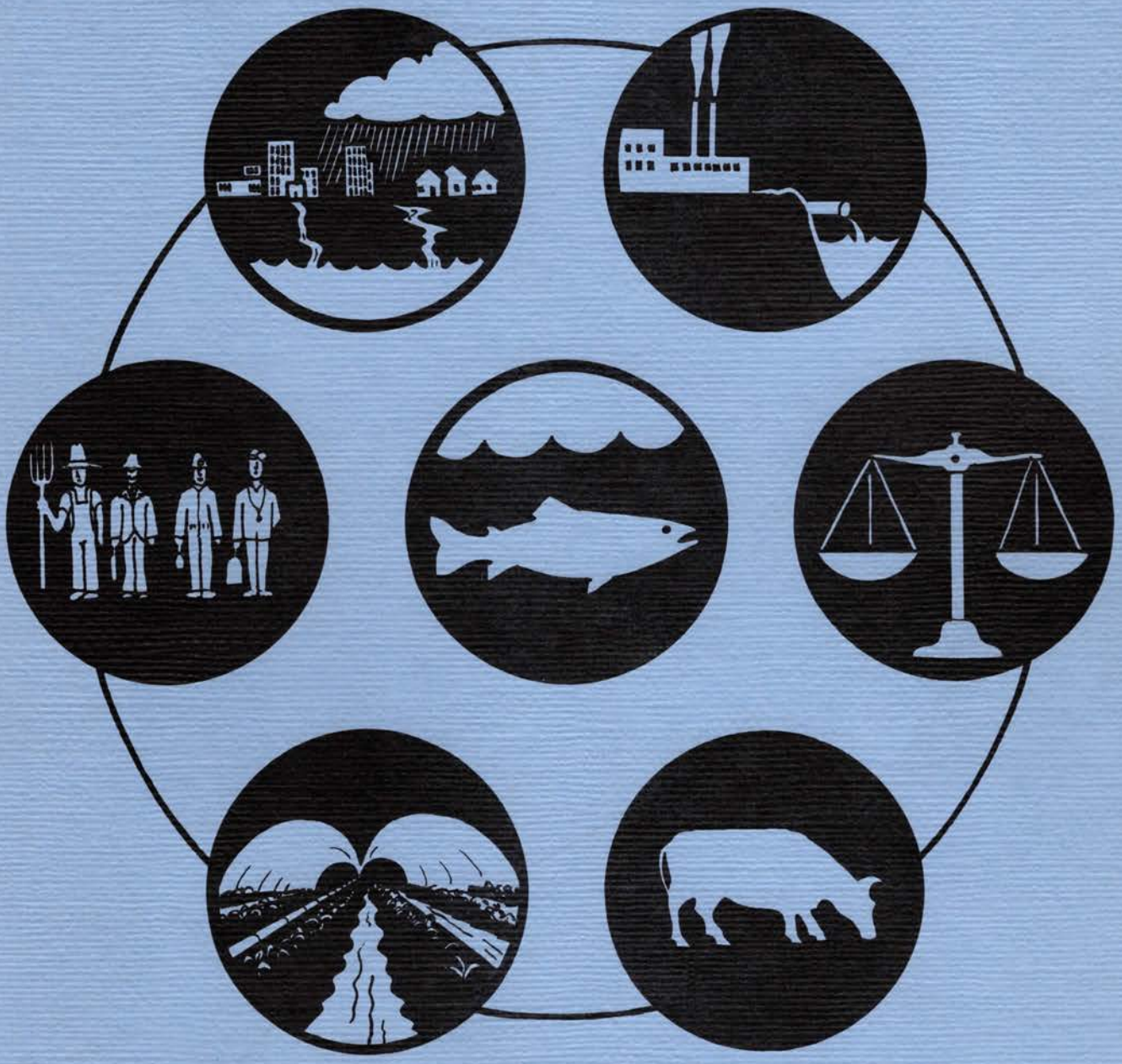
IMPLEMENTATION PLAN
WATER QUALITY MONITORING



Water Quality Management Plan

LARIMER-WELD REGIONAL COUNCIL OF GOVERNMENTS
LOVELAND, COLORADO

36

JUNE 1980

LARIMER-WELD REGIONAL COUNCIL OF GOVERNMENTS

208 AREAWIDE WATER QUALITY MANAGEMENT PLAN

IMPLEMENTATION PLAN FOR

REGIONAL WATER QUALITY MONITORING PROGRAM

Prepared For

Larimer-Weld Regional
Council of Governments

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1.0 EXECUTIVE SUMMARY

This report presents a recommended Water Quality Monitoring Program for the Larimer-Weld Region, Colorado. This project was implemented as part of the continuing Water Quality Management Planning Process for the region, as specified in the Areawide Water Quality Management Plan developed by the Larimer-Weld Regional Council of Governments, and subsequently certified by the Governor and approved by the Environmental Protection Agency.

1.1 GOALS

The Areawide Plan recognized the need for developing a coordinated water monitoring program in the region to insure that future investments in water pollution control are made in a wise and efficient manner, and to insure protection of beneficial uses of water throughout the region.

The Areawide Water Quality Management Plan identified the principles of monitoring program design, regional goals related to the program, program objectives, general recommendations, and criteria for program design. These factors together constitute the basis for design and implementation of the Regional Water Quality Monitoring Program.

1.2 REGIONAL WATER QUALITY MONITORING ADVISORY COMMITTEE

A Regional Water Quality Monitoring Advisory Committee was established by the Larimer-Weld Council of Governments to assist in review of existing programs and identifying future program needs. Organizations and representatives serving on the committee included:

City of Fort Collins
Max Grimes
Director of Pollution Control

City of Loveland
Ralph Mullinix
Water and Sewer Director

City of Greeley
Daryl Alleman
Water and Sewer Director

Colorado State University
Dr. Robert Ward
Dr. Sumner Morrison

Colorado Department of Health
Stan Mayes

Colorado Division of Wildlife
John Goettl

Environmental Protection Agency
Bill Warner
Rick Claggett

Great Western Sugar
Ron Brenton

U.S. Forest Service
Dave Rosgen

Kodak/Colorado
Joe Tunner

U.S. Geological Survey
Russ Livingston
Bob Brennan

Consultant Project Manager
Tom Pitts, P.E.

Larimer-Weld Regional COG
Terry Trembly

The Advisory Committee established priorities for water quality monitoring within the region. These are reported in Section 2.0.

1.3 APPROACH TO THE PROJECT

This project was directed towards designing a regional water quality monitoring program for surface waters in the region (Figure 1.3-A). Existing water quality monitoring programs conducted by Federal, State and local agencies and private interests were reviewed and incorporated to the maximum extent feasible. Existing programs were reviewed and evaluated in light of regional priorities and criteria. Recommendations for additional monitoring stations or constituents were made to fill in voids in existing on-going programs. Institutional responsibilities are recommended for Federal and State agencies and municipal/industrial dischargers regarding continued monitoring activities.

1.4 PROJECT ACCOMPLISHMENTS

Fifteen new monitoring stations were recommended in the region. During the course of this project, monitoring at six of those stations was initiated by the City of Loveland and City of Fort Collins. An inter-governmental agreement on water quality monitoring involving U.S. Geological Survey, Larimer-Weld Regional Council of Governments, City of Loveland and City of Fort Collins was culminated for ongoing programs.

1.5 SUMMARY

The most extensive in-stream monitoring programs are conducted by U.S. Geological Survey (U.S.G.S.) and the Colorado Department of Health (CDH). The U.S.G.S. establishes water quality monitoring stations and surface water measurement stations in cooperation with other Federal, State, and local agencies. In Larimer and Weld Counties, U.S.G.S. presently has cooperative agreements with the Water and Power Resources Services, Northern Colorado Water Conservancy District, City of Fort Collins, Left-Hand St. Vrain Conservancy District, and City of Loveland, through the Larimer-Weld Regional Council of Governments. U.S.G.S. currently conducts water quality sampling at 18 stations within

Larimer and Weld Counties. The Colorado Department of Health collects water quality samples at 13 stations in the region. Other sampling programs include effluent sampling by municipal and industrial discharges and special water quality studies by Federal, State, and local government, and private interests.

Colorado State University has conducted biosurveys on the Cache la Poudre River from 1969 through 1975 under sponsorship of Kodak/Colorado. The program was discontinued in 1975; however, additional biosurveys were conducted in the spring and summer of 1979. The City of Loveland sponsored one biosurvey in August, 1979, in four locations upstream and downstream of the city.

Bioassays are conducted at the Division of Wildlife Research Center at Fort Collins. Kodak/Colorado conducts bioassays at its Windsor facility. During 1978 and 1979 Fort Collins, Windsor, Greeley, and Kodak/Colorado sponsored bioassays at CSU to determine the effects of various pollutants on fish under cold and warm water conditions. There is no ongoing biosurvey or bioassay program in the region.

Existing regional programs were compared to regional priorities defined by the Regional Water Quality Monitoring Advisory Committee and the criteria for program design specified in the Larimer-Weld Water Quality Management Plan (208 Plan). Deficiencies were identified in the following areas:

1. There are no ongoing bioassay and biosurvey programs in the region.

2. In-stream monitoring above and below municipal and industrial discharges is inadequate in the Windsor area, below the Great Western Plant at Loveland, above the Greeley discharge, and in the Milliken, Johnstown, and Berthoud areas.

3. Additional sampling of metals and pesticides is needed to establish levels of these constituents and to ensure protection of municipal water supplies.

4. A water quality station is needed at the Weld/Adams county line to monitor impacts of external sources of pollution.

5. Flow data should be collected at all water quality sites. This is not presently being done.

6. In order to optimize use of monitoring resources, overlap and duplication between the U.S.G.S. Cooperative Program and the program being conducted by the Colorado Department of Health should be ended where feasible. CDH is presently sampling at six locations which are also sampled by U.S.G.S.

In order to overcome the deficiencies identified in program evaluation, fifteen new water quality stations are recommended in the region. Six of these stations will be located on the Cache la Poudre River, four on the Big Thompson River, one at Lake Loveland, two on the Little Thompson River, one on the South Platte River, and one at the mouth of Crow Creek. (This recommendation includes three recommended stations established on the Big Thompson River by the City of Loveland and U.S.G.S. in August, 1979, and four recommended new stations established by the City of Fort Collins and U.S.G.S. in October, 1979).

Modifications to the Colorado Department of Health Program are recommended to achieve the following objectives:

1. Elimination of overlap and duplication of the U.S.G.S. Sampling Program;

2. Expansion of the CDH Program to new locations not presently being monitored.

In order to accomplish these objectives, the recommended program calls for CDH to cease sampling at six locations where overlap and duplication is occurring. At these locations, CDH would enter into cooperative agreements with U.S.G.S. to sample those constituents presently included in the CDH Program which are not being sampled by U.S.G.S. In addition to this modification, the recommended program includes sampling at six new stations to be initiated by the Colorado Department of Health. Four stations are primary stations, and two are secondary stations. It is also proposed that CDH initiate instantaneous flow measurements at all stations where feasible. It is recognized that budgetary constraints may preclude full implementation of the CDH program in the near future.

A number of significant modifications are recommended for the existing U.S.G.S. Cooperative Program. These include additional new stations, additional constituents to be sampled at existing stations, and entering into new cooperative agreements. Incorporation of the modifications and continuation of existing monitoring programs make up the Regional Water Quality Monitoring Program in Larimer and Weld Counties. This program is identified in terms of the locations to be sampled, constituents, frequency of sampling, agency responsibility, and cooperative participation arrangement.

In addition to sampling of physical, chemical and biological constituents of the stream, the recommended monitoring program includes continued long term support of biosurvey activities in the region.

It is recommended that the State Department of Health immediately establish a Statewide Advisory Committee on Bioassays and Biosurveys to include scientists from government, industry and the academic community. This committee will:

1. Establish and approve standards for conducting bioassays and biosurveys in Colorado.

2. Establish priorities for and provide guidance to the State agency responsible for conducting bioassays.

3. Define the role of bioassay data in establishing water quality standards.

The estimated direct costs of the continuing program for municipalities is provided in Section 5.0.

Further program design is required in the future to more accurately define impacts of non-point pollution in specific areas of the Larimer-Weld region; to monitor for major events affecting water quality (i.e., urban storm water runoff;) to define parameters and frequency of sampling at fixed water quality stations existing and recommended, based upon results of full implementation of the recommended program changes.

2.0 FRAMEWORK FOR THE REGIONAL WATER QUALITY MONITORING PROGRAM

The Larimer-Weld Regional Council of Governments, a designated Areawide Water Quality Management Planning Agency under Section 208 of the Federal Clean Water Act, as amended, developed a water quality management plan for the region during the period of 1975 through 1978. In 1979, this plan was certified by the Governor and approved by the Environmental Protection Agency as the water quality management plan for the region. The plan recognized the need for developing a coordinated water quality monitoring program in the region:

> "A water quality monitoring program is a fundamental need to insure that future investments in water pollution control are made in a wise and efficient manner. A water quality monitoring program will allow making of investment decisions based on factual data developed in the region rather than opinions, old sayings, rules of thumb, inapplicable broad-scale regulatory efforts, and/or arbitrary decisions at the Federal, State, or local levels..." (Interim Report #21 "Alternative Technical Strategies for Achieving National Water Quality Goals in Larimer and Weld Counties, Colorado").

The framework for the regional water quality monitoring program is derived from the region's 208 Water Quality Management Plan and includes principles, general recommendations, and criteria for program design.

2.1 PRINCIPLES OF PROGRAM DESIGN

Four basic principles have guided design of the water quality monitoring program:

1. The primary objective of the water quality monitoring program is to insure sound investment in water quality control measures for the protection of beneficial uses.

2. A water quality monitoring program cannot be justified simply because data is collected, data collection is required, and/or funds are available. Water quality monitoring is not an end to itself. A justifiable program is one which supports overall water management goals of the region, the State, and the nation.

3. The monitoring program must be cost effective in itself. This implies that the program must produce information which supports overall water management

objectives with optimum use of available and ongoing monitoring resources. Cost is definitely a consideration in the design and implementation of water quality monitoring programs.

4. Successful implementation of the program is dependent upon cooperation and support of a number of local, State and Federal agencies and private organizations.

2.2 REGIONAL GOALS

The water quality monitoring program supports the following objectives stated in the "Goals and Objectives in Matters of Regional Concern", adopted by the Larimer-Weld Regional Council of Governments on May 5, 1976:

"B. Surface and Underground Water Quality/Wastewater Treatment

Goal: Encourage maintenance and enhancement of surface and underground water quality consistent with the use of these waters.

(Supporting) Objectives

1. Develop and implement an efficient and effective regional management plan for collection and treatment of wastewater.
2. Assure that the quality of surface and underground water is monitored by the appropriate agencies.
3. Support controls that will maintain and improve the region's water quality consistent with its use.
4. Encourage communication with water resource management and wastewater treatment agencies."

2.3 PROGRAM OBJECTIVES

The objectives of the water quality monitoring program, as stated in the Larimer-Weld Water Quality Management (208) Plan are:

1. Define the impacts of discrete point source discharges on water quality within the region;

2. Define the impacts of non-point sources such as agriculture, silviculture, mining, urban runoff, septic tanks and leachfields, and natural background conditions on water quality;

3. Define the relationships between non-point source pollution, natural background pollution, and point source pollution in the region;

4. Define the relationship between water quality parameters which can be measured and the beneficial uses of water recognized in the region;

5. Provide the basis for evaluating the effectiveness of measures implemented by municipalities, industries, and others involved in pollution control in the region;

6. Provide an indication as to the degree of pollution of groundwater supplies in the region, their significance on beneficial uses, future trends, and sources of pollution;

7. Provide the data necessary to insure protection of beneficial uses in the region;

8. Provide the data necessary to indicate trends in water quality.

2.4 GENERAL RECOMMENDATIONS

The general recommendations for the water quality monitoring program contained in the 208 plan are:

- In-stream sampling should be conducted by municipalities and industries above and below their points of discharge.

- The parameters sampled in the in-stream sampling program by municipalities and industries should be expanded so that impacts of point and non-point sources can be differentiated.

- Flow measurements should be taken by municipalities and industries in conjunction with in-stream water quality data.

- Data from ongoing Federal and State programs will be incorporated into the monitoring program.

- Data collected by municipal water suppliers in compliance with the Safe Drinking Water Act will be incorporated into the program.

- All proposed special water quality studies by Federal and State agencies will be reviewed for compliance with regional water quality goals and objectives.

- Biosurvey data will be collected in all streams of the region.

2.5 REGIONAL PRIORITIES FOR WATER QUALITY MONITORING

The Regional Water Quality Monitoring Advisory Committee established the following priorities for the regional monitoring program. In order of priority, they are:

1. A. Bioassays to determine toxicity of pollutants in specific streams.

   B. In-stream biosurveys to define the species, number, and extent of aquatic life.

   C. Sampling of EPA proposed priority pollutants in streams;

2. In-stream monitoring above and below municipal and industrial discharges to define the actual water quality impact of these sources;

3. Collection of flow data to determine actual seven-day/ten-year low flows to be used in establishing permit conditions;

4. Definition of water quality trends in the region;

5. Definition of non-point and point source relationships;

6. Identification of non-point source impacts.

2.6 CRITERIA FOR PROGRAM DESIGN

Design criteria for the water quality monitoring program take into account factors influencing the parameters to be sampled, sampling locations, frequency of sampling, i.e., the factors which control the cost and the effectiveness of the program. The criteria for the Larimer-Weld Regional Council of Governments 208 Program are:

1. Frequency of sampling should be dependent upon the following factors:

   a. Time over which changes in water quality can be anticipated, i.e., hourly, daily, seasonally, monthly, years, decades;

b. Sensitivity of applying water to various beneficial uses as a function of change in water quality;

c. The magnitude of changes anticipated by implementing point and non-point source pollution control measures;

d. Existing NPDES permit requirements.

2. The physical, chemical and biological constituents sampled will be dependent upon:

a. The characteristics of point and non-point source dischargers;

b. The significant characteristics related to the beneficial uses of water, including flow variations;

c. Constituents which can be controlled measurably through implementation of point and non-point source control measures;

d. Existing NPDES permit requirements.

