	200806	KERR DITCH NO 1	600612
FULTON DITCH	200808	KERR DITCH NO 2	600613
BRANTNER DITCH	200809	LOUISVILLE CCGC PL 2	600767
BRIGHTON DITCH	200810	SLOUGH OR BIJOU ASS"N D	700527
LUPTON BOTTOM DITCH	200812	CLEAR CR PLATTE RIVER D	700547
PLATTEVILLE DITCH	200813	COLO AGRICULTURAL D	700549
EVANS NO 2 DITCH	200817	CORT GRAVES HUGHES DITCH	700551
MEADOW ISLAND 1 DITCH	200821	CROKE CANAL	700553
MEADOW ISLAND DITCH	200822	FISHER DITCH	700570
FARMERS INDEPENDENT D	200824	KERSHAW DITCH	700597
HEWES COOK DITCH	200825	MANHART DITCH	700614
JAY THOMAS DITCH	200826	OUELETTE DITCH	700632
UNION DITCH	200828	RENO JUCHEM DITCH	700647
SECTION NO 3 DITCH	200830	ROCKY MOUNTAIN DITCH	700652
LOWER LATHAM DITCH	200834	CITY DITCH PL	801008
PATTERSON DITCH	200836	NEVADA DITCH	801009
HIGHLAND DITCH	200837	ENGLEWOOD INTAKE	801013
WHIPPLE DITCH	200871	EPPERSON DITCH/PUMP	801015
GERMAN DITCH	200872	LACOMBE POWER PLANT	801016
BIG DRY CREEK DITCH	200873	MCBROOM DITCH	900816
YOXALL DITCH	200874	CARLSON DITCH	6400501
LITTLE BURLINGTON CNL	200915	LIDDLE DITCH	6400502
GOOSEQUILL PUMP STATION	200922	SOUTH RESERVATION DITCH	6400503
LARIMER WELD IRR CANAL	300919	PETERSON DITCH	6400504
JOSH AMES DITCH	300921	RED LION SUPPLY DITCH	6400506
LAKE CANAL DITCH	300922	LONG ISLAND DITCH	6400507
JOHN G COY DITCH	300923	SETTLERS DITCH	6400508
CACHE LA PODR RES IN CNL	300924	HARMONY DITCH 1	6400511
CHAFFEE DITCH	300925	CHAMBERS DITCH	6400513
BOXELDER DITCH	300926	RAMSEY DITCH	6400514
FOSSIL CREEK INLET DITCH[1]	300927	POWELL BLAIR DITCH	6400516

Table F-3 Key Diversions within the Groundwater Model Domain

Diversion Name	Structure WDID	Diversion Name	Structure WDID
NEW CACHE LA POUDRE CO D	300929	LONE TREE DITCH	6400518
WHITNEY IRR DITCH	300930	JUD BRUSH DITCH	6400519
B H EATON DITCH	300931	ILIFF PLATTE VALLEY D	6400520
WILLIAM R JONES DITCH	300932	BRAVO DITCH	6400522
CANAL 3 DITCH	300934	LOWLINE DITCH	6400524
BOYD FREEMAN DITCH	300935	HENDERSON SMITH DITCH	6400525
OGILVY DITCH	300937	STERLING IRR CO DITCH 2	6400526
GRAY LAKES FDR D[1]	301117	STERLING IRR CO DITCH 1	6400528
PLATTE R PWR PMPG DVR	301203	SPRINGDALE DITCH	6400530
BIG T PLATTE R DITCH	400502	SCHNEIDER DITCH	6400531
BIG THOMPSON D MFG	400503	DAVIS BROS DITCH	6400532
EVANSTOWN DITCH	400517	PAWNEE DITCH	6400533
FARMERS IRR CANAL	400519	SOUTH PLATTE DITCH	6400535
HILL BRUSH DITCH	400522	RICE DITCH	6400599
HILLSBOROUGH DITCH	400523	ARAPAHOE POWER PLANT	801014

[1] No data available for these key diversions.

4.0 Aggregated Diversions

Aggregated diversions include diversions by non-key diversion structures that are grouped or aggregated together (SPDSS Task 3 -- Aggregate Non-Key Agricultural Diversion Structures 2008). As described in this TM, primary reasons non-key diversion structures were aggregated was to account for diversions that have recently become active, have sparse diversion records, divert from a small tributary, and/or have a relatively small acreage. The process for selecting the proper aggregated diversions to account for in the groundwater model is described in Section 4.1. The process for preparing the data for the MODFLOW Streamflow-Routing (SFR2) package is described in Section 4.2.

4.1 Aggregated Diversions Selection

Similar to the process used for key diversions, a coverage of aggregated diversions was imported into ArcGIS and aggregated diversions within the groundwater model domain were spatially selected. This selection was visually inspected to ensure that the proper aggregated diversions were identified and selected. There are two aggregated diversion points, shown in Table F-4.

Table F-4 Aggregated Diversions within the Groundwater Model Domain

No.	Structure ID	River
1	02_ADP003	South Platte River
2	07_ADP001	Clear Creek

4.2 Converting Diversion Data to MODFLOW Inputs

Data from a file (DDH) created in SPDSS Task 3 (2008) containing historical filled monthly diversion records for the two aggregated diversions were imported into *Excel* and filtered by the aggregated diversion Water District ID number. The data were then reformatted and uploaded to the SPDSS groundwater geodatabase. In addition, aggregated diversion point locations were imported from the ArcGIS coverage and assigned to a specific reach in the SFR2 stream network. The modeled aggregated diversions are shown in Figures F-1a, F-1b, and F-1c.

5.0 Discharges to Streams

Discharges to streams represented in the groundwater model include those identified by the U.S. Environmental Protection Agency (EPA) as major discharges within the counties located in the groundwater model domain. Three industrial and 21 municipal entities were found to directly discharge into seven streams, including the South Platte River, Boulder Creek, Big Dry Creek, Big Thompson River, Coal Creek, Cherry Creek, and the Cache la Poudre River. These 24 discharges contribute a significant flow into the various stream reaches. The process for selecting the proper discharges to model in the groundwater model is described in Section 5.1; the 24 dischargers are listed in Table F-5. Methods for preparing the data for the MODFLOW Streamflow-Routing (SFR2) package are described in Section 5.2.