3. The monitoring program should identify:

a. The impacts of external sources on the region, i.e., pollution from upstream areas;

b. The significance of external as opposed to internal sources on beneficial uses within the region and on downstream uses;

c. The impacts of specific point sources relative to other point sources, non-point sources, and natural background conditions.

4. Program should optimize use of resources for data collection and analysis to the maximum extent possible, and should recognize and incorporate the results of ongoing Federal, State, local agency and private programs.

5. Collection of flow data should be included as a fundamental element in the monitoring program to develop an understanding of fundamental relationships among hydrologic and water quality parameters.

6. The location of sampling points should be based on:

   a. Location of significant point and non-point source discharges;

   b. Need to differentiate impacts of specific discharges on in-stream water quality;

   c. Insuring protection of high quality mountain streams in the region.

The water quality monitoring program design project is limited to surface water quality at this time.

3.0 EXISTING MONITORING PROGRAMS

The most extensive monitoring programs conducted in the region are those of the U.S. Geological Survey (U.S.G.S.) under cooperative arrangements with Federal and local agencies, and the Colorado Department of Health's Water Quality Control Division. This section describes those programs, and programs conducted by municipalities and industries.

3.1 U.S. GEOLOGICAL SURVEY

The U.S. Geological Survey is charged by Congress with, among other things, collection of information on the nation's natural resources. In carrying out its responsibilities as a water resource investigation agency, the U.S.G.S. collects data on the nation's water resources, including flow data and water quality data at numerous locations throughout the United States. The U.S.G.S. operates a number of water resource and water quality data collection stations in the Larimer-Weld Region. All of these stations are funded under cooperative programs where U.S.G.S. provides 50 percent of the funding for site construction, operation and maintenance, and laboratory analysis, and the remaining 50 percent is provided by Federal, State, or local cooperators. The U.S.G.S. does not conduct bioassays or biosurveys.

U.S.G.S. presently has cooperative agreements for water quality sampling in Larimer and Weld Counties with the U.S. Bureau of Reclamation, Northern Colorado Water Conservancy District, City of Fort Collins, Left Hand St. Vrain Conservancy District, and City of Loveland through the Larimer-Weld Regional Council of Governments. The cooperative water quality sampling stations are identified in Table 3.1-A and Figures 3.1-A, B, and C.

The chemical, physical and biological constituents sampled at each location are determined by the individual cooperator, and vary from site to site. A complete list of water quality stations and constituents sampled at each station is included in Appendix A.

3.2 COLORADO DEPARTMENT OF HEALTH

The Colorado Department of Health is the water quality regulatory agency in the State of Colorado. As the regulatory agency, the Health Department has certain defined responsibilities under both Federal and State law for water quality monitoring for protection of water quality within the state.

Existing Stations ⊡

1. Mouth of Canyon (CDH)(USGS)
2. Lincoln Street (USGS)
3. I-25 (CDH)
4. Horsetooth Reservoir
5. Below Greeley (USGS)(CDH)

SEWAGE TREATMENT PLANT NO. 2

SEWAGE TREATMENT PLANT NO. 1

FLAGS INDICATE RIVER MILES FROM CONFLUENCE WITH SOUTH PLATTE RIVER

OWNERSHIP INDEX

A.D.	- ARTHUR DITCH CO.
C of G	- CITY OF GREELEY
C.P.R.	- CACHE LA POUDRE RESERVOIR CO.
D.C.D &R.	- DIXON CANYON DITCH & RESERVOIR CO.
D.C.&R.	- DIVIDE CANAL & RESERVOIR CO.
G.I.	- GREELEY IRRIGATION CO.
K.R.	- KITCHELL RESERVOIR CO.
L.C.R.	- LAKE CANAL RESERVOIR CO.
L.&W.	- LARIMER & WELD IRRIGATION CO.
L.&W.R.	- LARIMER & WELD RESERVOIR CO.
N.C.P.I.	- NEW CACHE LA POUDRE IRRIGATING CO.
N.P.	- NORTH POUDRE IRRIGATION CO.
O.L.&I.	- OGILVY LAND & IRRIGATION CO.
P.O.	- PRIVATE OWNERSHIP
P.V.&L.	- PLEASANT VALLEY & LAKE DITCH CO.
W.L.F.	- WOODS LAKE FARMS CO.
W.R.&C.	- WINDSOR RESERVOIR & CANAL CO.
W.L.R.	- WARREN LAKE RESERVOIR CO.
W.S.&S.	- WATER SUPPLY & STORAGE CO.

Fig. 3.1-A

WATER QUALITY MONITORING STATIONS

CACHE LA POUDRE R.

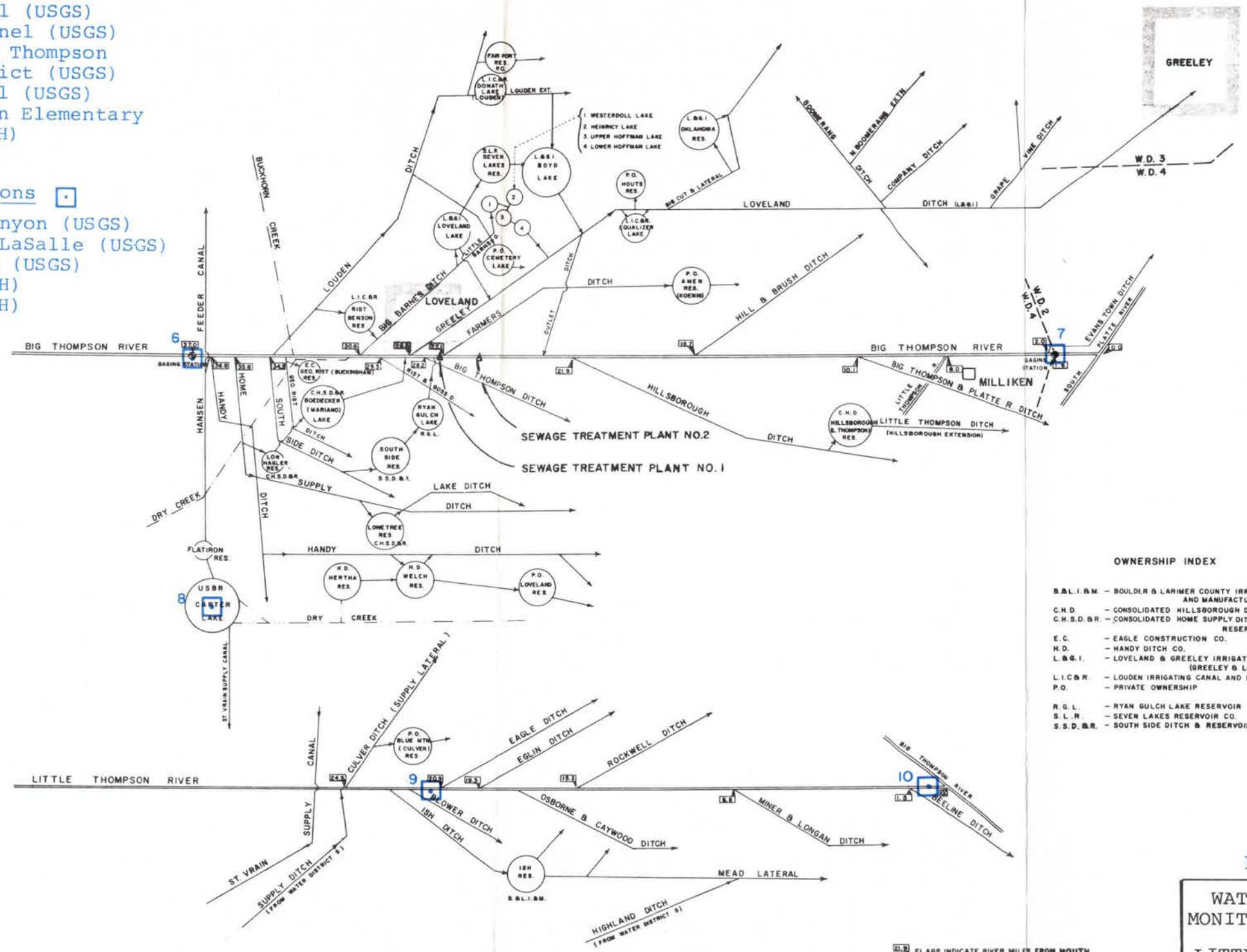
Prepared For
Northern Colorado Water Users Association
By
Morton W. Bittinger & Associates, Fort Collins, Colorado
1967

Existing Stations (Not Shown)

1. Adams Tunnel (USGS)
2. Olympus Tunnel (USGS)
3. Below Upper Thompson San. District (USGS)
4. Dille Tunnel (USGS)
5. Big Thompson Elementary School (CDH)

Existing Stations ⊡

6. Mouth of Canyon (USGS)
7. Mouth near LaSalle (USGS)
8. Carter Lake (USGS)
9. HWY 287 (CDH)
10. HWY 257 (CDH)



OWNERSHIP INDEX

B.&L.I.&M. – BOULDER & LARIMER COUNTY IRRIGATING AND MANUFACTURING CO.
C.H.D. – CONSOLIDATED HILLSBOROUGH DITCH CO.
C.H.S.D.&R. – CONSOLIDATED HOME SUPPLY DITCH AND RESERVOIR CO.
E.C. – EAGLE CONSTRUCTION CO.
H.D. – HANDY DITCH CO.
L.&G.I. – LOVELAND & GREELEY IRRIGATING CO. (GREELEY & LOVELAND)
L.I.C.&R. – LOUDEN IRRIGATING CANAL AND RESERVOIR CO.
P.O. – PRIVATE OWNERSHIP
R.G.L. – RYAN GULCH LAKE RESERVOIR CO.
S.L.R. – SEVEN LAKES RESERVOIR CO.
S.S.D.&R. – SOUTH SIDE DITCH & RESERVOIR CO.

21.9 FLAGS INDICATE RIVER MILES FROM MOUTH

Fig. 3.1-B

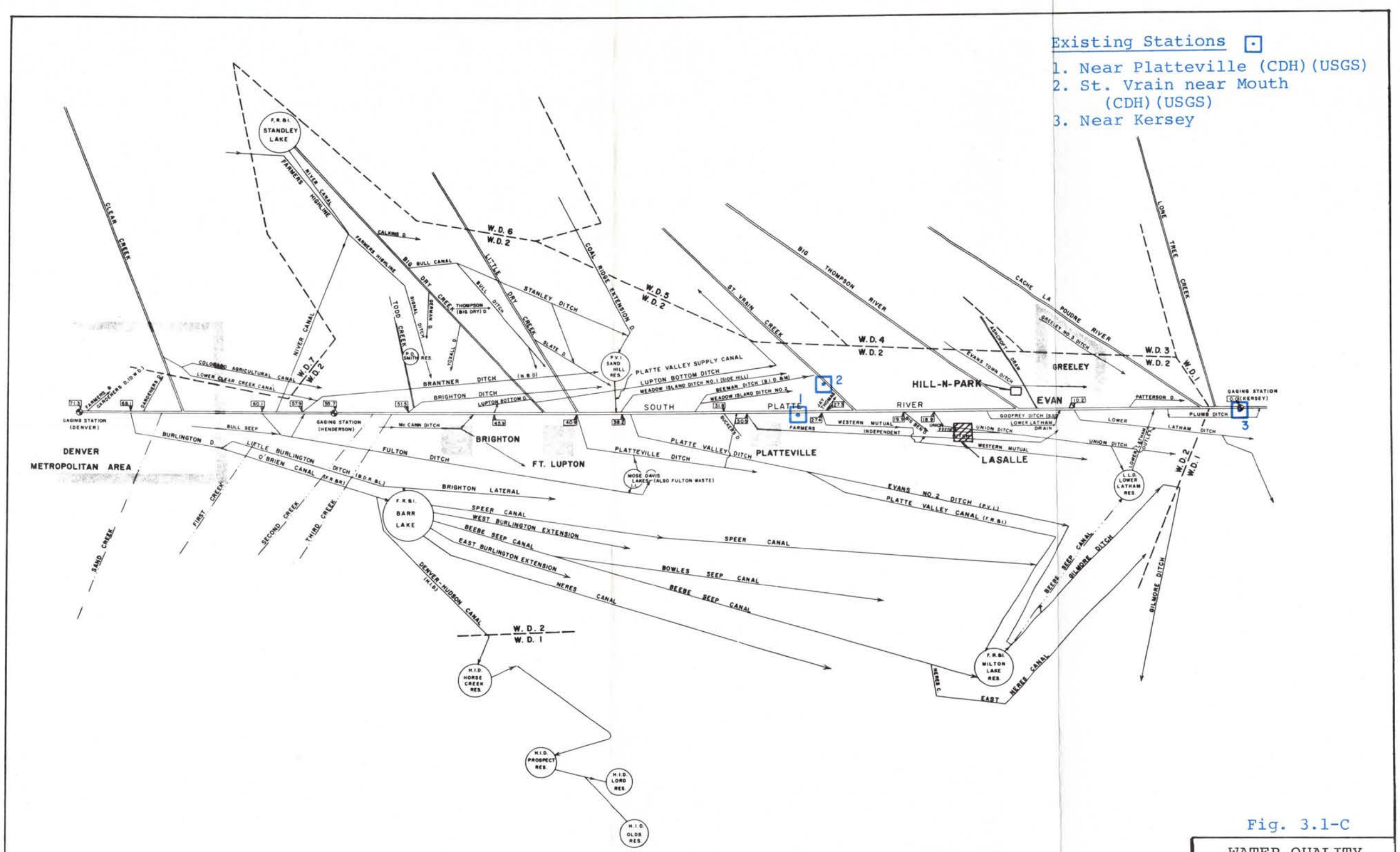
WATER QUALITY MONITORING STATIONS

LITTLE THOMPSON R.
Big Thompson R.

Prepared For
Northern Colorado Water Users Association
By
Morton W. Bittinger & Associates, Fort Collins, Colorado
1967

Existing Stations ⊡

1. Near Platteville (CDH)(USGS)
2. St. Vrain near Mouth (CDH)(USGS)
3. Near Kersey



OWNERSHIP INDEX

B.D.R.&L.	-	BURLINGTON DITCH, RESERVOIR & LAND CO.
B.I.D.&M.	-	BEEMAN IRRIGATING DITCH & MILLING CO.
D.W.D.	-	DENVER WATER DEPARTMENT
F.R.&I.	-	FARMERS RESERVOIR & IRRIGATION CO.
H.I.D.	-	HENRYLYN IRRIGATION DISTRICT
I.I.	-	IONE INVESTMENT CO.
L.L.D.	-	LOWER LATHAM DITCH CO.
N.B.D.	-	NEW BRANTNER DITCH CO.
P.I.&M.	-	PLATTEVILLE IRRIGATION & MILLING CO.
P.V.I.	-	PLATTE VALLEY IRRIGATION CO.
S.3 D.	-	SECTION 3 DITCH CO.

Fig. 3.1-C

WATER QUALITY MONITORING STATIONS

S. PLATTE RIVER

Prepared For
Northern Colorado Water Users Association

By
Morton W. Bittinger & Associates, Fort Collins, Colorado
1968

TABLE 3.1-A

U.S. GEOLOGICAL SURVEY COOPERATIVE

WATER QUALITY STATIONS

LARIMER AND WELD COUNTIES

BASIN	LOCATION	GAGING STATION	COOPERATOR
Cache la Poudre	Mouth of Canyon	Yes	USBR, Fort Collins
	Horsetooth Reservoir	Yes	USBR
	Shields Street	No	Fort Collins
	Lincoln Street in Fort Collins	Yes	Fort Collins
	Prospect Street in Fort Collins	No	Fort Collins
	Above Boxelder Creek	Yes	Fort Collins
	Below Greeley at Mouth	Yes	USBR
Big Thompson	Alva B. Adams Tunnel	No	USBR, Northern Colorado Water Conservancy District (NCWCD)
	Olympus Tunnel at Lake Estes	No	USBR
	Dille Tunnel near Drake	No	USBR
	Carter Lake	Yes	USBR
	Wilson Avenue above Loveland	No	Loveland
	Above Loveland No. 2 Waste Water Treatment Plant	Yes	Loveland
	Below Loveland No. 2 Plant	No	Loveland
	Mouth at LaSalle	Yes	USBR

TABLE 3.1-A (Continued)
U.S. GEOLOGICAL SURVEY COOPERATIVE
WATER QUALITY STATIONS
LARIMER AND WELD COUNTIES

BASIN	LOCATION	GAGING STATION	COOPERATOR
St. Vrain	Below Longmont	Yes	Left Hand-St. Vrain Conservancy District
	At Mouth near Platteville	No	USBR
Boulder Creek	At Mouth near Longmont	Yes	USBR
South Platte	Kersey	Yes	USBR
	Weldona (below Weld County Line)	Yes	USBR

The Federal Water Pollution Control Act as amended, Section 106(e) sets forth the State responsibilities for water quality monitoring where Federal funds are used to support such activities. The Environmental Protection Agency has published rules defining State responsibilities under Section 106 (Federal Register, May 23, 1979, Pages 30016-30042, 40CFR Parts 35, 130 and 131).

Under Appendix A, "Water Quality and Pollutant Source Monitoring", Paragraph B "Objectives and General Requirements," this rule states:

> "The objectives of the State monitoring program required by the Act are provision of the data, information or reports necessary to determine compliance with permit terms and conditions, to develop and maintain an understanding of the quality (and causes and effects of such quality) on the waters in the State for the purpose of supporting State water pollution control activities in relation to the achievement of national goals according to the Act, to report on such quality and its causes and effects, and to assess the State's pollution control program. To this end, each State shall establish and maintain the capacity and confidence to carry out a broad range of monitoring activities, both before and after implementing pollution controls, including measurement of pollutant sources, water quality (physical, chemical, and biological), the factors affecting water quality, and the specific effects of such quality upon the beneficial uses of the State's water...."

In addition to the responsibilities defined under Federal law, the Colorado Water Quality Control Act (Title 25, Article 8) specifies monitoring responsibilities of the Water Quality Control Division.

> "25-8-303. Monitoring. (1) The Division shall take such samplings as may be necessary to enable it to determine the quality of every reasonably accessible segment of State waters...."