Table F-5 Major Dischargers within the SPDSS Groundwater Domain

Discharger Name	NPDES ID	Receiving River
Boulder	CO0024147	Boulder Creek
Brighton	CO0021547	South Platte River
Brush	CO0021245	South Platte River
Littleton-Englewood	CO0032999	South Platte River
Commerce City	CO0026662	South Platte River
Fort Lupton	CO0021440	South Platte River
Fort Morgan	CO0044849	South Platte River
Greeley	CO0040258	Cache la Poudre
Sterling	CO0026247	South Platte River
Fort Collins	CO0026425	Cache la Poudre
Evans	CO0020508	South Platte River
Windsor	CO0020320	Cache la Poudre
Glendale	CO0020095	Cherry Creek
Stonegate	CO0026247	Cherry Creek
Parker	CO0046507	Cherry Creek
Public Service Company of Colorado Arapahoe Station	CO0001091	South Platte River
Westminster	CO0024171	Big Dry Creek
Broomfield	CO0026409	Big Dry Creek
Loveland	COU000211	Big Thompson River
Lafayette	CO0023124	Coal Creek
Louisville	CO0023078	Coal Creek
Public Service Company of Colorado Cherokee Station	CO0001104	South Platte River
Eastman Kodak Company	CO0032158	Cache la Poudre River
Metro Wastewater Reclamation District	CO0026638	South Platte River

5.1 Discharge Data Selection

Industrial and municipal daily data was estimated using two separate procedures. Industrial discharges were estimated using historical monthly discharge flows (approximately 2002 through 2007) obtained from EPA. Due to the lack of historical discharge data for industrial discharges, the average of the industrial discharge for the period (2002 to 2007) was used for the period of record (1950 to 2006).

Municipal discharges were based on population data and indoor return rates calculated for each municipality located in the groundwater model domain. The population data set was developed using available population data from HydroBase and a linear interpolation method to fill missing data (SPDSS 2007c).

Indoor return rates for each municipality were based on engineering estimates provided in the SPDSS Task 66.2 memorandum (SPDSS 2007b). The reported rates were utilized to estimate gallons per capita per day (gpcd) of wastewater flow directly discharged into the South Platte River, Boulder Creek, Big Dry Creek, Big Thompson River, Coal Creek, Cherry Creek, or Cache la Poudre River (SPDSS 2007b).

The annual population value was multiplied by the gpcd to obtain an average discharge value for each municipality. The resultant annual discharge values were varied on a monthly basis to account for seasonal variations in water use. The basis for the monthly variations was developed from wastewater discharge data obtained from the Metro Wastewater District.

5.2 Converting Discharge Data to MODFLOW Inputs

The monthly summary tables for each discharge's flows were summarized into one table. This data was added to the SPDSS groundwater geodatabase to be used in the development of the MODFLOW SFR2 package. Discharge locations were imported from the ArcGIS coverage and assigned to a specific reach of the SFR2 stream network. Table F-6 shows the average annual flows for each discharger included in the groundwater model for the three periods being modeled.

Table F-6 Average Annual Rates for Major Dischargers within the SPDSS Groundwater Domain

Discharger Name	NPDES ID	Average Annual Rate Steady State (AFY)	Average Annual Rate Transient (AFY)	Average Annual Rate Validation (AFY)
Boulder	CO0024147	11,445	12,263	8,585
Brighton	CO0021547	1,536	2,387	1,240
Brush	CO0021245	913	1,060	806
Littleton-Englewood	CO0032999	7,758	8,459	6,536
Commerce City	CO0026662	1,781	2,567	1,517
Fort Lupton	CO0021440	932	1,193	670
Fort Morgan	CO0044849	2,014	2,250	1,721
Greeley	CO0040258	9,722	12,460	7,405
Sterling	CO0026247	1,116	1,399	1,153
Fort Collins	CO0026425	13,779	17,754	9,240
Evans	CO0020508	1,091	2,241	857
Windsor	CO0020320	930	1,956	741
Glendale	CO0020095	338	543	233
Stonegate	CO0040291	0	482	80

Table F-6 Average Annual Rates for Major Dischargers within the SPDSS Groundwater Domain

Discharger Name	NPDES ID	Average Annual Rate Steady State (AFY)	Average Annual Rate Transient (AFY)	Average Annual Rate Validation (AFY)
Parker	CO0046507	992	3,878	800
Public Service Company of Colorado Arapahoe Station	CO0001091	12	12	12
Westminster	CO0024171	8,345	10,681	4,761
Broomfield	CO0026409	3,437	5,403	2,221
Loveland	COU000211	4,495	6,039	3,071
Lafayette	CO0023124	1,977	2,940	1,255
Louisville	CO0023078	1,917	2,356	997
Public Service Company of Colorado Cherokee Station	CO0001104	81	81	81
Eastman Kodak Company	CO0032158	42	42	42
Metro Wastewater Reclamation District	CO0026638	149,331	144,320	120,895

6.0 References

Burns, Alan. 1980. Hydrologic Analysis of the Proposed Badger-Beaver Creeks Artificial-Recharge Project, Morgan County, Colorado. USGS Water-Resources Investigations 80-46.

DeLorme, 2000. Colorado Atlas and Gazetteer.

Duke, H. R. and Longenbaugh, R. A. 1966. Evaluation of Water Resources in Kiowa and Bijou Creek Basins, Colorado. Prepared by Colorado State University for the Colorado Water Conservation Board. May.

SPDSS, 2008a. SPDSS Task 3 – Aggregate Non-Key Agricultural Diversion Structures, prepared by Leonard Rice Engineers (LRE) for the Colorado Water Conservation Board and Colorado Division of Water Resources, March 20, 2008.

_____, 2008b. SPDSS Phase 4 Task 46.2 – Stream Gain/Loss Estimates Technical Memorandum. Prepared by Camp Dresser and McKee (CDM) for the Colorado Water Conservation Board and Colorado Division of Water Resources. April 10, 2008.

_____, 2007a. SPDSS Task 2 – Identify Key Streamflow Gages and Estimate Streamflows for Missing Records. Prepared for Colorado Water Conservation Board and Colorado Division of Water Resources. Revised February, 2007.

_____, 2007b. SPDSS Task 3 – Key Diversion Structures. Prepared by LRE for the Colorado Water Conservation Board and Colorado Division of Water Resources. May 5, 2007.

_____, 2007c. SPDSS Task 66.2 – Collect and Develop Municipal and Industrial Consumptive Use Estimates. Prepared by LRE for the Colorado Water Conservation Board and Colorado Division of Water Resources. November 14, 2007.

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01/05/2012

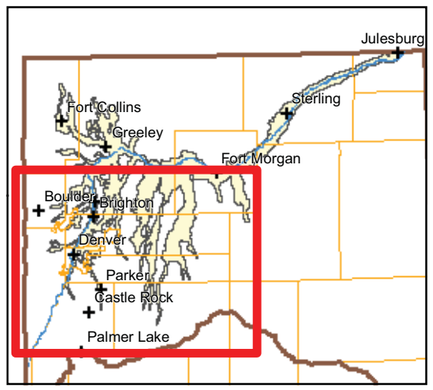
Figure F-1a: Southern Portion of Surface Water Model Inflows and Diversions

COLORADO DIVISION OF WATER RESOURCES
DEPARTMENT OF NATURAL RESOURCES

State of Colorado
Department of Natural Resources
Colorado Water Conservation Board
Division of Water Resources

Legend

- Diversion Locations
- Gage Locations
- Discharge Locations
- Aggregate Locations
- City
- Stream
- County
- Denver Basin Extent



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Miles

NAD 1983 UTM Zone 13N

Prepared by: CDM

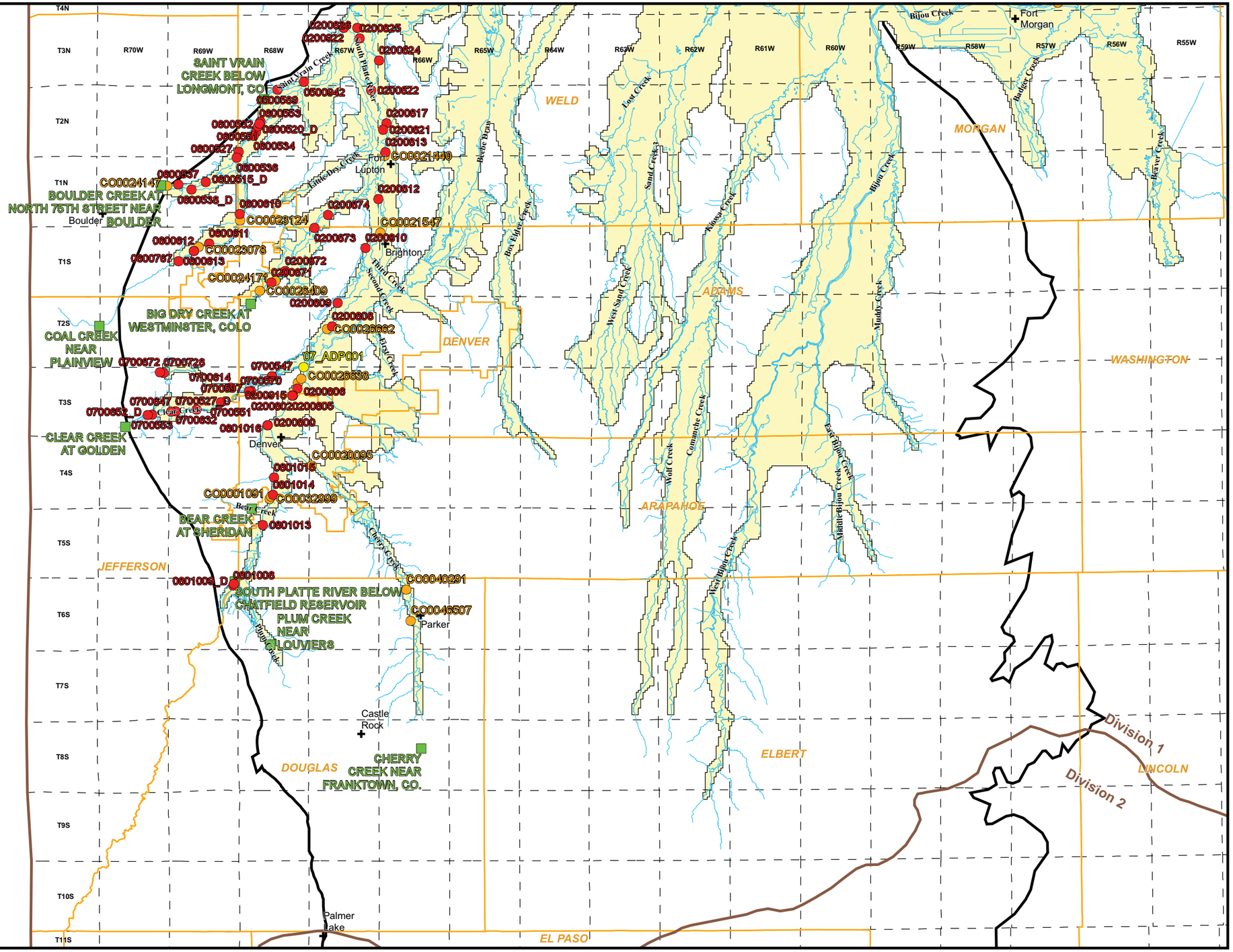

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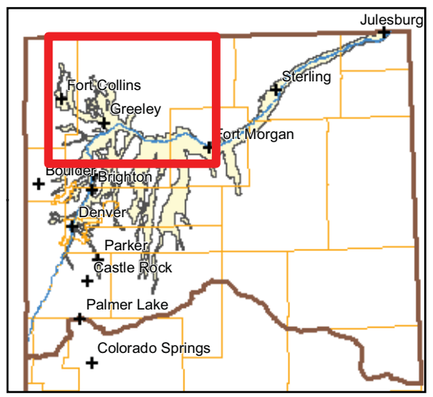
Figure F-1b: Middle Portion of Surface Water Model Inflows and Diversions

COLORADO DIVISION OF WATER RESOURCES
DEPARTMENT OF NATURAL RESOURCES

State of Colorado
Department of Natural Resources
Colorado Water Conservation Board
Division of Water Resources

Legend

- Diversion Locations
- Gage Locations
- Discharge Locations
- Aggregate Locations
- City
- Stream
- County
- Denver Basin Extent