Under both Federal and State law the Colorado Department of Health, Water Quality Control Division, is the agency with defined responsibilities for water quality monitoring for protection of water quality within the State.

The Water Quality Control Division of the Colorado Department of Health conducts a water quality monitoring program which includes 13 sampling stations within the region (Figures 3.1-A, B, and C). The sites are classified as either primary stations or secondary stations.

Primary stations are sampled bi-weekly or monthly. The following parameters are run on all primary station samples: Temperature, pH, Dissolved Oxygen, 5-day BOD, Turbidity, Suspended Solids, Dissolved Solids, Ammonia-N, NO_2-N, NO_3-N, Total Phosphorus as P, Calcium, Magnesium, Sodium, Chloride, SAR (calculated), Total Hardness, Total Copper, Total Iron, Total Lead, Total Manganese, Total Zinc and Fecal Coliforms.

The following parameters are run on primary station samples six times annually (every other month): Specific Conductivity, Total Kjeldahl-N, Sulfate, Total Cyanide, Total Cadmium.

Secondary Stations are sampled bi-monthly (six times per year) and all the parameters listed for the primary stations are analyzed on each sample. In addition to the routine analyses listed above, certain other analyses are run according to flow conditions and/or station location.

Certain parameters will be analyzed on all stations at a minimum frequency of twice annually; once during high flow and once during low flow. These parameters are as follows: Total Alkalinity, Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickle, Total Selenium, Total Silver, Total Uranium, Boron and Potassium.

A list of CDH stations by basin, location, and type is provided in Table 3.2-A. The tables in Appendix A list the constituents and frequency of collection for CDH stations.

3.3 MUNICIPAL AND INDUSTRIAL DISCHARGERS

All municipal and industrial dischargers are required to sample and analyze their discharges for constituents specified in their NPDES permits. The data is reported to the State Department of Health. In-stream water quality monitoring by municipalities and industries clearly is not required by Federal or State law or regulation, and is, in fact, the responsibility of the Colorado Department of Health. However, some municipalities and industries have conducted in-stream monitoring programs.

The municipal/industrial in-stream monitoring programs represent, individually and in total, a substantial investment in data collection. The investment is also voluntary, as it is not required by Federal or State law. The underlying concerns of municipalities and industries in sponsoring these programs are:

1. More information is needed to define the impacts of discharges on water quality;

TABLE 3.2-A

COLORADO DEPARTMENT OF HEALTH
WATER QUALITY STATIONS
LARIMER AND WELD COUNTIES

BASIN	LOCATION	TYPE[1]	SPECIAL SAMPLES[2]
Cache la Poudre	Mouth of Canyon	Secondary	B,Se,R,H/L
	At I-25	Primary	H/L
	Below Greeley at Mouth	Primary	Cr,R,H/L
Big Thompson	Below Upper Thompson Sanitation District	Secondary	H/L
	Near Big Thompson Elementary School	Secondary	H/L
	At Mouth near LaSalle	Primary	As,R,H/L
Little Thompson	At 287 near Berthoud	Secondary	H/L
	At 257 near Milliken	Primary	Se,H/L
St. Vrain	Below Longmont	Primary (M)	H/L
	Near Mouth	Secondary	As
Boulder Creek	At Boulder-Weld County Line	Primary	As
South Platte	Near Platteville	Secondary	Cr,R,H/L
	Kersey	Primary	H/L

1 Primary stations are sampled bi-weekly except for those denoted (M) which are sampled monthly.

2 H/L: High and low flow parameters - As, Arsenic; B, Boron; Cr, Chromium; Mo, Molybdenum; R, Radiological; Se, Selenium.

2. Data is needed to determine the long-term health of aquatic ecosystems in receiving waters;
3. Baseline and background water quality data are needed to establish appropriate water quality standards.
4. The monitoring program conducted by the Department of Health is not adequate to address the concerns above with respect to discharges and specific stream segments.

These concerns are the driving force behind municipal and industrial involvement in in-stream monitoring.

The level of involvement by local entities is partly indicated by their participation in cooperative programs with U.S.G.S. (Table 3.1-A). Local government funds water quality sampling at eight of the twenty stations operated by U.S.G.S. in Larimer and Weld Counties.

In addition to the cooperative programs, local entities have participated in in-stream biosurveys, site-specific bioassays, and special water quality studies. Participation in and support of these efforts represents a tangible commitment to sound, factually based water quality management and cost-effective environmental protection by local interests.

3.4 BIOSURVEYS

Biosurvey, as used in this report, means the determination of the characteristics of aquatic life in a specific stream segment using a predetermined scientifically appropriate sampling program. The characteristics of aquatic life to be determined may include the number of organisms present in the sample, the number of species represented, the relative weight or biomass of each species, and any observations of the general condition of the aquatic life present in the sample.

In-stream biosurveys of fish life are usually conducted by shocking the stream for a predetermined amount of time with a specified electric current and counting the stunned fish collected. Benthic surveys are surveys of the bottom life of streams and are also an important element in biosurveying. Benthic surveys are conducted by counting the various species of organisms present, their numbers, and/or biomass within a selected area or cross-section of the stream segment.

Biosurveys are an excellent indicator of the overall ability of a stream segment or water body to support aquatic life. Taken over long periods of time, biosurveys are excellent indicators of the condition or changing conditions in aquatic ecosystems.

Long-term trends in total population, species diversity, and population per species are far more important than the results of a single biosurvey. Absolute number of total population, species, and population per species may be subject to large fluctuations seasonally, and from sample to sample due to factors other than water quality, such as flow and channel conditions. While fundamental to a monitoring program, biosurvey data should be considered conservatively in drawing conclusions regarding relationships among water quality factors and aquatic ecosystems, and only after a long period of record is established.

Colorado State University conducted biosurveys on the Cache la Poudre River from 1969 to 1975 (Morrison, 1978). This effort was sponsored by Kodak/Colorado. Several sites from near the mouth of Poudre Canyon to below Windsor were sampled four times a year during this period to determine number and type of aquatic species present, and variations in population and species seasonally and by location. This information was used extensively in development of the Larimer-Weld 208 Plan. The regular program was discontinued in 1975. Additional biosurveys were conducted in 1979, and the program will be continued (Tunner, 1979).

The City of Loveland contracted with CSU to conduct a one time biosurvey in August, 1979, at four locations on the Big Thompson River in the vicinity of Loveland.

3.5 BIOASSAYS

Bioassays are tests conducted under highly controlled laboratory conditions for the purpose of establishing the tolerance of various aquatic species to levels of specific pollutants over a period of time. Because bioassays are sometimes used to establish in-stream water quality standards for certain pollutants (Water Quality Control Commission, 1979). It is critical that those bioassays be conducted under conditions which represent conditions in the stream to which the standard is to be applied. Toxicity of various pollutants to aquatic life is, in many cases, highly dependent upon ambient water quality conditions. Conducting bioassays under conditions very similar to those occurring in nature is extremely important. Where possible, water from the stream should be used as the test media for bioassays. This is particularly critical in the streams of the Front Range in Colorado. Due to the complex chemical nature of these streams, the toxicity of pollutants is much more variable than in pristine mountain streams.

Bioassays are conducted routinely at the Colorado Division of Wildlife Research Center, Northern Regional Office at Fort Collins. The effort has been directed primarily towards determining the impact of pollutants on trout and other game fish in high-mountain streams.

Kodak/Colorado conducts bioassays at its Windsor facility, and has the capability of using water from the Cache la Poudre River as a test medium.

During 1978 and 1979, the Cities of Fort Collins, Windsor, Greeley, and Kodak/Colorado sponsored bioassays at CSU (Morrison, Post, 1979). The bioassays were conducted to determine the effects of five pollutants on two species of fish under cold and warm water conditions. Cache la Poudre River waters from five separate locations was used in the tests. These bioassays were a one-time operation designed to determine toxicity of a limited number of pollutants on a limited number of fish species.

An on-going bioassay program is needed to determine the toxicity of chemicals in plains area streams. The expense of test facilities and need for highly skilled personnel necessitates establishment of a centralized State bioassay laboratory. To establish and maintain credibility, all bioassay work should be conducted under the direction of and in accordance with procedures established by a broad based advisory committee of qualified scientists from government, industry, and the academic community.

4.0 EVALUATION OF MONITORING PROGRAMS

Substantial resources have been committed to water quality monitoring programs in the Larimer-Weld Region by Federal, State and local agencies. Existing programs evolved out of the perceived needs of the individual agencies and reflect to varying degrees the following concerns:

- Need for information to conduct feasibility studies on future water development projects or evaluation of existing water development projects.
- Concern over present or future environmental regulations.
- Need for protection of existing beneficial uses.
- Need for data to enforce water quality regulations.
- Concern over the impact of specific discharges on specific stream segments.

Each of these concerns represents a valid reason for supporting water quality monitoring programs. Given the fact that existing water quality monitoring programs evolved out of these concerns, there is a need to evaluate the programs in terms of the priorities and criteria defined in Section 2.0 "Framework for the Regional Water Quality Monitoring Program". There is also a need to overcome deficiencies that have characterized some monitoring programs in the past including sporadic, single-purpose programs producing inconclusive results. In some cases, lack of coordination resulted in duplication of effort and less than optimum use of existing data and available resources. Programs have been terminated due to lack of funds or change in emphasis by the monitoring agency, and no central regional clearing house has been available to assist in development of regionally coordinated programs

To the extent that existing programs support regional priorities and criteria, they should not be changed or duplicated in the regional monitoring program. Monitoring programs should be modified where both regional priorities and the concerns of the agencies supporting the existing program can be met more effectively to the mutual benefit of both parties. Additions to the monitoring programs should be considered where existing programs do not meet regional priorities and criteria.

4.1 COMPARISON OF REGIONAL PRIORITIES AND EXISTING MONITORING PROGRAMS

Objectives of the water quality monitoring programs are stated in regional priorities for water quality monitoring set forth in Section 2.5. These priorities were established by the Regional Water Quality Monitoring Advisory Committee as part of the regional water quality monitoring program design project:

Priority	Item
1.A.	Bioassays to determine toxic levels of pollutants in specific streams.
B.	In-stream biosurveys to define the species, number, and extent of aquatic life.
C.	Sampling of EPA proposed priority pollutants in streams.
2.	In-stream monitoring above and below municipal and industrial discharges to define the actual water quality impact of these sources.
3.	Collection of flow data to determine actual seven-day/ten-year low flows to be used in establishing permit conditions.
4.	Definition of water quality trends in the region.
5.	Definition of non-point and point source relationships.
6.	Identification of non-point source impacts.

Existing programs are considered in the context of each priority below.

Priority 1.A. Bioassays to determine toxic levels of pollutants in specific streams.

Extensive data exists regarding the toxic impacts of pollutants on trout and other cold water species. This data applies primarily to the mountainous areas of the region and the priority for bioassays is being met with respect to cold water streams. Very little data exists regarding toxicity of pollutants in the chemically complex warm water plain streams, particularly those streams which are impacted by non-point sources such as irrigation return flow.

Within limits, bioassays are valid means of determining the toxic level of pollutants to aquatic life in specific streams of the region, provided the test media (dilution water sample) has the same degree of chemical complexing capability as the natural stream to which the results of the bioassay are to be applied. Results of laboratory bioassays should be compared to results of in-stream biosurveys and actual water quality data, and the results of bioassays adjusted accordingly to reflect the complexity of naturally occurring conditions. If the limitations of using bioassays alone are recognized and overcome through diligent research, bioassays can play an effective, important role in determination of toxic levels of chemicals applicable to specific stream segments. Appropriate toxic levels can then be incorporated into the water quality standards setting process to insure protection of aquatic life present in specific streams.

In the past, there has been a strong tendency by Federal and State regulatory agencies to conduct literature reviews of bioassays reported in scientific literature and subsequent establishment of water quality standards based on those literature reviews (Willingham, 1976; Davies, Goettl, 1976). This information was not and is not necessarily applicable to the specific streams and aquatic life in northeastern Colorado. The major concern of the Regional Water Quality Monitoring Advisory Committee is that establishment of standards by literature review or without recognition of the limitations of bioassays could result in expenditure of vast sums of money to meet those standards, while offering no actual increase of protection of aquatic life in local streams.

Bioassays conducted by CSU (described in Section 3.5) indicate that toxicity of pollutants to aquatic life in warm water plains streams is different by several orders of magnitude than in pristine high mountain streams. Because of this extreme variability there is a need for continued bioassays to determine toxicity of various pollutants in the plains streams of the region. Continuation of the bioassay program for warm water plains streams is essential if appropriate, cost-effective water quality standards are to be established. This should be a State responsibility, with a statewide advisory committee of qualified scientists from government, industry, and the academic community establishing procedures and overseeing activities by the State.

Priority 1.B. <u>In-stream biosurveys to determine the species number and extent of aquatic life</u>.

The existing program does not reflect this high priority item. Biosurveys have not been conducted in a continuous fashion in

any or all streams in the region. An on-going program is needed to assess the impacts of changes in discharges and flow regime on aquatic life, and to establish cause-effect relationships among all factors affecting aquatic life.

Priority 1.C. Sampling of EPA proposed priority pollutants in streams.

The existing monitoring program meets this concern on a partial basis. Meaningful sampling programs which address all pollutants on EPA's priority pollutant list are beyond the financial capability of any of the agencies presently involved in water quality monitoring in the region. Monitoring of proposed priority pollutants is the responsibility of the Water Quality Control Division. Monitoring of these pollutants should be conducted by the Division prior to drawing any conclusions regarding the occurrence or impacts of these pollutants on streams within the region.

Priority 2. In-stream monitoring above and below municipal and industrial dischargers to define the actual water quality impacts of these sources.

With the recent addition of the Loveland Monitoring Program, in-stream monitoring above and below municipal dischargers occurs at the following locations:

1. City of Loveland;
2. City of Fort Collins;
3. Town of Estes Park.

Monitoring occurs downstream of municipal and industrial dischargers at Greeley and Longmont. Voids in the program occur in the Windsor area, below the Great Western plant at Loveland, above the Greeley discharge, and in the Milliken, Johnstown, and Berthoud areas. Monitoring above and below small municipal dischargers on the South Platte River is not generally considered to be a high priority item because these small towns have a comparatively negligible impact on quality of the South Platte.

Priority 3. Collection of flow data to determine actual seven-day/ten-year low flows to be used in establishing NPDES permit conditions.

Under cooperative agreements with U.S.G.S., Fort Collins has added gaging stations in the vicinity of its municipal discharges. Loveland has recently added a gaging station immediately above its point of discharge. A gaging station exists on the Big Thompson River near the Upper Thompson Sanitation District discharge. The State Engineer maintains a gaging station on

the Cache la Poudre near Windsor that should allow accurate determination of seven-day/ten-year low flows for both Windsor and Kodak. Voids on the program are on the Cache la Poudre above Greeley, and on the Little Thompson River in the area of Johnstown, Milliken, and Berthoud.

Priority 4. Definition of water quality trends in the region.

For a number of locations, the existing monitoring program is adequate. The location of sampling stations at the confluences of the Cache la Poudre, Big Thompson, and St. Vrain Rivers with the South Platte, and stations on the South Platte near Platteville, Kersey, and Weldona should indicate water quality trends over the long term for those parameters sampled. These are complimented by monitoring stations on the Cache la Poudre between the mouth of the canyon and I-25 and on the Big Thompson between Estes Park and Loveland. Existing stations below Longmont and Boulder Creek should also support achievement of this priority item. The void in the program appears to be at the Weld/Adams county line.

Priority 5. Definition of Non-Point and Point Source Relationships.

Priority 6. Identification of Non-Point Source Impacts.

Non-point sources of pollution which impact or could potentially impact water quality in the region as identified in the Larimer-Weld 208 Plan include:

Urban Stormwater
Silvicultural Activities (recreation, logging, grazing)
Construction
Leachfields and Unlined Sewage Lagoons
Solid and Hazardous Waste Disposal
Irrigated Agriculture
Non-Irrigated Agriculture

Irrigated agriculture is the only non-point source which has been investigated extensively in the region.

The major concerns associated with these priorities, as expressed by the Regional Water Quality Monitoring Advisory Committee, are:

1. Point sources, i.e., municipal and industrial discharges may be incorrectly identified as contributing pollution which actually result from non-point sources, resulting in excessively restrictive discharge permit conditions, and subsequent implementation of non-cost-effective point source control measures.

2. Appropriate cost-effective control technology should be directed towards non-point sources contributing to water quality problems.

The two priorities and their related concerns are closely linked.

There are different means by which the goals associated with these priorities could be met from a monitoring standpoint:

1. Establish fixed monitoring stations on all stream segments potentially affected by various non-point sources.
2. Monitor (a) above municipal discharges to determine the quality of streams prior to impacts by municipal discharges; (b) monitor municipal discharges to determine their magnitude and characteristics; (c) monitor below municipal discharges to determine the impact of those discharges on water quality; and (d) deduce that all other impacts are "non-point sources".
3. Initiate special short-term surveys to (a) identify the impacts of specific non-point sources where they are known to affect water quality, and (b) to differentiate point and non-point source impacts of specific pollutants.

The most cost-effective method appears to be a combination of 2 and 3 above. Municipalities, in cooperation with the U.S.G.S., have implemented monitoring programs above and below their discharges in the vicinity of Fort Collins, Loveland and Estes Park. These monitoring programs serve the dual purpose of defining the impact of point source discharges, as well as allowing differentiation of impacts from non-point sources. Municipalities and industries also monitor their own discharges and should be able to analyze discharge data, upstream and downstream data, to determine the impacts of their specific discharge on water quality as well as to differentiate impacts of other point and non-point sources.

Priority 6, Identification of non-point source impacts, is generally not being met in the region, particularly in the categories of urban runoff, silvicultural activities, and leachfields and unlined sewage lagoons.

Impacts of irrigated agriculture on water quality in terms of sediment, salinity, nitrates, phosphorous, and ammonia were documented in the initial Larimer-Weld Regional 208 Planning program (Water Quality Impacts of Irrigated Agriculture, Interim Report No. 22, Larimer-Weld Regional Council of Governments, 1978). The primary problem constituents

contributed by irrigated agriculture included salinity and nitrates. These constituents are monitored routinely at numerous stations in the region and serve as indicators of the impact of irrigated agriculture on water quality, when considered with data describing point source impacts.