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Scale
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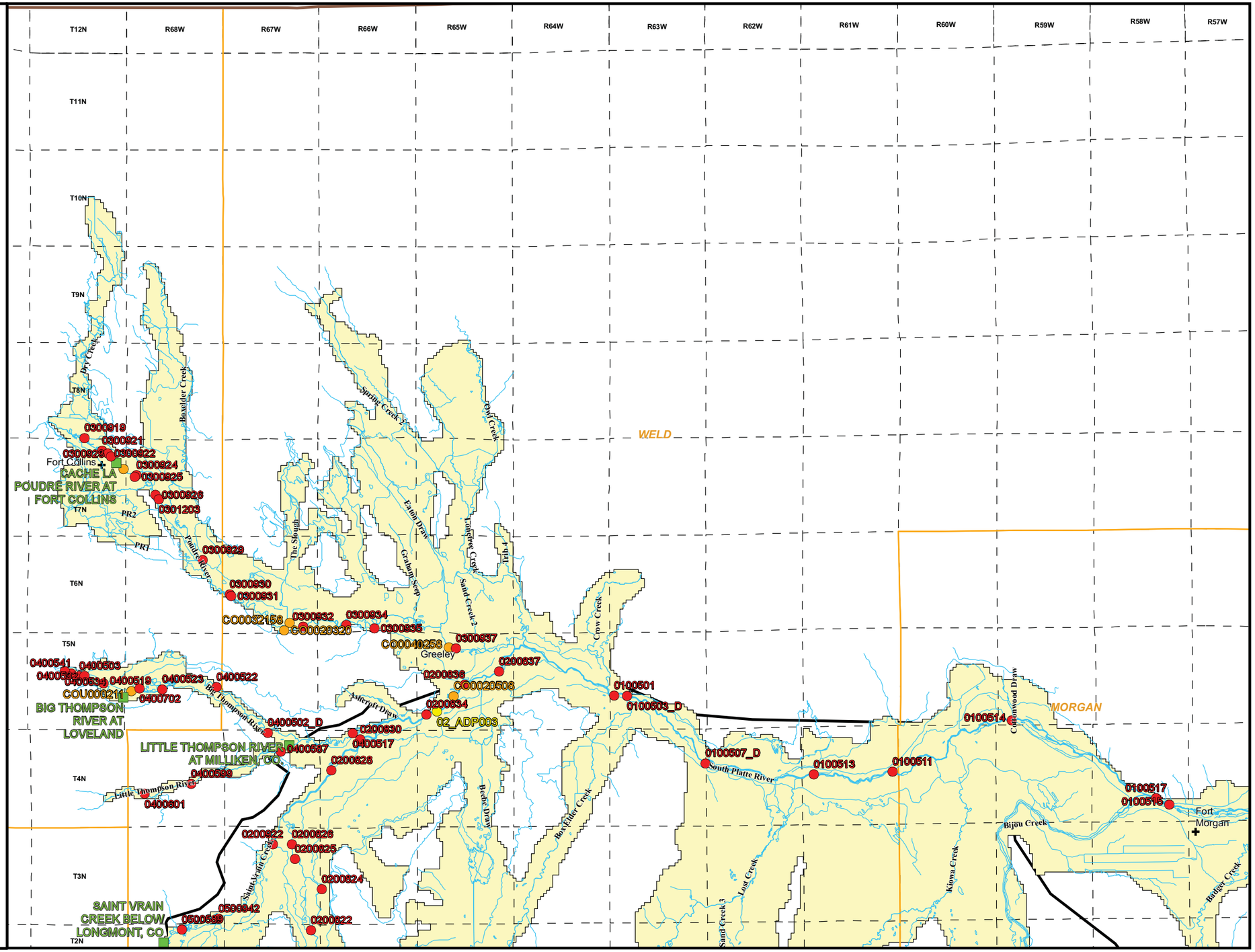
Miles

NAD 1983 UTM Zone 13N

Prepared by: CDM



SPDSS Alluvial Groundwater Model Report

01/05/2012

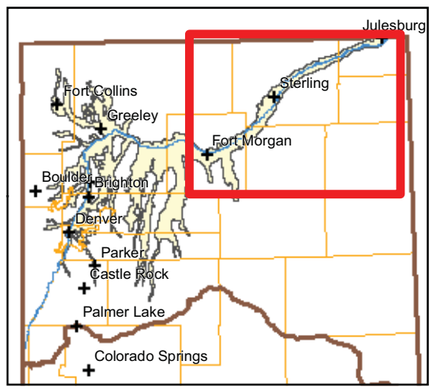
Figure F-1c: Eastern Portion of Surface Water Model Inflows and Diversions

COLORADO DIVISION OF WATER RESOURCES
DEPARTMENT OF NATURAL RESOURCES

State of Colorado
Department of Natural Resources
Colorado Water Conservation Board
Division of Water Resources

Legend

- Diversion Locations
- Gage Locations
- Discharge Locations
- Aggregate Locations
- City
- Stream
- County
- Denver Basin Extent