Urban runoff has not been intensively studied within the region. The impacts of urban runoff on beneficial uses has not been defined. Urban runoff impacts are anticipated to occur in the Big Thompson River below Loveland, in Lake Loveland, in the Cache la Poudre River below Fort Collins, in the Cache la Poudre and the South Platte River below Greeley. Fixed monitoring stations with predetermined sampling frequencies presently existing in the region in the vicinity of Fort Collins, Loveland and Estes Park, and downstream of Greeley and Longmont will, at some point, have to be augmented with special surveys during runoff events to determine the impacts for urban runoff on receiving waters. These types of surveys are often expensive, labor intensive, and somewhat dependent on chance in terms of producing accurate results.

No specific urban runoff water quality monitoring program that is event-oriented is recommended at this time. In lieu of this, information being developed under the National Urban Runoff Program should be utilized as it becomes available to determine potential impacts of urban runoff on receiving waters in norhtern Colorado. The Environmental Protection Agency recently initiated the National Urban Runoff Program (NURP) in several locations around the country. The program involves intensive sampling, monitoring, and implementation of best management practices on a demonstration basis.

The Denver metropolitan area is one area selected for implementation of the National Urban Runoff Program. Results from that program will be analyzed as available and transferred to the Larimer-Weld Region as appropriate. Prior to implementing any extensive best management practices for urban runoff control, however, intensive special surveys should be conducted to determine if implementation of such solutions would be cost-effective in northern Colorado.

Potential impacts of improperly operating leachfields and septic tanks are a concern in the Big Thompson Canyon and in the Cache la Poudre drainage in the vicinity of Red Feather Lakes. Impacts of recreational uses of the National Forest and National Parks on water quality are also of concern in those same areas. Cause and effect relationships have not been adequately assessed in the Larimer-Weld 208 Plan. An assessment is needed to determine the best means of dealing with these known problems, particularly those problems resulting from improperly operating leachfields and septic tanks. The problem in the Big

Thompson Canyon may be temporary and results at least partially from conditions following the disastrous flood of July, 1976. This problem could be more adequately assessed with a special intensive monitoring survey of the Canyon, rather than establishment of long-term monitoring stations. However, it would be highly desirable to establish a long-term water quality monitoring station in the upper reaches of the Poudre River to assess the impacts of both improperly operating leachfields and extensive recreational activities which occur in the upper Poudre drainage. The Cache la Poudre drainage is the major water supply source for both Fort Collins and Greeley.

In addition to recreation, logging and grazing on forest lands can impact water quality. Because practically all of this activity occurs on National Forest land, the U.S. Forest Service should be responsible for monitoring. This is consistent with views previously expressed by Forest Service personnel, and reflects the positive, cooperative attitude of the Forest Service on water quality management matters. Monitoring forest activities would be the proper subject for inclusion in an inter-governmental agreement between the Larimer-Weld Council of Governments and the U.S. Forest Service.

4.2 COMPARISON OF EXISTING MONITORING PROGRAMS TO REGIONAL CRITERIA

Section 2.6 of this report provides criteria for monitoring program design. Evaluation of existing programs with respect to these criteria is provided below.

Criteria #1. Frequency of sampling.

Most of the in-stream sampling for physical, chemical, and biological constituents is taking place on a bi-weekly, monthly, or bi-monthly basis. This is generally considered adequate given the present objectives and priorities for the monitoring program. Although the frequency of sampling is adequate for most priorities, it must be recognized that special water quality monitoring surveys will be needed to address specific questions such as impact of urban runoff, definition of mixing zones below point source discharges, impact of specific pollutants not included in the fixed station monitoring program, etc. The frequency of these special studies is anticipated to be intense, but the studies themselves may be short-term in nature, primarily designed to meet specific limited objectives necessary for proper water quality management in the region.

Frequency of sampling at all stations should be thoroughly evaluated each year, however, as it can have a significant impact on the overall cost of the sampling program.

Criteria #2. Physical, chemical and biological constituents sampled.

This criteria is generally being met, however, additional sampling of priority metals and pesticides is needed to establish presence, absence and levels of these parameters in water bodies in the region. Analysis of water for pesticides is very expensive in absolute terms and compared to other constituents. The Department of Health should be responsible for conducting pesticide analyses when and where the Department deems appropriate. Until the Department of Health initiates pesticide analyses, municipalities and industries should support pesticide analyses.

Criteria #3. The monitoring program should identify the impacts of external sources of the region, i.e., pollution from upstream areas.

This criteria is generally being met with existing monitoring stations on the St. Vrain below Longmont, on Boulder Creek at the Boulder-Weld county line, and monitoring being conducted by U.S.G.S. in cooperation with the Northern Colorado Water Conservancy District at Alva B. Adams Tunnel. Water quality monitoring is needed at the Weld-Adams county line to monitor water pollution entering the region from the Denver metropolitan area. An additional sampling station should be established upstream of Fort Lupton to indicate impacts of point and non-point source discharges from the Denver Metro area.

Criteria #4. Programs should optimize use of resources for data collection and analysis to the maximum extent possible and should recognize and incorporate the results of ongoing Federal, State, local agency and private programs.

This goal is not being met to the extent feasible because of overlap and duplication between the U.S.G.S. cooperative program and the program being conducted by the Colorado Department of Health. This problem is discussed in detail in Section 4.3.

Criteria #5. Collection of flow data should be included as a fundamental element of the monitoring program to develop an understanding of relationships among hydrologic and water quality parameters.

Water quality data alone, i.e., concentration of specific pollutants, temperature, pH, and other parameters, provide an indication of in-stream water quality conditions at the

time the sample is taken, and can be used to identify water quality trends over long periods of time. However, analysis of water quality data to determine cause and effect relationships among pollutant sources and in-stream water quality, and actual water quality impacts of point and non-point sources requires collection of flow data taken at the time the water quality sample is taken. It is extremely difficult to give meaning to high and low concentrations, i.e., the extremes experienced in any normal set of data collected at the stations over a period of time, without knowledge of flow conditions at the time water quality data is collected.

This criteria is being met at a number of locations where flow data is being collected along with water quality data. There are a number of locations, however, where water quality data is being collected and no flow data is being collected. These include:

Location	Agency
Cache la Poudre at I-25	CDH
Big Thompson at Big Thompson School	CDH
Little Thompson near Berthoud	CDH
Little Thompson at 257	CDH
Boulder Creek at Boulder/Weld county line	CDH
South Platte near Platteville	CDH

All of these locations are associated with the Department of Health Water Quality Monitoring Program. As a minimum the State Program and all water quality monitoring programs should include an instantaneous discharge measurement at the time the water quality sample is taken.

Criteria #6. Location of sampling points should be based on:

a) location of significant point and non-point source discharges.

Voids in meeting this criteria have been identified above, and include upstream of the Greeley area, downstream of the Great Western discharge at Loveland, Big Thompson Canyon between Drake and the mouth of the canyon, Cache la Poudre River at Monroe diversion, Weld/Adams county line.

b) need to differentiate impacts of specific discharges on in-stream water quality.

Voids in the program occur in the vicinity of Windsor, below the Fossil Creek Reservoir outlet, below Great Western at Loveland, and at the Weld/Adams county line.

c) insuring the protection of high quality mountain streams in the region.

The void in the program is in the Upper Cache la Poudre River Basin.

4.3 OVERLAP AND DUPLICATION AT DEPARTMENT OF HEALTH/U.S.G.S. SAMPLING STATIONS

In reviewing the in-stream monitoring programs conducted by U.S.G.S. and the Colorado Department of Health, it is apparent that there is a considerable overlap in terms of stations sampled and duplication of the constituents sampled. Overlap and duplication is occurring at six of the thirteen stations included in the CDH sampling program. Tables 4.3-A, B, C, and D indicate the locations of common sampling points, frequency, and the constituents being sampled by both agencies. This information is summarized below:

Location	Number of Water Quality Constituents Sampled by both U.S.G.S. and CDH
Big Thompson River (near mouth)	18
Cache la Poudre River (near mouth of canyon)	19
Cache la Poudre River (below Greeley)	18
St. Vrain River (below Longmont)	20

TABLE 4.3-A Common Constituents in the Cache la Poudre River Basin

U.S.G.S. Station		State Health Station		Number of Common Constituents	Common Constituents
Location	Freq.	Location	Freq.		
Cache la Poudre River at Moc near Ft. Collins, #0675200		Cache la Poudre above Ft. Collins; Greeley W.S. Diversion Headgate, #26		19	
	Month-ly		Bi-Mon-thly	17	Temp, pH, DO, NO_2-N, NO_3-N, Phosphorus Total, Calcium, Magnesium, Sodium, SAR, Total Hardness, Iron, Manganese, Chloride, Conductivity, Total KJD-N, Sulfate
	Monthly		High & Low Flow	2	Total Alkalinity, Potassium

TABLE 4.3-A Common Constituents in the Cache la Poudre River Basin (Continued)

U.S.G.S. Station		State Health Station		Number of Common Constituents	Common Constituents
Location	Freq.	Location	Freq.		
Cache la Poudre River near I-25 Rest Area, #06752300		Cache la Poudre River near I-25 Rest Area, #126		19	
	Monthly		Bi-Weekly	14	Temp , pH , D.O. , NO_2-N, NO_3-N, Total Phosphorus as P, Calcium, Magnesium, Sodium, Chloride, SAR, Total Hardness, Manganese, Iron
	Monthly		Bi-Monthly	3	Conductivity, Total KJD-N, Sulfate
	Monthly		High & Low Flow	2	Total Alkalinity, Potassium

TABLE 4.3-A Common Constituents in the Cache la Poudre River Basin (Continued)

U.S.G.S. Station		State Health Station		Number of Common Constituents	Common Constituents
Location	Freq.	Location	Freq.		
Cache la Poudre River near Greeley, #06752500		Cache la Poudre River near Greeley, #27		18	
	Monthly		Bi-Weekly	14	Temp, pH, D.O., NO_2-N, NO_3-N, Phosphorus, Calcium, Magnesium, Sodium, Chloride, SAR, Total Hardness, Iron, Manganese
	Monthly		Bi-Monthly	2	Conductivity, Sulfate
	Monthly		High & Low Flow	2	Total Alkalinity, Potassium

TABLE 4.3-B Common Constituents in the Big Thompson River Basin

U.S.G.S. Station		State Health Station		Number of Common Constituents	Common Constituents
Location	Freq.	Location	Freq.		
Big Thompson at mouth near LaSalle #06744000		Big Thompson near mouth, #28		18	
	Monthly		Bi-Weekly	14	Temp, pH, D.O., NO_2-N, NO_3-N, Phosphorus, Calcium, Magnesium, Sodium, Chloride, SAR, Total Hardness, Iron, Manganese
	Monthly		Bi-Monthly	2	Conductivity, Sulfate
	Monthly		High & Low Flow	2	Total Alkalinity, Potassium

TABLE 4.3-C Common Constituents in the St. Vrain River Basin

U.S.G.S. Station		State Health Station		Number of Common Constituents	Common Constituents
Location	Freq.	Location	Freq.		
St. Vrain below Longmont #06725450		St. Vrain below Longmont #31		20	
	Monthly		Monthly	15	Temp, pH, D.O., Suspended Solids (Sediment), NO_2-N, NO_3-N, Total Phosphorus as P, Calcium, Magnesium, Sodium, Chloride, SAR, Hardness Total, Iron, Manganese
	Monthly		Monthly	3	Total Kjeldahl-N, Sulfate, Specific Conductivity
	Monthly		High & Low Flow	2	Total Alkalinity, Potassium

TABLE 4.3-C Common Constituents in the St. Vrain River Basin (Continued)

U.S.G.S. Station		State Health Station		Number of Common Constituents	Common Constituents
Location	Freq.	Location	Freq.		
St. Vrain at Mouth near Platteville #06731000		St. Vrain near Mouth #29		18	
	Monthly		Bi-Monthly	16	Temp, pH, D.O., NO_2-N, NO_3-N, Phosphorus, Calcium, Magnesium, Sodium, Chloride, SAR, Total Hardness, Iron, Manganese, Specific Conductivity, Sulfate
	Monthly		High & Low Flow	2	Total Alkalinity, Potassium

TABLE 4.3-D Common Constituents in the South Platte River Basin

U.S.G.S. Station		State Health Station		Number of Common Constituents	Common Constituents
Location	Freq.	Location	Freq.		
South Platte River at Kersey #06754000		South Platte River near Kersey #22		18	
	Bi-Weekly April-Sept., Monthly Other Times		Bi-Weekly	14	Temp, pH, D.O., NO_2-N, NO_3-N, Phosphorus, Calcium, Magnesium, Sodium, Chloride, SAR, Total Hardness, Iron, Manganese
	" " "		Bi-Monthly	2	Conductivity, Sulfate
	" " "		High & Low Flow	2	Total Alkalinity, Potassium

TABLE 4.3-E

CDH CONSTITUENTS NOT SAMPLED BY

U.S.G.S. AT OVERLAPPING LOCATIONS

LOCATION	CONSTITUENTS	FREQUENCY
Cache la Poudre at Mouth of Canyon	5-day BOD, Turbidity, Dissolved Solids, Ammonia-N, Total Copper, Total Lead, Total Zinc and Fecal Coliforms. Total Cyanide, Total Cadmium.	Bi-Monthly
	Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, and Boron.	High and Low Flow
Cache la Poudre at I-25	To be discontinued by U.S.G.S.	
Cache la Poudre at Mouth	5-day BOD, Turbidity, Dissolved Solids, Ammonia-N, Total Copper, Total Lead, Total Zinc and Fecal Coliforms.	Bi-Weekly
	Total Kjeldahl-N, Total Cyanide, Total Cadmium, Total Chromium (1/), Total Alpha(2/), and Beta(3/) Analysis.	Bi-Monthly
	Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, and Boron.	High and Low Flow
Big Thompson River near Mouth	5-day BOD, Turbidity, Dissolved Solids, Ammonia-N, Total Copper, Total Lead, Total Zinc and Fecal Coliforms.	Bi-Weekly (change to monthly recommended)
	Total Kjeldahl-N, Total Cyanide, Total Cadmium.	Bi-Monthly

TABLE 4.3-E (Continued)
CDH CONSTITUENTS NOT SAMPLED BY
U.S.G.S. AT OVERLAPPING LOCATIONS

LOCATION	CONSTITUENTS	FREQUENCY
Big Thompson River near Mouth (continued)	Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron.	High and Low Flow
St. Vrain below Longmont	5-day BOD, Turbidity, Dissolved Solids, Ammonia-N, Total Copper, Total Lead, Total Zinc and Fecal Coliforms.	Monthly
	Total Cyanide, Total Cadmium.	Bi-Monthly
	Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron.	High and Low Flow
St. Vrain near Mouth	5-day BOD, Turbidity, Dissolved Solids, Ammonia-N, Total Copper, Total Lead, Total Zinc, Fecal Coliforms, Total Kjeldahl-N, Sulfate, Total Cyanide, Total Cadmium, Total Arsenic.	Bi-Monthly
	Total Alkalinity, Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron.	High and Low Flow
Boulder Creek	5-day BOD, Turbidity, Dissolved Solids, Ammonia-N, Total Copper, Total Lead, Total Zinc and Fecal Coliforms.	Bi-Weekly
	Total Kjeldahl-N, Total Cyanide, Total Cadmium, Total Arsenic.	Bi-Monthly

TABLE 4.3-E (Continued)
CDH CONSTITUENTS NOT SAMPLED BY
U.S.G.S. AT OVERLAPPING LOCATIONS

LOCATION	CONSTITUENTS	FREQUENCY
Boulder Creek (continued)	Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron.	High and Low Flows
South Platte near Kersey	5-day BOD, Turbidity, Dissolved Solids, Ammonia-N, Total Copper, Total Lead, Total Zinc and Fecal Coliforms.	Bi-Weekly
	Total Kjeldahl-N, Total Cyanide, Total Cadmium.	Bi-Monthly
	Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron.	High and Low Flows

St. Vrain River (near Platteville)	18
South Platte River (near Kersey)	18

Both the U.S.G.S. and the State sample more parameters in addition to the ones that are duplicated, i.e., both agencies sample more than the 18-20 parameters listed in the Tables, and the ones over and above those 18-20 are different. Table 4.3-E lists the constituents sampled by the State which <u>are not</u> included in the U.S.G.S. program at those locations sampled by both U.S.G.S. and the Colorado Department of Health.

In addition to those stations where exact overlap has occurred in terms of location, both the State and the U.S.G.S. have sampling stations on Boulder Creek only a few miles apart. CDH samples Boulder Creek at the Boulder/Weld county line, while U.S.G.S. maintains a gaging station and water quality station at the mouth of Boulder Creek.

One way to eliminate duplication and overlap and achieve the goal of optimizing utilization of monitoring resources in the region would be for the State to enter into cooperative agreement with U.S.G.S. to sample for those constituents not covered in the present U.S.G.S. program. Under a cooperative agreement, U.S.G.S. could cost-share at the 50% level.

Discussions with the Water Quality Control Division during the course of this project indicate that the Division is reluctant to enter into cooperative agreements with the U.S. Geological Survey because of increased costs for water quality analyses over and above what the State has currently budgeted for having those analyses conducted it its own laboratory. In light of this consideration, it is strongly recommended that the State conduct an analysis which includes the following elements:

1. The State should review water quality data from its stations in the Larimer-Weld Region, and in particular, those stations where overlap and duplication is occurring to determine if continued sampling of constituents is productive and if so, at what frequency. The initial analysis should focus on those constituents sampled by CDH which are presently not being sampled by the U.S.G.S.

2. The State should obtain cost estimates from the U.S.G.S. for those constituents not presently sampled by U.S.G.S. as indicated in Table 4.3-E.

3. The State should fully define its total costs for gathering, analyzing and recording the results of its water quality sampling. (Present CDH cost schedules include only costs of labor and materials; capital costs for replacement or acquisition of laboratory equipment is not included. Full costs of field personnel and sample procurement are also not included).

4. The State should compare U.S.G.S. cost estimates with the full costs presently being expended by State field and laboratory personnel for collection and analysis of sample information.