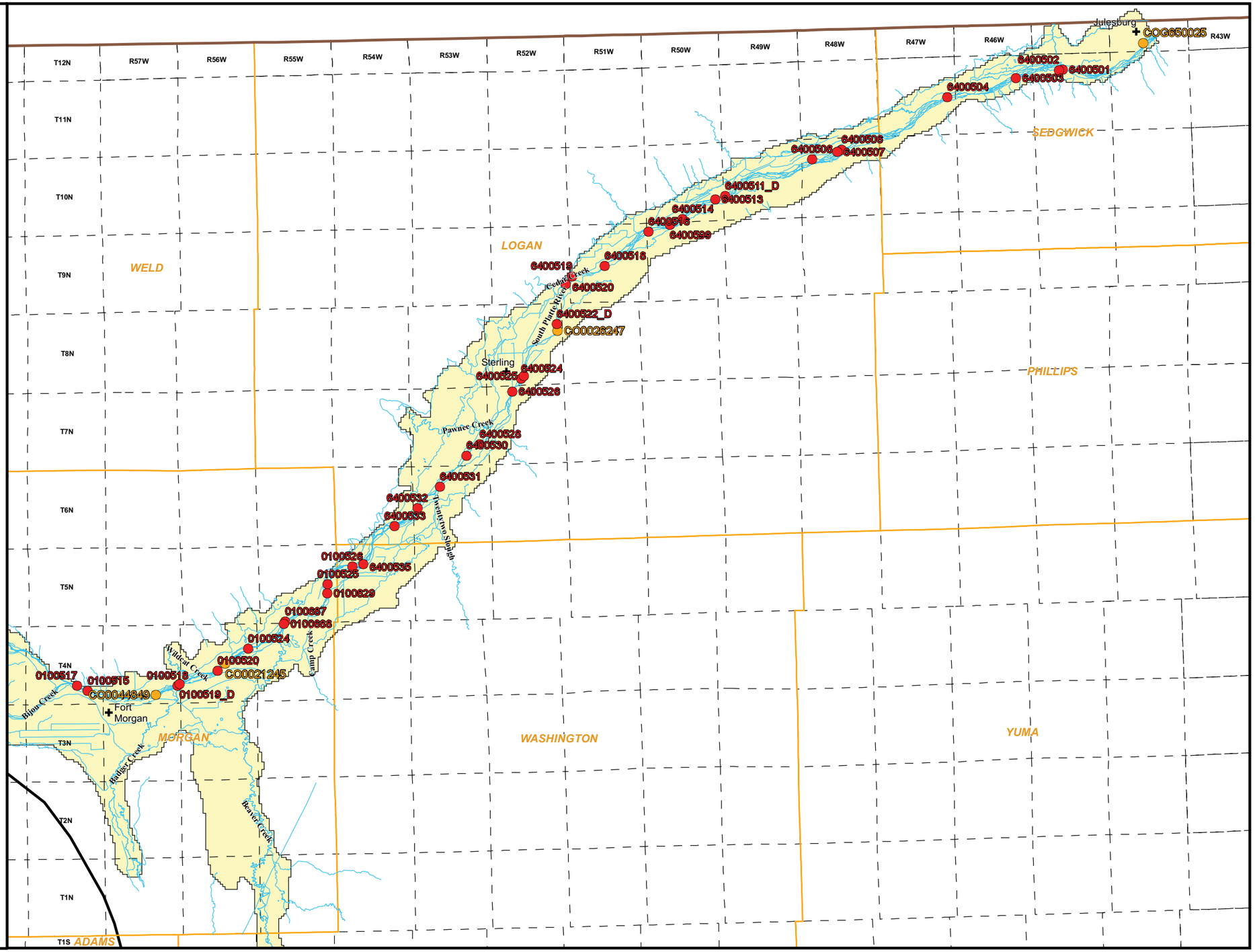


N
W E
S

Scale
1:500,000
0 2.5 5 10
Miles

NAD 1983 UTM Zone 13N

Prepared by: CDM



SPDSS Alluvial Groundwater Model Report

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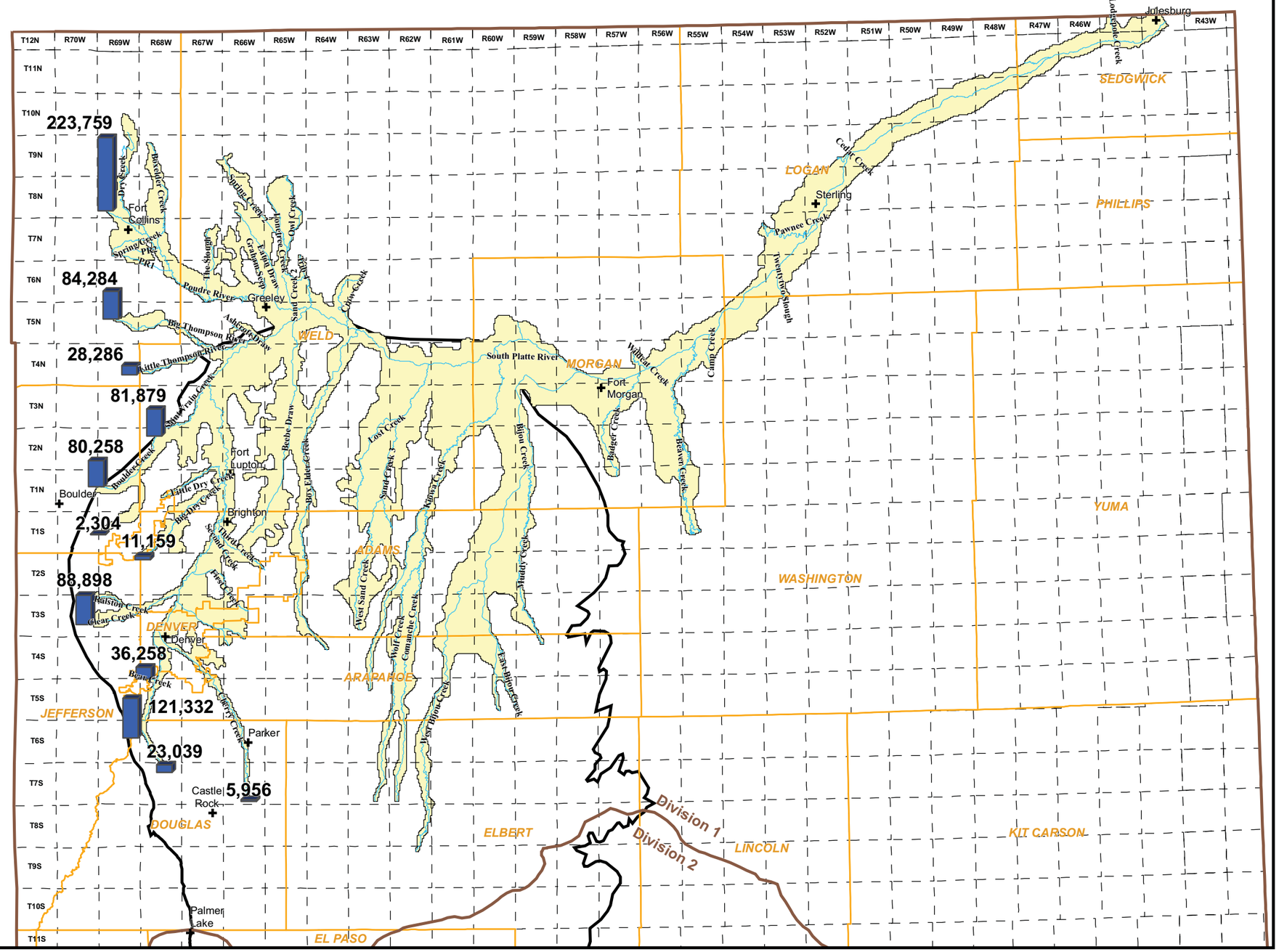
Figure F-2: Average Annual Surface Water Inflows (1950-2006)

COLORADO DIVISION OF WATER RESOURCES
DEPARTMENT OF NATURAL RESOURCES

State of Colorado
Department of Natural Resources
Colorado Water Conservation Board
Division of Water Resources