5. Based on this detailed station by station analysis, the State should determine whether or not it is cost-effective to enter into agreements with the U.S. Geological Survey to sample, analyze and report those constituents not sampled by U.S.G.S. at overlapping locations as indicated in Table 4.3-E.

In the event this analysis shows that the State can enter into cooperative agreements and save money, resources presently being expended by the State should be used to expand its monitoring network to other areas in the region where more sampling is needed.

5.0 RECOMMENDED WATER QUALITY MONITORING PROGRAM

The evaluation of existing programs in Section 4.0 provides the basis for recommending a water quality monitoring program for the Larimer-Weld Region. The recommended program is designed to overcome deficiencies in the existing program with respect to regional priorities and criteria. The recommended program includes new water quality stations, modification of the existing Colorado Department of Health Program, modification of the existing U.S.G.S. Cooperative Program, and expansion of biosurvey work in the region. Specific recommendations are made concerning future bioassay work by the State of Colorado. Recommendations are made regarding which institutions should participate in various sampling activities. Cost sharing arrangements and the estimated costs of the recommended program are included, as well as recommended institutional responsibilities of Federal, State, and local governments.

5.1 NEW WATER QUALITY STATIONS

Fifteen new water quality stations are recommended in the region. Six of these stations will be located on the Cache la Poudre River, four on the Big Thompson River, one at Lake Loveland, two on the Little Thompson River, one on the South Platte River, and one station at Crow Creek. This recommendation includes six new monitoring stations established during the process of program design. Three of the stations recommended were established by the City of Loveland on the Big Thompson River in August, 1979, and three of the new stations recommended were established by the City of Fort Collins in October, 1979.

Table 5.1-A provides a list of the new locations, the purpose of establishing the station, and recommended participants for each station. Locations are shown on Figures 5.1-A, B and C.

Implementation of this program will require modification of both the U.S.G.S. Cooperative Program and the Colorado Department of Health Monitoring Program. These modifications are discussed in subsequent sections.

5.2 RECOMMENDED MODIFICATIONS TO COLORADO DEPARTMENT OF HEALTH WATER QUALITY MONITORING PROGRAM

Modifications to the Colorado Department of Health Program are recommended to achieve the following objectives:

TABLE 5.1-A

RECOMMENDED NEW WATER

QUALITY STATIONS

LOCATION	PURPOSE	PARTICIPANTS
Cache la Poudre at Monroe Diversion (1)	Protection of Fort Collins water supply; quality of Upper Poudre.	U.S.G.S./ Fort Collins
Cache la Poudre at Shields Street (1)	Quality of Poudre upstream of urban runoff impacts.	U.S.G.S./ Fort Collins
Cache la Poudre at Boxelder (1)	Impacts of Fort Collins No. 2 Wastewater Treatment Plant.	U.S.G.S./ Fort Collins
Cache la Poudre at Highway 257	Quality of Poudre above Windsor/Kodak, impacts of Fossil Creek Reservoir releases.	CDH or U.S.G.S./CDH
Cache la Poudre below Windsor (at Greeley No. 3 Ditch)	Quality of Poudre below Windsor/Kodak.	CDH or U.S.G.S./CDH
Cache la Poudre above Greeley (near Greeley No. 3 Wasteway)	Quality of Poudre above Greeley point sources.	CDH or U.S.G.S./CDH
Big Thompson at Wilson (2)	Quality of Thompson upstream of Loveland urban runoff.	U.S.G.S./ Loveland
Big Thompson above Loveland Wastewater Treatment Plant (2)	Impacts of urban runoff, quality of Thompson above treatment plant.	U.S.G.S./ Loveland
Big Thompson below Loveland (1)	Downstream impacts of urban runoff and Loveland treatment plant, quality above Great Western.	U.S.G.S./ Loveland/Great Western

(1) Established October, 1979.

(2) Established August, 1979.

TABLE 5.1-A (Continued)
RECOMMENDED NEW WATER
QUALITY STATIONS

LOCATION	PURPOSE	PARTICIPANTS
Big Thompson below Great Western (above Big Thompson and South Platte Ditch)	Impacts of Great Western discharge.	U.S.G.S./ Great Western
Lake Loveland	Quality of Greeley water supply.	U.S.G.S./ Greeley
Little Thompson below Berthoud (near Rockwell Ditch)	Quality downstream of Berthoud.	CDH or U.S.G.S./CDH
Little Thompson above Johnstown	Quality above Johnstown and Great Western discharge.	CDH or U.S.G.S./CDH
South Platte above Fort Lupton	Impacts of upstream discharges, quality of water entering region.	CDH or U.S.G.S./CDH
Crow Creek at Mouth	Establish baseline conditions prior to start up of new Greeley treatment plant.	U.S.G.S./ Greeley

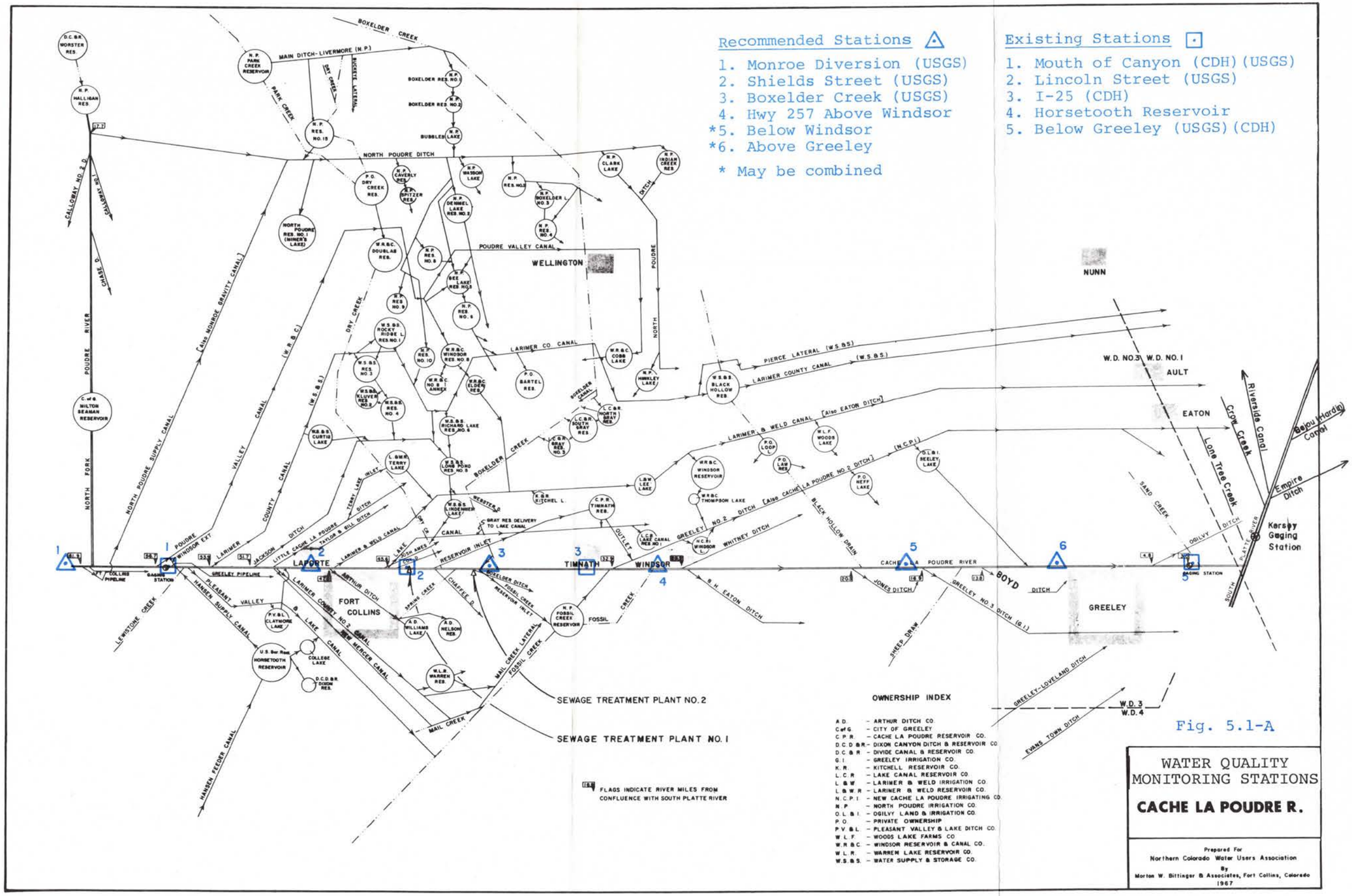

Recommended Stations
1. Monroe Diversion (USGS)
2. Shields Street (USGS)
3. Boxelder Creek (USGS)
4. Hwy 257 Above Windsor
*5. Below Windsor
*6. Above Greeley
* May be combined
Existing Stations
1. Mouth of Canyon (CDH)(USGS)
2. Lincoln Street (USGS)
3. I-25 (CDH)
4. Horsetooth Reservoir
5. Below Greeley (USGS)(CDH)
BOXELDER CREEK
MAIN DITCH-LIVERMORE (N.P.)
PARK CREEK
DRY CREEK
BUCKEYE LATERAL
NORTH POUDRE DITCH
POUDRE VALLEY CANAL
WELLINGTON
NUNN
LARIMER CO. CANAL
PIERCE LATERAL (W.S.&S.)
LARIMER COUNTY CANAL (W.S.&S.)
LARIMER & WELD CANAL [Also EATON DITCH]
W.D. NO.3
W.D. NO. 1
AULT
EATON
Riverside Consl
Crow Creek
Lone Tree Creek
Bijou Hardig Canal
Empire Ditch
Kersey Gaging Station
SAND CREEK
OGILVY DITCH
SOUTH PLATTE RIVER
BOYD
GREELEY
GREELEY NO.3 DITCH (G.I.)
JONES DITCH
SHEEP DRAW
BLACK HOLLOW DRAIN
GREELEY NO.2 DITCH [Also CACHE LA POUDRE NO.2 DITCH] (N.C.P.I.)
WHITNEY DITCH
R.H. EATON DITCH
GREELEY-LOVELAND DITCH
EVANS TOWN DITCH
W.D. 3
W.D. 4
CACHE LA POUDRE RIVER
LAPORTE
FORT COLLINS
TIMNATH
WINDSOR
NORTH FORK
POUDRE RIVER
CHAMBERS LAKE
CALLOWAY NO. 2 D.
CALLOWAY NO. 1 D.
NORTH POUDRE SUPPLY CANAL [ALSO MONROE GRAVITY CANAL]
NORTH POUDRE VALLEY CANAL (W.S.&S.)
LITTLE CACHE LA POUDRE
TAYLOR & BILL DITCH
JACKSON DITCH
LARIMER
COUNTY CANAL
TERRY LAKE INLET
TERRY LAKE DITCH
LAKE JOHN AMES
RESERVOIR INLET
GRAY RES. DELIVERY TO LAKE CANAL
OUTLET
GREELEY PIPELINE
PLEASANT VALLEY
HANSEN SUPPLY CANAL
LEWISTONE CREEK
ARTHUR DITCH
LARIMER COUNTY NO. 2 CANAL
NEW MERCER CANAL
CHAFFEE D.
SPRING CREEK
BOXELDER DITCH
FOSSIL CREEK RESERVOIR INLET
MAIL CREEK LATERAL
FOSSIL CREEK
MAIL CREEK
HANSEN FEEDER CANAL
SEWAGE TREATMENT PLANT NO.2
SEWAGE TREATMENT PLANT NO. I
FLAGS INDICATE RIVER MILES FROM CONFLUENCE WITH SOUTH PLATTE RIVER
OWNERSHIP INDEX
A.D. – ARTHUR DITCH CO.
C of G. – CITY OF GREELEY
C.P.R. – CACHE LA POUDRE RESERVOIR CO.
D.C.D.&R. – DIXON CANYON DITCH & RESERVOIR CO.
D.C.&R. – DIVIDE CANAL & RESERVOIR CO.
G.I. – GREELEY IRRIGATION CO.
K.R. – KITCHELL RESERVOIR CO.
L.C.R. – LAKE CANAL RESERVOIR CO.
L.&W. – LARIMER & WELD IRRIGATION CO.
L.&W.R. – LARIMER & WELD RESERVOIR CO.
N.C.P.I. – NEW CACHE LA POUDRE IRRIGATING CO.
N.P. – NORTH POUDRE IRRIGATION CO.
O.L.&I. – OGILVY LAND & IRRIGATION CO.
P.O. – PRIVATE OWNERSHIP
P.V.&L. – PLEASANT VALLEY & LAKE DITCH CO.
W.L.F. – WOODS LAKE FARMS CO.
W.R.&C. – WINDSOR RESERVOIR & CANAL CO.
W.L.R. – WARREN LAKE RESERVOIR CO.
W.S.&S. – WATER SUPPLY & STORAGE CO.
WATER QUALITY MONITORING STATIONS
CACHE LA POUDRE R.
Prepared For
Northern Colorado Water Users Association
By
Morton W. Bittinger & Associates, Fort Collins, Colorado
1967

Fig. 5.1-A

Existing Stations (Not Shown)

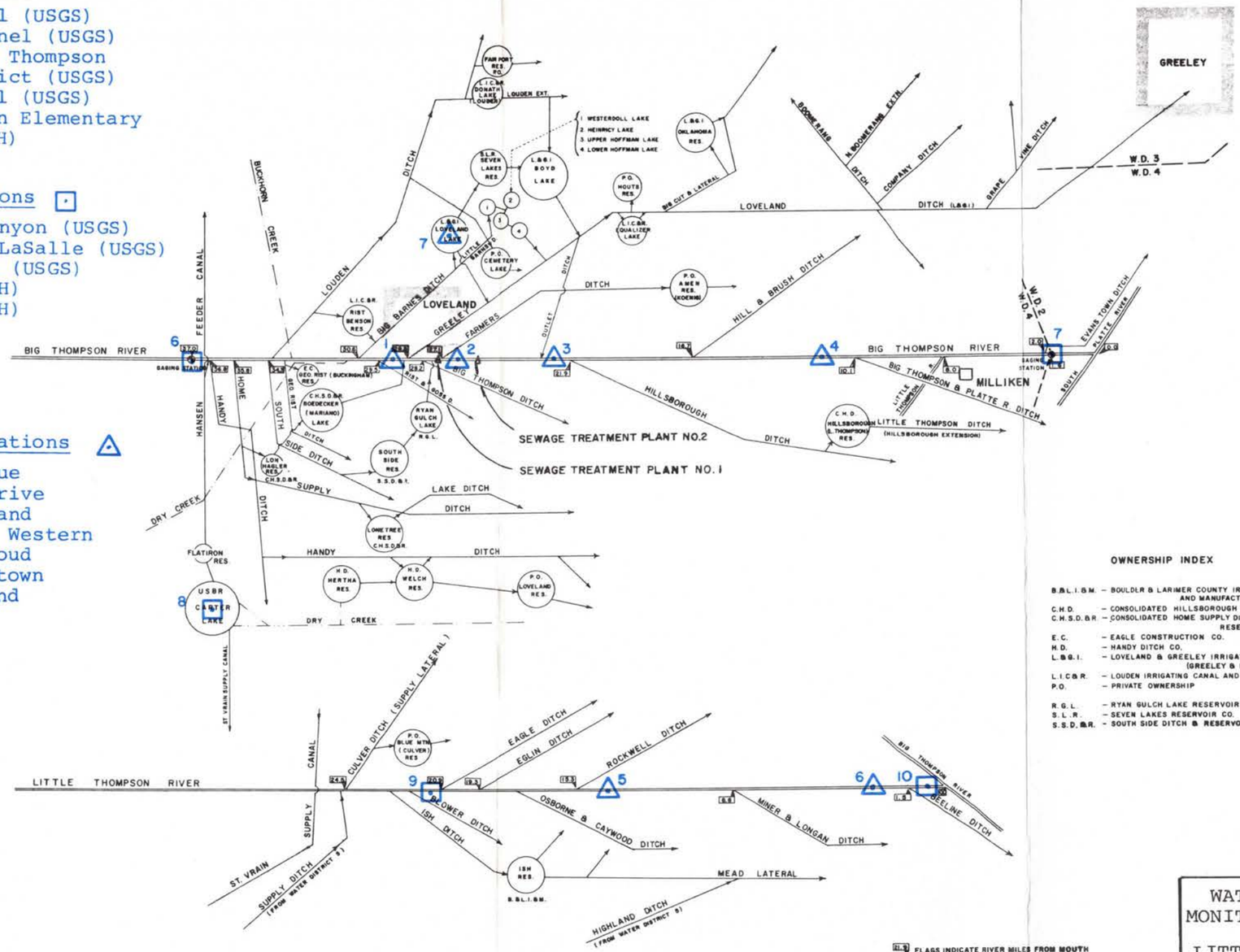
1. Adams Tunnel (USGS)
2. Olympus Tunnel (USGS)
3. Below Upper Thompson San. District (USGS)
4. Dille Tunnel (USGS)
5. Big Thompson Elementary School (CDH)

Existing Stations ⊡

6. Mouth of Canyon (USGS)
7. Mouth near LaSalle (USGS)
8. Carter Lake (USGS)
9. HWY 287 (CDH)
10. HWY 257 (CDH)

Recommended Stations △

1. Wilson Avenue
2. Riverside Drive
3. Below Loveland
4. Below Great Western
5. Below Berthoud
6. Above Johnstown
7. Lake Loveland



OWNERSHIP INDEX

B.&L.I.&M. – BOULDER & LARIMER COUNTY IRRIGATING AND MANUFACTURING CO.
C.H.D. – CONSOLIDATED HILLSBOROUGH DITCH CO.
C.H.S.D.&R. – CONSOLIDATED HOME SUPPLY DITCH AND RESERVOIR CO.
E.C. – EAGLE CONSTRUCTION CO.
H.D. – HANDY DITCH CO.
L.&G.I. – LOVELAND & GREELEY IRRIGATING CO. (GREELEY & LOVELAND)
L.I.C.&R. – LOUDEN IRRIGATING CANAL AND RESERVOIR CO.
P.O. – PRIVATE OWNERSHIP
R.G.L. – RYAN GULCH LAKE RESERVOIR CO.
S.L.R. – SEVEN LAKES RESERVOIR CO.
S.S.D.&R. – SOUTH SIDE DITCH & RESERVOIR CO.