Legend

- Stream Inflow, ac-ft/yr
- City
- Stream
- County
- Denver Basin Extent



N
W E
S

Scale
1:1,000,000
0 5 10 20
Miles

NAD 1983 UTM Zone 13N

Prepared by: CDM

Attachment 1: TSTool file used to Generate Stream Inflows

```
# All inflows using TSTools to provide data for model input. All data is written to DateValue format for ease of upload to database.
# All tributary time series results are displayed in order within the DateValue output file.
# DDH file used to fill diversion records because it has filled historic records rather than Hydrobase which has no filling.
#
# Step 1 - Set Output Period and Year Type
setOutputPeriod(01/1950,12/2006)
setOutputYearType(Calendar)
#
#
# Bear Creek at Sheridan
#
# Step 1 - Read HydroBase for Streamflow Information
# 06711500 - BEAR CREEK AT SHERIDAN
06711500.DWR.Streamflow.Month~HydroBase
# Step 2 - Read DDH for Diversion Total Information
0900816...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# Step 3 - Add McBroom Ditch to Bear Creek At Sheridan Gage
# Notice- Mcbroom Ditch Transferred in 1978 Resulting in Reduced Diversion
add(TSID="06711500.DWR.Streamflow.Month",TSList="SpecifiedTS",AddTSID="0900816...MONTH",HandleMissingHow=IgnoreMissing)
# Step 4 - Free McBroom Ditch Time Series
free(TSID="0900816...MONTH")
#
#
#
# Big Dry Creek at Westminster, CO filled w St Vrain at Lyons using regression
# Step 1 - Read HydroBase for Streamflow Information
# 06720820 - BIG DRY CREEK AT WESTMINSTER, COLO
06720820.USGS.Streamflow.Month~HydroBase
# 06724000 - SAINT VRAIN CREEK AT LYONS, CO
06724000.DWR.Streamflow.Month~HydroBase
# Step 2 - Fill Big Dry w/ St Vrain at Lyons using regression
fillRegression(TSID="06720820.USGS.Streamflow.Month",IndependentTSID="06724000.DWR.Streamflow.Month",NumberOfEquations=MonthlyEquations,Intercept=0)
# Step 3 - Free St Vrain at Lyons
free(TSID="06724000.DWR.Streamflow.Month")
#
#
#
# Big Thompson River at Loveland fill with
#Big Thompson River at mouth of canyon near Drake using regression- add diversions
# Step 1 - Read HydroBase for Streamflow Information
# 06741510 - BIG THOMPSON RIVER AT LOVELAND
06741510.USGS.Streamflow.Month~HydroBase
# 06738000 - BIG THOMPSON RIVER AT MOUTH OF CANYON NEAR DRAKE
06738000.DWR.Streamflow.Month~HydroBase
# Step 2 - Use Big Thompson at canyon mouth near Drake to fill missing data using regression
fillRegression(TSID="06741510.USGS.Streamflow.Month",IndependentTSID="06738000.DWR.Streamflow.Month",NumberOfEquations=MonthlyEquations,Intercept=0)
# Step 3 - Free Big Thompson at canyon mouth near Drake
free(TSID="06738000.DWR.Streamflow.Month")
# Step 4 - Read diversion time series
```

```
# 0400534 - Mariana Ditch
0400534...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# 0400532 - Loveland Greeley Canal
0400532...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# 0400519 - Farmer's Irr Canal
0400519...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# 0400503 - Big Thompson D MFG
0400503...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# 0400541 - Rist Goss Ditch
0400541...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# Step 5 - Add Loveland Greeley Canal diversion to Big Thompson River near Loveland gage
add(TSID="06741510.USGS.Streamflow.Month",TSList="SpecifiedTS",AddTSID="0400532...MONTH",Handle
MissingHow=IgnoreMissing)
# Step 6 - Add Mariana Ditch diversion to Big Thompson River near Loveland gage
add(TSID="06741510.USGS.Streamflow.Month",TSList="SpecifiedTS",AddTSID="0400534...MONTH",Handle
MissingHow=IgnoreMissing)
# Step 7 - Add Farmer's Irr Canal diversion to Big Thompson River near Loveland gage
add(TSID="06741510.USGS.Streamflow.Month",TSList="SpecifiedTS",AddTSID="0400519...MONTH",Handle
MissingHow=IgnoreMissing)
# Step 8 - Add Big Thompson D MFG diversion to Big Thompson River near Loveland gage
add(TSID="06741510.USGS.Streamflow.Month",TSList="SpecifiedTS",AddTSID="0400503...MONTH",Handle
MissingHow=IgnoreMissing)
# Step 9 - Add Rist Goss Ditch diversion to Big Thompson River near Loveland gage
add(TSID="06741510.USGS.Streamflow.Month",TSList="SpecifiedTS",AddTSID="0400541...MONTH",Handle
MissingHow=IgnoreMissing)
# Step 10 - Free Diversion Time Series
# 0400534 - Mariana Ditch
free(TSID="0400534...MONTH")
# 0400532 - Loveland Greeley Canal
free(TSID="0400532...MONTH")
# 0400519 - FARMERS IRR CANAL
free(TSID="0400519...MONTH")
# 0400503 - BIG THOMPSON D MFG
free(TSID="0400503...MONTH")
# 0400541 - RIST GOSS DITCH
free(TSID="0400541...MONTH")
#
#
#
# Boulder Creek at North 75th Street near Boulder filled w/ Boulder Cr near Orodell using regression
# Step 1 - Read HydroBase for Streamflow Information
# 06730200 - BOULDER CREEK AT NORTH 75TH STREET NEAR BOULDER
06730200.USGS.Streamflow.Month~HydroBase
# 06727000 - BOULDER CREEK NEAR ORODELL
06727000.DWR.Streamflow.Month~HydroBase
# Step 2 - fill Boulder Cr at N 75th w/ Boulder Cr near Orodell using regression
fillRegression(TSID="06730200.USGS.Streamflow.Month",IndependentTSID="06727000.DWR.Streamflow.Mont
h",NumberOfEquations=MonthlyEquations,Intercept=0)
# Step 3 - free Boulder Cr near Orodell
free(TSID="06727000.DWR.Streamflow.Month")
#
#
#
# Cherry Creek near Franktown
# Step 1 - Read HydroBase for Streamflow Information
# 06712000 - CHERRY CREEK NEAR FRANKTOWN, CO.
```

```
06712000.USGS.Streamflow.Month~HydroBase