71.9 FLAGS INDICATE RIVER MILES FROM MOUTH

Fig. 5.1-B

WATER QUALITY MONITORING STATIONS

LITTLE THOMPSON R.
Big Thompson R.

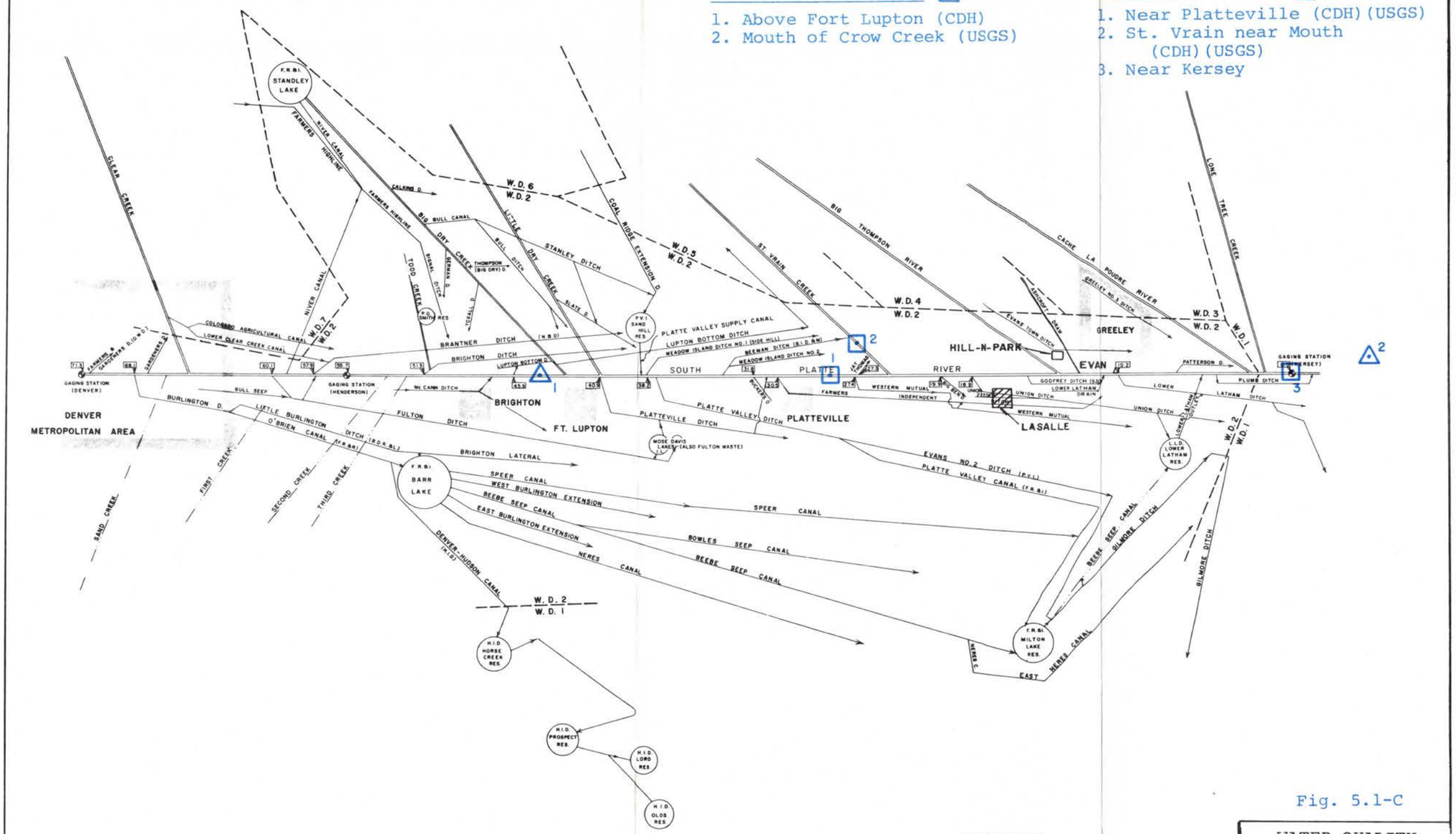
Prepared For
Northern Colorado Water Users Association
By
Morton W. Bittinger & Associates, Fort Collins, Colorado
1967

Recommended Stations △

1. Above Fort Lupton (CDH)
2. Mouth of Crow Creek (USGS)

Existing Stations ⊡

1. Near Platteville (CDH)(USGS)
2. St. Vrain near Mouth (CDH)(USGS)
3. Near Kersey



OWNERSHIP INDEX

B.D.R.&L.	-	BURLINGTON DITCH, RESERVOIR & LAND CO.
B.I.D.&M.	-	BEEMAN IRRIGATING DITCH & MILLING CO.
D.W.D.	-	DENVER WATER DEPARTMENT
F.R.B.I.	-	FARMERS RESERVOIR & IRRIGATION CO.
H.I.D.	-	HENRYLYN IRRIGATION DISTRICT
I.I.	-	IONE INVESTMENT CO.
L.L.D.	-	LOWER LATHAM DITCH CO.
N.B.D.	-	NEW BRANTNER DITCH CO.
P.I.&M.	-	PLATTEVILLE IRRIGATION & MILLING CO.
P.V.I.	-	PLATTE VALLEY IRRIGATION CO.
S.3 D.	-	SECTION 3 DITCH CO.

Fig. 5.1-C

WATER QUALITY MONITORING STATIONS

S. PLATTE RIVER

Prepared For
Northern Colorado Water Users Association
By
Morton W. Bittinger & Associates, Fort Collins, Colorado
1968

1. Elimination of overlap and duplication of the U.S.G.S. Sampling Program;

2. Expansion of the CDH Program to new locations which are not presently being monitored.

In order to accomplish these objectives, the recommended program calls for CDH to cease sampling activities at the six locations where overlap and duplication occur. At these locations CDH would enter into cooperative agreements with U.S.G.S. where feasible to sample those constituents presently included in the CDH Program which are not being sampled by U.S.G.S. These constituents are identified in Table 4.3-E.

The recommended program includes sampling at six new stations to be initiated by Colorado Department of Health. Four stations are primary stations and two are secondary stations. It is proposed that CDH initiate instantaneous flow measurements at all sampling stations where feasible. In lieu of adding new stations, CDH may want to consider the option of entering into cooperative agreements with U.S.G.S. for monitoring at new locations.

Table 5.2-A identifies recommended modifications to the CDH Program. Specific constituents and frequencies of sampling are identified in Section 5.4.

5.3 RECOMMENDED MODIFICATIONS TO THE U.S.G.S. COOPERATIVE PROGRAM

In order to implement the recommended regional program a number of modifications are necessary to the U.S.G.S. Cooperative Program. These include additional new stations, additional constituents to be sampled at existing stations, and entering into new cooperative agreements, as indicated in Table 5.3-A.

Three new stations are proposed on the Cache la Poudre River in cooperation with the City of Fort Collins. The existing cooperative station at I-25 will be deleted from the system. Two new stations (in addition to the three recently established stations in the vicinity of Loveland) are proposed in the Big Thompson drainage, one below the Great Western sugar plant, and one at Lake Loveland. A new station is proposed at the mouth of Crow Creek in cooperation with Greeley. Additional analyses for pesticides and heavy metals are proposed at several stations, and it is recommended that U.S.G.S. enter into a cooperative agreement with the Colorado Department of Health for sampling of constituents identified in Table 4.3-E. These constituents are ones that are presently being sampled by CDH at existing U.S.G.S. water quality monitoring stations.

Specific constituents and frequencies are defined in Section 5.4.

TABLE 5.2-A

RECOMMENDED MODIFICATIONS TO

CDH WATER QUALITY

MONITORING PROGRAM

LOCATION	ACTION
Cache la Poudre at Mouth of Canyon	Delete station; enter into cooperative agreement with U.S.G.S. for sampling of additional parameters (Table 4.3-E).
Cache la Poudre at I-25	Maintain station; add instantaneous flow measurement.
Cache la Poudre at Highway 257	Add primary monthly station; special samples, instantaneous flow.
Cache la Poudre below Windsor	Add primary monthly station; special samples, instantaneous flow.
Cache la Poudre above Greeley	Add primary monthly station; special samples, instantaneous flow.
Cache la Poudre below Greeley	Delete station; enter into cooperative agreement with U.S.G.S. for sampling of additional parameters (Table 4.3-E).
Big Thompson near Big Thompson Elementary School	Maintain; add instantaneous flow.
Big Thompson at Mouth near LaSalle	Delete station; enter into cooperative agreement with U.S.G.S. for samples of additional parameters (Table 4.3-E).
Little Thompson near Berthoud	Maintain; add instantaneous flow.
Little Thompson below Berthoud	Add secondary station; instantaneous flow.
Little Thompson above Johnstown	Add secondary station; instantaneous flow.
St. Vrain below Longmont	Delete station; enter into cooperative agreement with U.S.G.S. for samples of additional parameters (Table 4.3-E).

TABLE 5.2-A (Continued)
RECOMMENDED MODIFICATIONS TO
CDH WATER QUALITY
MONITORING PROGRAM

LOCATION	ACTION
St. Vrain at Mouth	Delete station; enter into cooperative agreement with U.S.G.S. for samples of additional parameters (Table 4.3-E).
Boulder Creek	Delete station; enter into cooperative agreement with U.S.G.S. for samples of additional parameters (Table 4.3-E).

TABLE 5.3-A

RECOMMENDED MODIFICATIONS TO THE

U.S.G.S. COOPERATIVE PROGRAM

LOCATION	ACTION	COOPERATOR
Cache la Poudre River at Monroe Diversion	Add new station.	City of Fort Collins
Cache la Poudre River at Mouth of Canyon	Add heavy metals and pesticides to constituents; add CDH constituents (Table 4.3-E).	WPRS, NCWCD, Greeley (NEW) CDH (NEW)
Cache la Poudre River at Shields Street	Add new station.	City of Fort Collins
Cache la Poudre River at Lincoln Street	Add metals, nitrogen series, and pesticides to constituents sampled.	City of Fort Collins
Cache la Poudre River at Prospect Street	Add sampling for metals, nitrogen series, pesticides.	City of Fort Collins
Cache la Poudre River at Boxelder Creek	Add new station.	City of Fort Collins
Cache la Poudre River at I-25	Delete station.	
Cache la Poudre River at Mouth near Greeley	Add nitrogen series, metals, and pesticides sampling, CDH constituents (Table 4.3-E).	WPRS, Greeley (NEW), CDH (NEW)
Big Thompson River at Alva B. Adams Tunnel	Maintain station.	WPRS, NCWCD
Big Thompson River Olympus Tunnel at Lake Estes	Maintain existing station.	WPRS

TABLE 5.3-A (Continued)
RECOMMENDED MODIFICATIONS TO THE
U.S.G.S. COOPERATIVE PROGRAM

LOCATION	ACTION	COOPERATOR
Big Thompson River at Dilly Tunnel	Maintain station.	WPRS
Carter Lake	Maintain station	WPRS
Big Thompson River at Wilson Avenue	Maintain new station.	City of Loveland
Big Thompson River above Plant #2	Maintain new station.	City of Loveland, Great Western (NEW)
Big Thompson River below Great Western	Add new station.	Great Western (NEW)
Lake Loveland	Add new station.	City of Greeley
Big Thompson River at Mouth	Maintain new station. CDH Constituents (Table 4.3-E).	WPRS, CDH (NEW)
Boulder Creek at Mouth near Platteville	Add new constituents per State Program (See Table 4.3-E).	WPRS, CDH (NEW)
St. Vrain River near Mouth	Add CDH constituents (Table 4.3-E).	WPRS, CDH (NEW)
South Platte River at Kersey	Add CDH constituents (Table 4.3-E)	WPRS, CDH (NEW)
Crow Creek at Mouth	Add new station.	Greeley

5.4 RECOMMENDED WATER QUALITY MONITORING PROGRAM

Incorporation of the modifications listed in the two previous sections, and continuation of existing monitoring programs make up the Regional Water Quality Monitoring Program in Larimer and Weld Counties. The total program is presented in Table 5.4-A. This Table shows the location of each sampling station, the agency responsible for actually collecting and analyzing the sample, the constituents to be sampled, frequency, and the participant if it is a U.S.G.S. Cooperative Program. The constituents to be sampled at each location are listed by schedule name or number. Table 5.4-B identifies the physical, chemical, and biological constituents included in each schedule. Schedules are established by U.S.G.S. to meet cooperators needs, and are subject to modification to meet changing needs.

5.5 ESTIMATED COST OF PROGRAM FOR PARTICIPATING MUNICIPALITIES

The costs for the program have been estimated for the participating municipalities of Fort Collins, Loveland, and Greeley. The total cost of programs involving municipalities is $80,810, 50 percent of which would be contributed by U.S.G.S. The remainder is divided among Fort Collins ($21,770), Loveland ($10,735), and Greeley ($7,900) based on their proportionate share of the cost of analysis, sample collection, and operation and maintenance of the water quality and surface water stations. Costs for Fort Collins do not include construction of the new station at Boxelder Creek ($3,000), or cooperative surface water quantity programs in the upper Cache la Poudre drainage ($3,900).

These costs were compiled by the consultant based on approximate cost for various components of the program. These cost estimates were not provided by U.S.G.S. and final costs may vary from the anticipated estimates.

Costs have not been estimated for the Colorado Department of Health Program at sampling stations maintained entirely by CDH or those recommended for cost sharing arrangements by U.S.G.S. in this draft report. Substantial cost contributions by W.P.R.S., Northern Colorado Water Conservancy District, and St. Vrain Left-Hand Conservancy District, are not shown.

Table 5.5-A provides a breakdown of the estimated direct costs of the program for participating municipalities by station. Costs include the program elements apportioned to municipalities indicated in Table 5.4-A, but do not include substantial indirect costs of data review and analysis incurred by municipalities.

TABLE 5.4-A

RECOMMENDED WATER QUALITY MONITORING PROGRAM

FOR THE LARIMER-WELD REGION

LOCATION	CONSTITUENTS +	FREQUENCY	PARTICIPANT
Cache la Poudre River at Monroe Diversion (U.S.G.S.)*	449 (1)	Monthly	Fort Collins
	480 (1)	Monthly	Fort Collins
	498 (1)	Monthly	Fort Collins
	1474 (M) (1)	Quarterly	Fort Collins
Cache la Poudre River at Mouth of Canyon (U.S.G.S.)	449 (2)	Monthly	WPRS
	A129 (2)	Monthly	WPRS
	A130 (2)	Monthly	WPRS
	A268 (2)	Monthly	WPRS
	A311 (2)	Monthly	WPRS
	498	Quarterly	Greeley
	7-metals	Monthly	Greeley
	1474 (M)	Semi-Annual	Greeley
	CDH-4.3-E (2)	Bi-Monthly	CDH
	Flow (2)	(Recorder)	WPRS
Horsetooth Reservoir (U.S.G.S.)	35 (2)	Monthly	WPRS
	A55 (2)	Monthly	WPRS
	309 (3 depths)	Monthly	WPRS
	D.O. & Temp. Profile (2)	Monthly	WPRS
	Flow (2)	(Recorder)	WPRS
	498 (1)	Quarterly	Fort Collins
	7-metals (1)	Monthly	Fort Collins
	1475 (M) (1)	Semi-Annual	Fort Collins

(1) Implemented, Fall, 1979.
(2) Existing.
(3) Recommended Addition.
(4) Implemented, Summer, 1979.
* Agency responsible for sampling, analysis, and reporting.
\+ Numerical references to constituents sampled are typical U.S.G.S. schedules for a specified group of parameters. Individual parameters on these schedules may be added or deleted at the request of the cooperator. All other references are to CDH constituents as noted on Table 4.3-E.

TABLE 5.4-A (Continued)
RECOMMENDED WATER QUALITY MONITORING PROGRAM
FOR THE LARIMER-WELD REGION

LOCATION	CONSTITUENTS +	FREQUENCY	PARTICIPANT
Cache la Poudre River at Shields Street (U.S.G.S.)	449 (1)	Monthly	Fort Collins
	480 (1)	Monthly	Fort Collins
	498 (1)	Quarterly	Fort Collins
	7-metals (1)	Monthly	Fort Collins
	Flow (1)	(Recorder)	Fort Collins
	1474 (M) (1)	Semi-Annual	Fort Collins
Cache la Poudre River at Lincoln Street (U.S.G.S.)	449 (2)	Monthly	Fort Collins
	480 (2)	Monthly	Fort Collins
	498 (2)	Quarterly	Fort Collins
	7-metals (2)	Monthly	Fort Collins
	1474 (M) (1)	Quarterly	Fort Collins
	Flow (2)	Monthly	Fort Collins
Cache la Poudre River at Prospect (U.S.G.S.)	449 (2)	Monthly	Fort Collins
	480 (2)	Monthly	Fort Collins
	498 (2)	Quarterly	Fort Collins
	7-metals (2)	Monthly	Fort Collins
	1474 (M) (1)	Semi-Annual	Fort Collins
	Flow (2)	(Recorder)	Fort Collins
Cache la Poudre River at Boxelder Creek (U.S.G.S.)	449 (1)	Monthly	Fort Collins
	480 (1)	Monthly	Fort Collins
	498 (1)	Quarterly	Fort Collins
	7-metals (1)	Monthly	Fort Collins
	1474 (M) (1)	Semi-Annual	Fort Collins
	Flow (1)	(Recorder)	Fort Collins

(1) Implemented, Fall, 1979.
(2) Existing.
(3) Recommended Addition.
(4) Implemented, Summer, 1979.

\+ Numerical references to constituents samples are typical U.S.G.S. schedules for a specified group of parameters. Individual parameters on these schedules may be added or deleted at the request of the cooperator. All other references are to CDH constituents as noted on Table 4.3-E.

TABLE 5.4-A (Continued)
RECOMMENDED WATER QUALITY MONITORING PROGRAM
FOR THE LARIMER-WELD REGION

LOCATION	CONSTITUENTS +	FREQUENCY	PARTICIPANT
Cache la Poudre River at I-25 (CDH)	CDH-Primary (2)	Bi-Weekly	CDH
	CDH-H/L (2)	Semi-Annual	CDH
Cache la Poudre River at Highway 257 (CDH)	CDH-Primary	Monthly	CDH
	CDH-H/L	Semi-Annual	CDH
	1474 (M)	Semi-Annual	CDH
	Flow (2)	Weekly	(State Engineer-ongoing)
Cache la Poudre River above Greeley (CDH)	CDH-Primary	Monthly	CDH
	CDH-H/l	Semi-Annual	CDH
	1474(M)	Semi-Annual	CDH
	Flow	Monthly	CDH
Cache la Poudre River below Greeley (U.S.G.S.)	449 (2)	Monthly	WPRS
	480 (3)	Monthly	Greeley
	498 (3)	Quarterly	Greeley
	7-metals (3)	Monthly	Greeley
	1474 (M)(3)	Semi-Annual	Greeley
	CDH-4.3-E (2)	Monthly	CDH
Big Thompson River at Alva B. Adams Tunnel (U.S.G.S.)	449 (2)	Monthly	WPRS NCWCD

(1) Implemented, Fall, 1979.
(2) Existing.
(3) Recommended Addition.
(4) Implemented, Summer, 1979.

+ Numerical references to constituents samples are typical U.S.G.S. schedules for a specified group of parameters. Individual parameters on these schedules may be added or deleted at the request of the cooperator. All other references are to CDH constituents as noted on Table 4.3-E.

TABLE 5.4-A (Continued)
RECOMMENDED WATER QUALITY MONITORING PROGRAM
FOR THE LARIMER-WELD REGION

LOCATION	CONSTITUENTS +	FREQUENCY	PARTICIPANT
Big Thompson River at Olympus Tunnel (U.S.G.S.)	449 (2)	Monthly	WPRS
	35 (2)	Monthly	WPRS
	A55 (2)	Monthly	WPRS
	309 (2)	Monthly	WPRS
Big Thompson River below UTSD (CDH)	CDH-Secondary (2)	Bi-Monthly	CDH
	CDH-H/L (2)	Semi-Annual	CDH
Big Thompson River at Dille Tunnel (U.S.G.S.)	449 (2)	Monthly	WPRS
Carter Lake (U.S.G.S.)	35 (2)	Monthly	WPRS
	A55 (2)	Monthly	WPRS
	309 (2)	Monthly	WPRS
Big Thompson River near Big Thompson Elementary School (CDH)	CDH-Secondary (2)	Bi-Monthly	CDH
	CDH-H/L (2)	Semi-Annual	CDH

(1) Implemented, Fall, 1979.
(2) Existing.
(3) Recommended Addition.
(4) Implemented, Summer, 1979.

+ Numerical references to constituents samples are typical U.S.G.S. schedules for a specified group of parameters. Individual parameters on these schedules may be added or deleted at the request of the cooperator. All other references are to CDH constituents as noted on Table 4.3-E.

TABLE 5.4-A (Continued)
RECOMMENDED WATER QUALITY MONITORING PROGRAM
FOR THE LARIMER-WELD REGION

LOCATION	CONSTITUENTS +	FREQUENCY	PARTICIPANT
Big Thompson River at Wilson Avenue (U.S.G.S.)	4-metals (4)	Monthly	Loveland
	R-3 (4)	Monthly	Loveland
	449 (4)	Monthly	Loveland
	480 (4)	Monthly	Loveland
	Flow (4)	Monthly	Loveland
Big Thompson River above Loveland WWTP No. 2 (U.S.G.S.)	7-metals (4)	Monthly	Loveland
	R-3 (4)	Monthly	Loveland
	449 (4)	Monthly	Loveland
	480 (4)	Monthly	Loveland
	Flow (4)	Recorder	Loveland
	1474 (M) (4)	Semi-Annual	Loveland
Big Thompson River below Loveland WWTP No. 2 (U.S.G.S.)	7-metals (4)	Monthly	Loveland/ Great Western
	R-3 (4)	Monthly	Loveland/ Great Western
	449 (4)	Monthly	Loveland/ Great Western
	480 (4)	Monthly	Loveland/ Great Western
	Flow (4)	Monthly	Loveland/ Great Western
	1474 (M) (4)	Semi-Annual	Loveland/ Great Western
Big Thompson River below Great Western (U.S.G.S.)	7-metals (3)	Monthly	Great Western
	R-3 (3)	Monthly	Great Western
	449 (3)	Monthly	Great Western
	480 (3)	Monthly	Great Western
	Flow (3)	Monthly	Great Western

(1) Implemented, Fall, 1979.
(2) Existing.
(3) Recommended Addition.
(4) Implemented, Summer, 1979.

+ Numerical references to constituents samples are typical U.S.G.S schedules for a specified group of parameters. Individual parameters on these schedules may be added or deleted at the request of the cooperator. All other referencesare to CDH constituents as noted on Table 4.3-E.

TABLE 5.4-A (Continued)
RECOMMENDED WATER QUALITY MONITORING PROGRAM
FOR THE LARIMER-WELD REGION

LOCATION	CONSTITUENTS +	FREQUENCY	PARTICIPANT
Lake Loveland (U.S.G.S.)	449 (3)	Monthly	Greeley
	498 (3)	Quarterly	Greeley
	1474 (M)(3)	Semi-Annual	Greeley
Big Thompson River at Mouth (U.S.G.S.)	449 (2)	Monthly	WPRS
	CDH-4.3-E(2)	Monthly	CDH
	Flow (3)	Recorder	CDH
Little Thompson River at 287 (CDH)	CDH-Secondary (2)	Bi-Monthly	CDH
	CDH-H/L (2)	Semi-Annual	CDH
	Flow (3)	Bi-Monthly	CDH
Little Thompson River below Berthoud (CDH)	CDH-Secondary (3)	Bi-Monthly	CDH
	CDH-H/L (3)	Semi-Annual	CDH
	1474 (M)(3)	Semi-Annual	CDH

(1) Implemented, Fall, 1979.
(2) Existing.
(3) Recommended Addition.
(4) Implemented, Summer, 1979.

+ Numerical references to constituents samples are typical U.S.G.S. schedules for a specified group of parameters. Individual parameters on these schedules may be added or deleted at the request of the cooperator. All other references are to CDH constituents as noted on Table 4.3-E.

TABLE 5.4-A (Continued)
RECOMMENDED WATER QUALITY MONITORING PROGRAM
FOR THE LARIMER-WELD REGION

LOCATION	CONSTITUENTS +	FREQUENCY	PARTICIPANT
Little Thompson River above Johnstown (CDH)	CDH-Secondary (3)	Bi-Monthly	CDH
	CDH-H/L (3)	Semi-Annual	CDH
	1474 (M)(3)	Semi-Annual	CDH
Little Thompson River at 257 (CDH)	CDH-Secondary (2)	Bi-Monthly	CDH
	CDH-H/L (2)	Semi-Annual	CDH
	1474 (M)(3)	Semi-Annual	CDH
St. Vrain River below Longmont (U.S.G.S.)	409 (2)	Monthly	Left-Hand St. Vrain Conservancy District
	A301 (2)	Monthly	Left-Hand St. Vrain Conservancy District
	A268 (2)	Monthly	Left-Hand St. Vrain Conservancy District
	A129 (2)	Monthly	Left-Hand St. Vrain Conservancy District
	474 (2)	Monthly	Left-Hand St. Vrain Conservancy District
	CDH-4.3-E (2)	Monthly	CDH
	1474(M)(3)	Semi-Annual	CDH

(1) Implemented, Fall, 1979.
(2) Existing.
(3) Recommended Addition.
(4) Implemented, Summer, 1979.

+ Numerical references to constituents samples are typical U.S.G.S. schedules for a specified group of parameters. Individual parameters on these schedules may be added or deleted at the request of the cooperator. All other references are to CDH constituents as noted on Table 4.3-E.

TABLE 5.4-A (Continued)
RECOMMENDED WATER QUALITY MONITORING PROGRAM
FOR THE LARIMER-WELD REGION

LOCATION	CONSTITUENTS +	FREQUENCY	PARTICIPANTS
St. Vrain River at Mouth (U.S.G.S.)	449 (2) CDH-4.3-E (2) 1474(M)(3) Flow (2)	 Bi-Monthly Semi-Annual Recorder	WPRS CDH CDH Left-Hand St. Vrain Conservancy District
Boulder Creek at Mouth near Platteville (U.S.G.S.)	449 (2) Flow (2) CDH-4.3-E (3)	Monthly Recorder Monthly	WPRS WPRS CDH
South Platte River at Weld/Adams County Line (CDH)	CDH-Primary (3) CDH-H/L (3) 1474(M)(3) CDH-C,R (3)	Monthly Semi-Annual Semi-Annual Bi-Monthly	CDH CDH CDH CDH
South Platte River near Platteville (CDH)	CDH-Secondary (2) CDH-H/L (2) 1474(M)(3) CDH-C,R (2)	Bi-Monthly Semi-Annual Semi-Annual Bi-Monthly	CDH CDH CDH CDH

(1) Implemented, Fall, 1979.
(2) Existing.
(3) Recommended Addition.
(4) Implemented, Summer, 1979.

\+ Numerical references to constituents samples are typical U.S.G.S. schedules for a specified group of parameters. Individual parameters on these schedules may be added or deleted at the request of the cooperator. All other references are to CDH constituents as noted on Table 4.3-E.

TABLE 5.4-A (Continued)
RECOMMENDED WATER QUALITY MONITORING PROGRAM
FOR THE LARIMER-WELD REGION

LOCATION	CONSTITUENTS +	FREQUENCY	PARTICIPANT
South Platte River near Kersey (U.S.G.S.)	449 (2)	Monthly	WPRS
	A55 (2)	Monthly	WPRS
	CDH-4.3-E (2)	Monthly	CDH
	1474(M)(3)	Semi-Annual	CDH
Crow Creek at Mouth (U.S.G.S.)	449 (3)	Monthly	Greeley
	480 (3)	Monthly	Greeley
	498 (3)	Quarterly	Greeley
	1474(M)(3)	Semi-Annual	Greeley
	Flow (3)	(Recorder)	Greeley

(1) Implemented, Fall, 1979.
(2) Existing.
(3) Recommended Addition.
(4) Implemented, Summer, 1979.

+ Numerical references to constituents samples are typical U.S.G.S. schedules for a specified group of parameters. Individual parameters on these schedules may be added or deleted at the request of the cooperator. All other references are to CDH constituents as noted on Table 4.3-E.

TABLE 5.4-B
SCHEDULES OF WATER QUALITY CONSTITUENTS
INCLUDED IN MONITORING PROGRAM

U.S.G.S. Schedule (Name or Number)	Constituents+	
1474(M)	ALDRIN	ENDOSULFAN
	CHLORDANE DIELDRIN	GUTHION
	DDT	MALATHIN
	ENDRIN	PARATHION
	HEPTACHLOR LINDANE	2-4-D
	METHOXYCHLOR	2,4,5-TP
	MIREY	PCB
	TOXAPHIENE	PHENOL
4-METALS	CADMIUM	ZINC
	LEAD	CHROMIUM
7-METALS	CADMIUM	COPPER
	LEAD	ALUMINUM
	ZINC	SILVER
	CHROMIUM	
R-1	FECAL COLIFORM	
	SUSPENDED SOLIDS	
	BOD5	
CDH-4.3-E	Refers to those constituents now included in CDH Program which should be added to U.S.G.S. Programs. Identified in Table 4.3-E, pp. 4-20.	
CDH-PRIMARY	TEMPERATURE	TOTAL PHOSPHORUS AS P
	pH	CALCIUM
	D.O.	MAGNESIUM
	5-DAY BOD	SODIUM
	TURBIDITY	CHLORIDE
	SUSPENDED SOLIDS	SAR (CALCULATED)
	DISSOLVED SOLIDS	TOTAL HARDNESS
	AMONIA-N	TOTAL ZINC
	NO2-N	FECAL COLIFORMS
	NO3-N	
CDH-C,R	CHROMIUM	
	RADIOLOGICAL	

+ Constituent list for Schedule includes those parameters typically sampled. Additions or deletions may be made at the request of the Cooperator.

TABLE 5.4-B
SCHEDULES OF WATER QUALITY CONSTITUENTS
INCLUDED IN MONITORING PROGRAM

U.S.G.S. Schedule (Name or Number)	Constituents +	
CDH-SECONDARY	Same as "CDH-PRIMARY", sampled bi-monthly	
CDH-H/L	TOTAL ALKALINITY	TOTAL NICKEL
	TOTAL ALUMINUM	TOTAL SELENIUM
	TOTAL ARSENIC	TOTAL SILVER
	TOTAL BERYLLIUM	TOTAL URANIUM
	TOTAL MERCURY	BORON
		POTASSIUM

+ Constituent list for Schedule includes those parameters typically sampled Additions or deletions may be made at the request of the Cooperator.

TABLE 5.5-A

ESTIMATED DIRECT COSTS OF WATER QUALITY PROGRAM
FOR PARTICIPATING MUNICIPALITIES

LOCATION	COST	U.S.G.S. SHARE	MUNICIPAL SHARE
Cache la Poudre River at Monroe Diversion (1)	$ 7,500	$ 3,750	$ 3,750 (Fort Collins)
Cache la Poudre River at Mouth of Canyon (1)	2,800	1,400	1,400 (Greeley)
Horsetooth Reservoir (1)	4,860	2,430	2,430 (Fort Collins)
Cache la Poudre River at Shields Street (1)	6,570	3,285	3,285 (Fort Collins)
Cache la Poudre River at Lincoln Street (1)	9,020	4,510	4,510 (Fort Collins)
Cache la Poudre River at Prospect (1)	6,570	3,285	3,285 (Fort Collins)
Cache la Poudre River at Boxelder (1)	9,020	4,510	4,510 (Fort Collins)
Cache la Poudre River below Greeley	3,500	1,750	1,750 (Greeley)
Big Thompson River at Wilson Avenue (1)	5,600	2,800	2,800 (Loveland)
Big Thompson River above Loveland WWTP No. 2 (1)	8,750	4,375	4,375 (Loveland)
Big Thompson River below Loveland WWTP No. 2 (1)	7,120	3,560	3,560 (Loveland)
Lake Loveland	4,500	2,250	2,250 (Greeley)
Crow Creek at Mouth	5,000	2,500	2,500 (Greeley
TOTAL	$80,810	$40,405	$40,405

TABLE 5.5-A (Continued)
ESTIMATED DIRECT COSTS OF WATER QUALITY PROGRAM
FOR PARTICIPATING MUNICIPALITIES

$21,770	(Fort Collins)
$10,735	(Loveland)
$ 7,900	(Greeley)

(1) In operation as of December, 1979.

Total Cost:	65,010
Municipal Cost (direct):	32,505

5.6 IN-STREAM BIOSURVEYS

A continuing program of biosurveys to determine the characteristics of aquatic life in the region's streams is a basic program need. This need is presently not being met. Members of the Regional Water Quality Monitoring Advisory Committee believe that conducting biosurveys is basically a responsibility of the State of Colorado. However, given the present budgetary constraints of the Water Quality Control Division, it is not practical to anticipate that the Division will assume this responsibility in the near future. Therefore, it is recommended that municipalities and industries in the region provide funding for on-going biosurveys in major regional streams impacted by municipal and industrial discharges.

5.6.1 Cache la Poudre River

On the Cache la Poudre River biosurveys are intially recommended for the following locations:

1. Lion's Park, Laporte;
2. Martinez Park, Fort Collins;
3. I-25 Rest Area, below Fort Collins;
4. Highway 392 Bridge, west of Windsor;
5. Below Windsor/Kodak Discharge, River Mile 20;
6. Weld County Road 31 above Greeley;
7. Near confluence with South Platte, below Greeley.

Biosurveys are recommended to be conducted three times each year in the spring, summer and fall. It is estimated that this would cost approximately $2,000 per survey, or $6,000 total. This cost should be shared by all municipal and industrial dischargers on the Poudre River.

5.6.2 Big Thompson River

On the Big Thompson River, biosurveys are recommended for the following four locations near Loveland:

1. Wilson Avenue;
2. River Street Bridge;
3. Road 9C;
4. Road 3S.

These biosurveys should be conducted three times per year. Each survey has an estimated cost of $1,000 or $3,000 total. This cost would be shared by the City of Loveland and Great Western Sugar.

5.6.3 St. Vrain and South Platte Rivers

It would be highly desirable to have the biosurveys conducted on the St. Vrain River and in the South Platte River downstream of the Weld-Adams county line. However, because there are no significant municipal and industrial dischargers in this reach, it is recommended that such biosurveys be funded by the State.

It is recommended that biosurveys be conducted on the lower South Platte River in Weld County above and below Crow Creek, and in the Crow Creek drainage by the City of Greeley to determine baseline conditions prior to implementing a land treatment system in that area.

5.6.4 Advisory Committee

There is a need for establishment of accepted statewide standards for developing biosurvey information. These standards would include such items as the current to be used in shock tests, length of shock tests, qualifications of personnel conducting the tests, and general procedures used in biosurveying. Such standards are necessary to insure that biosurveys conducted by various entities and parties are scientifically sound and comparable. It is recommended that a Statewide Advisory Committee be established including representatives of government, the academic community, and industry to establish standards for biosurveying in Colorado water bodies.

5.7 BIOASSAYS

In 1978 and 1979, Fort Collins, Greeley, Windsor, and Kodak/ Colorado jointly sponsored a series of bioassays to determine the toxicity of ammonia, copper, zinc, silver and cadmium to aquatic life in the waters at various locations of the Cache la Poudre River. The results of these bioassays indicated that significant differences exist in toxicity levels between cold water mountainous streams and warm water plains streams. The bioassays were conducted on five pollutants. Additional pollutants, particularly metals, should be included in this warm water bioassay program.

The Larimer-Weld Regional Water Quality Monitoring Advisory Committee reached the following conclusions concerning bioassays:

1. Bioassays are an essential part of the water quality standards setting process for the State of Colorado.

2. An authorized State agency should be responsible for conducting bioassays. However, bioassays conducted by industry or other entities in accordance with established scientific procedures should be considered in the standards setting process.