# Step 2 - Read DDH for Diversion Total Information
# 081362 - JOHN JONES DITCH
0801362...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# Step 3 - Subtract John Jones Ditch from Cherry Creek near Franktown Gage
subtract(TSID="06712000.USGS.Streamflow.Month",TSList="SpecifiedTS",SubtractTSID="0801362...MONTH",
HandleMissingHow=IgnoreMissing)
# Step 4 - Free John Jones Ditch Time Series
free(TSID="0801362...MONTH")
#
#
#
# Clear Creek at Golden fill with near Golden, subtract diversions
# Step 1 - Read HydroBase for Streamflow Information
# 06719500 - CLEAR CREEK NEAR GOLDEN
# 06719505 - CLEAR CREEK AT GOLDEN
06719500.USGS.Streamflow.Month~HydroBase
06719505.USGS.Streamflow.Month~HydroBase
# Step 2 - Read DDH for Diversion Total Information
# 0700540 - CHURCH DITCH
0700540...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# 0700502 - AGRICULTURAL DITCH
0700502...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# 0700569 - FARMER'S HIGHLINE CANAL
0700569...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# 0700698 - WANNEMAKER DITCH
0700698...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# 0700601 - LEE STEWART ESKINS DITCH
0700601...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# Step 3 - Clear Creek near Golden gage was moved downstream and discontinued in 1979
# First subtract Church Ditch from Clear Creek near Golden gage
subtract(TSID="06719500.USGS.Streamflow.Month",TSList="SpecifiedTS",SubtractTSID="0700540...MONTH",
HandleMissingHow=IgnoreMissing)
# Step 4 - Combine Clear Creek near Golden records with Clear Creek at Golden records
fillFromTS(06719505.USGS.Streamflow.Month,06719500.USGS.Streamflow.Month,*,*)
# Step 6 - Subtract Agricultural Ditch from Clear Creek at Golden gage
subtract(TSID="06719505.USGS.Streamflow.Month",TSList="SpecifiedTS",SubtractTSID="0700502...MONTH",
HandleMissingHow=IgnoreMissing)
# Step 7 - Subtract Farmer's Highline Canal Ditch from Clear Creek at Golden gage
subtract(TSID="06719505.USGS.Streamflow.Month",TSList="SpecifiedTS",SubtractTSID="0700569...MONTH",
HandleMissingHow=IgnoreMissing)
# Step 8 - Subtract Wannemaker Ditch from Clear Creek at Golden gage
subtract(TSID="06719505.USGS.Streamflow.Month",TSList="SpecifiedTS",SubtractTSID="0700698...MONTH",
HandleMissingHow=IgnoreMissing)
# Step 9 - Subtract Lee Stewart Eskins Ditch from Clear Creek at Golden gage
subtract(TSID="06719505.USGS.Streamflow.Month",TSList="SpecifiedTS",SubtractTSID="0700601...MONTH",
HandleMissingHow=IgnoreMissing)
# Step 10 - Free Clear Creek near Golden Time Series
free(TSID="06719500.USGS.Streamflow.Month")
# Step 11 - Free Diversion Time Series
# 0700540 - CHURCH DITCH
free(TSID="0700540...MONTH")
# 0700502 - AGRICULTURAL DITCH
free(TSID="0700502...MONTH")
# 0700569 - FARMER'S HIGHLINE CANAL
free(TSID="0700569...MONTH")
```

```
# 0700698 - WANNEMAKER DITCH
free(TSID="0700698...MONTH")
# 0700601 - LEE STEWART ESKINS DITCH
free(TSID="0700601...MONTH")
#
#
#
# Coal Creek near Plainview, fill with regression using S Boulder Creek near Eldorado Springs
# combined with BOSDELCO gage
# Step 1 - Read HydroBase for Streamflow Information to combine
# S Boulder Cr near Eldorado Springs with BOSDELCO
# 06729500 - SOUTH BOULDER CREEK NEAR ELDORADO SPRINGS, CO
06729500.DWR.Streamflow.Month~HydroBase
# BOSDELCO - SOUTH BOULDER CREEK DIVERSION NEAR ELDORADO SPRINGS
BOSDELCO.DWR.Streamflow.Month~HydroBase
# Step 2 - 06729500 gage was moved. Fill new gage (BOSDELCO) with previous gage data.
fillFromTS(BOSDELCO.DWR.Streamflow.Month,06729500.DWR.Streamflow.Month,*,*)
# Step 3 - Free S Boulder Cr near Eldorado Springs (06729500) gage.
free(TSID="06729500.DWR.Streamflow.Month")
# Step 4 - Read Coal Creek near Plainview gage data.
# 06730300 - COAL CREEK NEAR PLAINVIEW
06730300.DWR.Streamflow.Month~HydroBase
# Step 5 - Fill Coal Cr nr Plainview gage with BOSDELCO using regression.
fillRegression(TSID="06730300.DWR.Streamflow.Month",IndependentTSID="BOSDELCO.DWR.Streamflow.Mo
nth",NumberOfEquations=MonthlyEquations,Intercept=0)
# Step 6 - Free BOSDELCO gage.
free(TSID="BOSDELCO.DWR.Streamflow.Month")
# Step 7 - Read DDH for Diversion Total Information
# 0600606 - Church ditch (upper)
0600606...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# 0600608_D - Eggleston No 1 Ditch
0600608_D...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# 0600621 - William C Hake Ditch
0600621...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# Step 8 - Subtract Church Ditch (upper) from Coal Creek near Plainview Gage
subtract(TSID="06730300.DWR.Streamflow.Month",TSList="SpecifiedTS",SubtractTSID="0600606...MONTH",
HandleMissingHow=IgnoreMissing)
# Step 9 - Subtract Eggleston No 1 Ditch from Coal Creek near Plainview Gage
subtract(TSID="06730300.DWR.Streamflow.Month",TSList="SpecifiedTS",SubtractTSID="0600608_D...MONTH
",HandleMissingHow=IgnoreMissing)
# Step 10 -Subtract William C Hake Ditch from Coal Creek near Plainview Gage
subtract(TSID="06730300.DWR.Streamflow.Month",TSList="SpecifiedTS",SubtractTSID="0600621...MONTH",
HandleMissingHow=IgnoreMissing)
# Step 11 - Free Diversion Time Series
# 0600606 - Church Ditch (upper)
free(TSID="0600606...MONTH")
# 0600608 - Eggleston No 1 Ditch
free(TSID="0600608_D...MONTH")
# 0600621 - William C Hake Ditch
free(TSID="0600621...MONTH")
#
#
#
# Little Thompson filled using regression to St. Vrain
# Step 1 - Read HydroBase for Streamflow Information
# 06743500 - LITTLE THOMPSON RIVER AT MILLIKEN, CO.
```

06743500.USGS.Streamflow.Month~HydroBase
06731000 - ST. VRAIN CREEK AT MOUTH, NEAR PLATTEVILLE, CO.
06731000.DWR.Streamflow.Month~HydroBase
# Step 2 - Fill Little Thompson at Milliken gage with St. Vrain Creek at Mouth using regression
fillRegression(TSID="06743500.USGS.Streamflow.Month",IndependentTSID="06731000.DWR.Streamflow.Month",NumberOfEquations=MonthlyEquations,Intercept=0)
# Step 3 - Free St. Vrain Creek at Mouth
free(TSID="06731000.DWR.Streamflow.Month")
# Step 4 - Read DDH for Diversion Total Information
# 0400601 - ROCKWELL D ROCKWELL P P
0400601...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
0400599 - MINER LONGAN DITCH
0400599...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
0400587 - BEELINE DITCH
0400587...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# Step 5 - Add Rockwell D Rockwell P P
add(TSID="06743500.USGS.Streamflow.Month",TSList="SpecifiedTS",AddTSID="0400601...MONTH",HandleMissingHow=IgnoreMissing)
# Step 6 - Add Miner Longan Ditch
add(TSID="06743500.USGS.Streamflow.Month",TSList="SpecifiedTS",AddTSID="0400599...MONTH",HandleMissingHow=IgnoreMissing)
# Step 7 - Add Beeline Ditch
add(TSID="06743500.USGS.Streamflow.Month",TSList="SpecifiedTS",AddTSID="0400587...MONTH",HandleMissingHow=IgnoreMissing)
# Step 8 - Free Diversion Time Series
# 0400601 - ROCKWELL D ROCKWELL P P
free(TSID="0400601...MONTH")
# 0400599 - MINER LONGAN DITCH
free(TSID="0400599...MONTH")
# 0400587 - BEELINE DITCH
free(TSID="0400587...MONTH")
#
#
#
Plum Creek near Louviers combine with near Sedalia
Step 1 - Read HydroBase for streamflow information
06709500 - PLUM CREEK NEAR LOUVIERS
06709500.USGS.Streamflow.Month~HydroBase
0670900 - PLUM CREEK NEAR SEDALIA
06709000.USGS.Streamflow.Month~HydroBase
# Step 2 - Plum Creek "near Louviers" combined with "near Sedalia"
fillFromTS(06709500.USGS.Streamflow.Month,06709000.USGS.Streamflow.Month,*,*)
# Step 3 - Free near Sedalia Streamflow Time Series
free(TSID="06709000.USGS.Streamflow.Month")
#
#
#
Cache la Poudre at Fort Collins filled with regression to Poudre at Canyon Mouth - add diversions
Step 1 - Read HydroBase for Streamflow Information
06752260 - CACHE LA POUDRE RIVER AT FORT COLLINS, CO.
06752260.USGS.Streamflow.Month~HydroBase
06752000 - CACHE LA POUDRE R A MO OF CN, NR FT COLLINS, CO.
06752000.DWR.Streamflow.Month~HydroBase
# Step 2 - Fill Poudre at Fort Collins with regression to Poudre at canyon mouth
fillRegression(TSID="06752260.USGS.Streamflow.Month",IndependentTSID="06752000.DWR.Streamflow.Month",NumberOfEquations=MonthlyEquations,Intercept=0)

```
# Step 3 - Free Poudre at canyon mouth
free(TSID="06752000.DWR.Streamflow.Month")
# Step 4 - Read DDH for Diversion Total Information
# 0300923 - John G Coy Ditch
0300923...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# 0300922 - Lake Canal Ditch
0300922...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# 0300921 - Josh Ames Ditch
0300921...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# 0300919 - Larimer Weld Irr Canal
0300919...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# 03_ADP002 - Agg Ditch
03_ADP002...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# Step 5 - Add Lake Canal Ditch diversion to Cache la Poudre at Fort Collins
add(TSID="06752260.USGS.Streamflow.Month",TSList="SpecifiedTS",AddTSID="0300922...MONTH",Handle
MissingHow=IgnoreMissing)
# Step 6 - Add Josh Ames Ditch diversion to Cache la Poudre at Fort Collins
add(TSID="06752260.USGS.Streamflow.Month",TSList="SpecifiedTS",AddTSID="0300921...MONTH",Handle
MissingHow=IgnoreMissing)
# Step 7 - Add Larimer Weld Irr Canal diversion to Cache la Poudre at Fort Collins
add(TSID="06752260.USGS.Streamflow.Month",TSList="SpecifiedTS",AddTSID="0300919...MONTH",Handle
MissingHow=IgnoreMissing)
# Step 8 - Add Agg Ditch diversion to Cache la Poudre at Fort Collins
add(TSID="06752260.USGS.Streamflow.Month",TSList="SpecifiedTS",AddTSID="03_ADP002...MONTH",Hand
leMissingHow=IgnoreMissing)
# Step 9 - Add John G Coy Ditch diversion to Cache la Poudre at Fort Collins
add(TSID="06752260.USGS.Streamflow.Month",TSList="SpecifiedTS",AddTSID="0300923...MONTH",Handle
MissingHow=IgnoreMissing)
# Step 10 - Free Diversion Time Series
# 0300923 - John G Coy Ditch
free(TSID="0300923...MONTH")
# 0300922 - Lake Canal Ditch
free(TSID="0300922...Month")
# 0300921 - Josh Ames Ditch
free(TSID="0300921...MONTH")
# 0300919 - Larimer Weld Irr Canal
free(TSID="0300919...MONTH")
# 03_ADP002 - Agg Ditch
free(TSID="03_ADP002...MONTH")
#
#
#
# Saint Vrain below Longmont fill with St Vrain near Platteville using regression
# Step 1 - Read HydroBase for Streamflow Information
# 6725450 - SAINT VRAIN CREEK BELOW LONGMONT
06725450.USGS.Streamflow.Month~HydroBase
# 06731000 - SAINT VRAIN CREEK AT MOUTH NEAR PLATTEVILLE, CO
06731000.DWR.Streamflow.Month~HydroBase
# Step 2 - Fill Saint Vrain Creek below Longmont with St V near Platteville using regression
fillRegression(TSID="06725450.USGS.Streamflow.Month",IndependentTSID="06731000.DWR.Streamflow.Mont
h",NumberOfEquations=MonthlyEquations,Intercept=0)
# Step 3 - Free St Vrain near Platteville
free(TSID="06731000.DWR.Streamflow.Month")
#
#
#
```

```
# South Platte River below Chatfield fill with SPR at Littleton combined with Englewood gages
# Step 1 - Read HydroBase for Streamflow Information
# PLACHACO - South Platte River below Chatfield
PLACHACO.DWR.Streamflow.Month~HydroBase
# 06710000 - South Platte River at Littleton
06710000.USGS.Streamflow.Month~HydroBase
# 06710247 - SOUTH PLATTE RIVER BELOW UNION AVE, AT ENGLEWOOD
06710247.USGS.Streamflow.Month~HydroBase
# 06711565 - SOUTH PLATTE RIVER AT ENGLEWOOD
06711565.USGS.Streamflow.Month~HydroBase
# 06710245 - SOUTH PLATTE RIVER AT UNION AVE AT ENGLEWOOD
06710245.USGS.Streamflow.Month~HydroBase
# Step 2 - Fill at Union gage data with data from Littleton gage
fillFromTS(06710245.USGS.Streamflow.Month,06710000.USGS.Streamflow.Month,*,*)
free(TSID="06710000.USGS.Streamflow.Month")
# Step 3 - Fill At Union gage with At Englewood
fillRegression(TSID="06710245.USGS.Streamflow.Month",IndependentTSID="06711565.USGS.Streamflow.Mont
h",NumberOfEquations=MonthlyEquations,Intercept=0)
free(TSID="06711565.USGS.Streamflow.Month")
# Step 4 - Read Englewood Intake diversion
0801013...MONTH~StateMod~Z:\SPDSS_5\6-Data\T48\Streams\Diversions\SP2008.ddh
# Step 5 - Subtract Englewood intake from At Union
subtract(TSID="06710245.USGS.Streamflow.Month",TSList="SpecifiedTS",SubtractTSID="0801013...MONTH",
HandleMissingHow=IgnoreMissing)
# Step 6 - Free Englewood Intake
free(TSID="0801013...MONTH")
# Step 7 - Fill Below Union with At Union
fillFromTS(06710247.USGS.Streamflow.Month,06710245.USGS.Streamflow.Month,*,*)
# Step 8 - Free SPR at Union
free(TSID="06710245.USGS.Streamflow.Month")
# Step 9 - Fill Chatfield gage using regression to Below Union
fillRegression(TSID="PLACHACO.DWR.Streamflow.Month",IndependentTSID="06710247.USGS.Streamflow.M
onth",NumberOfEquations=MonthlyEquations,Intercept=0)
# Step 10 - Free SPR below Union
free(TSID="06710247.USGS.Streamflow.Month")
#
#
writeDateValue(OutputFile="Z:\SPDSS_5\6-
Data\T48\Streams\TSTools\Output\P5_T48_SWinflows",TSList="AllTS")
```