3. There is great concern about the manner in which bioassays are conducted. The Colorado Department of Health should establish a Statewide Advisory Committee to develop standards for conducting bioassays to insure scientifically supportable data results from the bioassay tests. Committee members should be scientists from government, industry, and the academic community.

4. The Statewide Advisory Committee on Bioassays should review the results of all bioassay tests conducted which will become part of the water quality standards setting process to insure that those bioassays meet scientific standards, and are in fact applicable to the water bodies to which the standards will be applied.

5. Such a Statewide Advisory Committee should be established at the earliest possible date to oversee conduct of bioassays in the State.

6. The Statewide Advisory Committee should establish priorities for conducting bioassays on pollutants, and these priorities should be reflected in the program carried out by the authorized state agency.

7. The Statewide Advisory Committee should define the manner in which bioassays relate to the standards setting process, and any limitations in applying bioassay results to the water quality standards setting process.

5.8 RECOMMENDED INSTITUTIONAL RESPONSIBILITIES

The recommended institutional responsibilities reflect (1) the practicality of many on-going programs, (2) need for a central clearing house for water quality monitoring programs in the region, and (3) need for increased coordination of water quality monitoring in the Larimer-Weld Region. The following recommendations are made regarding continued institutional responsibilities for water quality monitoring in the Larimer-Weld Region.

5.8.1 U.S. Geological Survey

1. U.S. Geological Survey should continue its cooperative agreements with non-municipal agencies such as Water and Power Resources Service (formerly the U.S. Bureau of Reclamation), Northern Colorado Water Conservancy District, Left Hand-St. Vrain Conservancy District, and others.

2. The U.S. Geological Survey and the non-municipal cooperators should notify the Larimer-Weld Regional Council of Governments 208 Program Director of any intent to change the program in terms of constituents monitored, locations, or frequency of monitoring well in advance of the time the change is made.

3. The U.S. Geological Survey, the cooperating municipality(ies) and the Larimer-Weld Regional Council of Governments are jointly responsible for reviewing the results of monitoring programs, making any additional recommendations regarding deletion or addition of constituents, locations or frequency of sampling to insure continued cost-effectiveness of those programs.

5.8.2 Colorado Department of Health

1. The Colorado Department of Health should enter into cooperative agreements with the U.S. Geological Survey, where it can do so without adverse budgetary impacts to its monitoring program, to insure greater cost-effectiveness to the overall program in the Larimer-Weld Region and the State.

2. The Colorado Department of Health should inform the Larimer-Weld Regional Council of Governments 208 Program Director of any intent to make any changes in frequency, location, or constituents sampled in its monitoring program. Changes should be made in consultation with the Larimer-Weld Regional Council of Governments and its Regional Water Quality Monitoring Advisory Committee.

3. The Colorado Department of Health should participate in the Larimer-Weld Regional Council of Governments' Regional Water Quality Advisory Committee.

4. The Colorado Department of Health should establish and participate in a Statewide Advisory Committee on Bioassays and Biosurveys.

5. The Colorado Department of Health should inform the Larimer-Weld Regional Council of Governments of any special surveys it intends to engage in involving water quality monitoring, bioassays or biosurveys in the Larimer-Weld Region. This should include any activities proposed, reviewed, funded or implemented by the Colorado Department of Health.

5.8.3 Larimer-Weld Regional Council of Governments

The Larimer-Weld Regional Council of Governments has the following responsibilities regarding water quality monitoring:

1. The Larimer-Weld COG should enter into inter-governmental agreements with municipalities and the U.S.G.S. for all cooperative monitoring programs conducted in the Region.

2. The Larimer-Weld COG should establish an on-going Regional Water Quality Advisory Committee to review the results of monitoring programs conducted in the Region, including biosurveys and bioassays conducted by others. The committee should meet periodically and make recommendations concerning the overall effectiveness of the program, and any changes that should be made in the program.

3. The Larimer-Weld Regional COG should recommend to the State that a Statewide Advisory Committee on Bioassays and Biosurveys be formed in accordance with Sections 5.2 and 5.3 of this report.

4. The Larimer-Weld COG should conduct periodic reviews of the regional water quality monitoring program and make recommendations to all participants regarding its effectiveness, with recommendations for changes as appropriate. Review and recommendations should be made on no less than an annual basis.

5. The Larimer-Weld COG should function as a central information receiving house for all water quality data collected in the region.

6. The Larimer-Weld COG should maintain a list of all current on-going monitoring activities in the Region, including those conducted by the U.S. Geological Survey in cooperation with others, special studies conducted by municipalities, State and Federal agencies and others, and keep the Regional Water Quality Monitoring Advisory Committee informed of those on-going studies.

7. The Larimer-Weld COG should make specific budgetary and staffing commitments to carry out these recommendations.

5.8.4 Municipal and Industrial Dischargers

1. All municipalities desiring to implement monitoring programs in cooperation with the U.S. Geological Survey should do so through inter-governmental agreements among municipalities, Larimer-Weld Regional Council of Governments, and the U.S. Geological Survey. Once local and Federal funding is authorized, municipalities should enter into an inter-governmental agreement with the Larimer-Weld Regional Council of Governments for pass-through funding of its share of the monitoring program. The Larimer-Weld Regional Council of Governments will simultaneously execute an agreement with the U.S. Geological Survey for program implementation. The Larimer-Weld Regional Council of Governments will receive funds directly from the municipalities and will disburse funds directly to the U.S.G.S. to pay for the municipal share of the program.

2. Dischargers should participate in the Regional Water Quality Monitoring Advisory Committee.

3. Dischargers should inform the Larimer-Weld Rregional COG 208 Program Director of any special surveys conducted in the region.

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APPENDIX A

EXISTING WATER QUALITY/QUANTITY MONITORING PROGRAMS

This appendix provides a tabulation of water quantity and water quality monitoring stations operated by the U.S. Geological Survey in cooperation with others, the State Engineer (stream flow stations only), and the Colorado Department of Health. The tabulation is current as of July 1, 1979.

Stations are listed upstream to downstream. If water quality constituents are sampled, they are listed in the column entitled "Water Quality Constituents Sampled." The data in the "Frequency" column applies to water quality constituents only. The dates indicated in the column entitled "Stream Flow" indicate the period of record for stream flow measurements only, and do not apply to water quality sampling in most cases.

The tables are organized by river basin as follows:

TABLE NO.	RIVER BASIN
3.0-A	Cache la Poudre
3.0-B	Big Thompson
3.0-C	St. Vrain
3.0-D	South Platte

TABLE 3.0-A Larimer/Weld Water Quality Monitoring Stations-Cache la Poudre River Basin

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Cameron Pass Ditch at Cameron Pass (U.S.G.S.)	06745500	yes (1912-)		
Michigan Ditch at Cameron Pass (U.S.G.S.)	06746000	yes (1905-12, 1913-)		
Joe Wright Creek near Cameron Pass (U.S.G.S.)	06746100	yes (1974-)		
Skyline Ditch at Chambers Lake (State)	06746500	yes (1894-)		
Laramie Poudre Tunnel near Chambers Lake (State)	06747000	yes (1913-)		
Bob Ditch near Glenderey (State)	06747200	yes (1919-)		
Columbine Ditch at Deadman Hill (State)	06750000	yes (1920-)		
Wilso Supply Ditch near Eaton Res. (State)	06750500	yes (1902-12, 1913-)		
Grand Ditch at LaPoudre Pass (State)	09010000	yes (1895-1903,04-09,1910-)		

TABLE 3.0-A Larimer/Weld Water Quality Monitoring Stations-Cache la Poudre River Basin (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
South Fork Cache la Poudre River near Rustic (U.S. (U.S.G.S.)	06748600	Yes		
Cache la Poudre above Ft. Collins (State) Greeley W.S. Division Headgate (Upstream Headgate)	26		Temperature, pH, Dissolved Oxygen, 5-day BOD, Turbidity, Suspended Solids, Dissolved Solids, Ammonia-N, NO_2-N, NO_3-N, Total Phosphorus as P, Calcium, Magnesium, Sodium, Chloride, SAR (calculated), Total Hardness, Total Copper, Total Iron, Total Lead, Total Manganese, Total Zinc and Fecal Coliforms. Specific Conductivity, Total Kjeldahl-N, Sulfate, Total Cyanide, Total Cadmium. Total Alkalinity, Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron and Potassium.	Bi-Monthly High and Low Flow

TABLE 3.0-A Larimer/Weld Water Quality Monitoring Stations-Cache la Poudre River Basin (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Cache la Poudre River at MOC near Ft. Collins (U.S.G.S.), 0.5 miles downstream from the headgate of Poudre Valley Canal and 1.2 miles upstream from Louistown Creek	06752000	yes (1881-)	LAB WATSTR NAME 2 00410 Alk,Tot (As CACO3) 8 00440 Bicarbonate 12 00915 Calcium Diss 15 00940 Chloride Diss 28 70301 Residue Dis Calc Sum 29 70303 Residue Dis Ton/Aft 30 70302 Residue Dis Ton/Day 31 00950 Fluoride Diss 32 00902 Hardness Noncarb 33 00900 Hardness Total 36 01046 Iron Dissolved 40 00925 Magnesium Diss 42 01056 Manganese Dissolved 54 00935 Potassium Diss 56 00955 Silica Dissolved 57 00931 SAR 59 00930 Sodium Diss 60 00932 Sodium Percent 63 00945 Sulfate Diss 69 00000 Sp. Conductance Lab 74 00660 Phosphate Dis Ortho 128 00666 Phosphorus Dis As P 162 00671 Phos Ortho Dis As P 228 00631 NO2-NO3 as n Diss A129 Phos Tot as P A130 Phos Tot as PO4 A268 Nitrogen Diss KJD A301 Nitrogen NH4 ASN DIS	Monthly
			Temp Conductivity pH D.O.	Monthly

TABLE 3.0-A Larimer/Weld Water Quality Monitoring Stations-Cache la Poudre River Basin (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Horsetooth Reservoir Near Ft. Collins (U.S.G.S.)	06737500	yes (1951-)	27 70300 Residue Dis 180C 29 70303 Residue Dis Ton/Aft 30 70302 Residue Dis Ton/Day 45 71851 NITR. NO3 as NO3 DIS 46 71856 NITR. NO2 AS NO2 DIS 69 00000 Sp. Conductance Lab 123 00610 Nitrogen NH4 Asn Tot 129 00665 Phosphorus Tot as P 160 00613 Nitrogen NO2 ASN Dis 167 00618 Nitrogen NO3 ASN Dis 228 00631 NO2 NO3 as N Diss A55 Algal Growth Potential 309 (3 depths) Temp Conductivity pH D.O. Total Coli Fecal Coli	Monthly

TABLE 3.0-A Larimer/Weld Water Quality Monitoring Stations-Cache la Poudre River Basin (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Cache la Poudre River at Ft. Collins (U.S.G.S.) on left bank 150' downstream from the Lincoln Ave. Bridge, 2200' east of the intersection of College (Hwy 287) and Mountain Avenues.	06752260	yes (1975-)	LAB WATSTR NAME 2 00410 Alk,Tot (As CACO3) 8 00440 Bicarbonate 12 00915 Calcium Diss 15 00940 Chloride Diss 28 70301 Residue Dis Calc Sum 29 70303 Residue Dis Ton/Aft 30 70302 Residue Dis Ton/Day 31 00950 Fluoride Diss 32 00902 Hardness Noncarb 33 00900 Hardness Total 36 01046 Iron Dissolved 40 00925 Magnesium Diss 42 01056 Manganese Dissolved 54 00935 Potassium Diss 56 00955 Silica Dissolved 57 00931 SAR 59 00930 Sodium Diss 60 00932 Sodium Percent 63 00945 Sulfate Diss 69 00000 Sp. Conductance Lab 74 00660 Phosphate Dis Ortho 128 00666 Phosphorus Dis As P 162 00671 Phos Ortho Dis As P 228 00631 NO2-NO3 as n Diss A129 Phos Tot as P A130 Phos Tot as PO4 A268 Nitrogen Diss KJD A301 Nitrogen NH4 ASN DIS	Monthly
			Temp Conductivity pH D.O.	Monthly

TABLE 3.0-A Larimer/Weld Water Quality Monitoring Stations-Cache la Poudre River Basin (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Cache la Poudre River at Ft. Collins at Prospect Street (U.S.G.S.)	06752270	No	LAB WATSTR NAME 2 00410 Alk,Tot (As CACO3) 8 00440 Bicarbonate 12 00915 Calcium Diss 15 00940 Chloride Diss 28 70301 Residue Dis Calc Sum 29 70303 Residue Dis Ton/Aft 30 70302 Residue Dis Ton/Day 31 00950 Fluoride Diss 32 00902 Hardness Noncarb 33 00900 Hardness Total 36 01046 Iron Dissolved 40 00925 Magnesium Diss 42 01056 Manganese Dissolved 54 00935 Potassium Diss 56 00955 Silica Dissolved 57 00931 SAR 59 00930 Sodium Diss 60 00932 Sodium Percent 63 00945 Sulfate Diss 69 00000 Sp. Conductance Lab 74 00660 Phosphate Dis Ortho 128 00666 Phosphorus Dis As P 162 00671 Phos Ortho Dis As P 228 00631 NO2-NO3 as n Diss A129 Phos Tot as P A130 Phos Tot as PO4 A268 Nitrogen Diss KJD A301 Nitrogen NH4 ASN DIS	Monthly

TABLE 3.0-A Larimer/Weld Water Quality Monitoring Stations-Cache la Poudre River Basin (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Cache la Poudre River at Timnath (U.S.G.S.), near I-25 rest area. Same as Colorado Department of Health Station #126	06752300	No	LAB WATSTR NAME 2 00410 Alk,Tot (As CACO3) 8 00440 Bicarbonate 12 00915 Calcium Diss 15 00940 Chloride Diss 28 70301 Residue Dis Calc Sum 29 70303 Residue Dis Ton/Aft 30 70302 Residue Dis Ton/Day 31 00950 Fluoride Diss 32 00902 Hardness Noncarb 33 00900 Hardness Total 36 01046 Iron Dissolved 40 00925 Magnesium Diss 42 01056 Manganese Dissolved 54 00935 Potassium Diss 56 00955 Silica Dissolved 57 00931 SAR 59 00930 Sodium Diss 60 00932 Sodium Percent 63 00945 Sulfate Diss 69 00000 Sp. Conductance Lab 74 00660 Phosphate Dis Ortho 128 00666 Phosphorus Dis As P 162 00671 Phos Ortho Dis As P 228 00631 NO2-NO3 as n Diss A129 Phos Tot as P A130 Phos Tot as PO4 A268 Nitrogen Diss KJD A301 Nitrogen NH4 ASN DIS *Temp *Conductivity *pH *D.O.	Monthly

TABLE 3.0-A Larimer/Weld Water Quality Monitoring Stations-Cache la Poudre River Basin (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Cache la Poudre River near I-25 rest area south-east of Ft. Collins. (State)	126	No	Temperature, pH, Dissolved Oxygen, 5-day BOD, Turbidity, Suspended Solids, Dissolved Solids, Ammonia-N, NO_2-N, NO_3-N, Total Phosphorus as P, Calcium, Magnesium, Sodium, Chloride, SAR (calculated), Total Hardness, Total Copper, Total Iron, Total Lead, Total Manganese, Total Zinc and Fecal Coliforms.	Bi-Weekly
			Specific Conductivity, Total Kjeldahl-N, Sulfate, Total Cyanide, Total Cadmium.	Bi-Monthly
			Total Alkalinity, Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron and Potassium.	High and Low Flow

TABLE 3.0-A Larimer/Weld Water Quality Monitoring Stations-Cache la Poudre River Basin (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Cache la Poudre River near Greeley (U.S.G.S.)	06752500	yes (1903-04, 14-19, 1924-)	LAB WATSTR NAME 2 00410 ALK TOT (AS CACO3) 8 00440 BICARBONATE 12 00915 CALCIUM DISS 15 00940 CHLORIDE DISS 28 70301 RESIDUE DIS CALC SUM 29 70303 RESIDUE DIS TON/AFT 30 70302 RESIDUE DIS TON/DAY 31 00950 FLUORIDE DISS 32 00902 HARDNESS NONCARB 33 00900 HARDNESS TOTAL 36 01046 IRON DISSOLVED 40 00925 MAGNESIUM DISS 42 01056 MANGANESE DISSOLVED 54 00935 POTASSIUM DISS 56 00955 SILICA DISSOLVED 57 00931 SAR 59 00930 SODIUM DISS 60 00932 SODIUM PERCENT 63 00945 SULFATE DISS 69 00000 SP. CONDUCTANCE LAB 74 00660 PHOSPHATE DIS ORTHO 128 00666 PHOSPHORUS DIS AS P 162 00671 PHOS ORTHO DIS AS P 228 00631 NO2+NO3 AS N DISS Temp Conductivity pH D.O.	Monthly

TABLE 3.0-A Larimer/Weld Water Quality Monitoring Stations-Cache la Poudre River Basin (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Cache la Poudre near Greeley, U.S.G.S. Gaging Station	27		Temperature, pH, Dissolved Oxygen, 5-day BOD, Turbidity, Suspended Solids, Dissolved Solids, Ammonia-N, NO_2-N, NO_3-N, Total Phosphorus as P, Calcium, Magnesium, Sodium, Chloride, SAR (calculated), Total Hardness, Total Copper, Total Iron, Total Lead, Total Manganese, Total Zinc and Fecal Coliforms.	Bi-Weekly
			Specific Conductivity, Total Kjeldahl-N, Sulfate, Total Cyanide, Total Cadmium Total Chromium[1/], Total Alpha[2/], and Beta[3/] Analysis.	Bi-Monthly
			Total Alkalinity, Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron and Potassium.	High & Low Flow

1/ If positive, tests for trivalent and hexavalent cromium will be run.
2/ If 15 pCi/l, particular radionuclide(s) determined.
3/ If 50 pCi/l, particular dionuclide(s) determined.

TABLE 3.0-B Larimer/Weld Water Quality Monitoring Stations-Big Thompson River

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Eureka Ditch near Flatop Mountain (State Engineer)	09012000	yes by State (1939-)		
Alva B. Adams Tunnel Near Estes Park (U.S.G.S.)	09013000	yes by State (1946-)	LAB WATSTR NAME 2 00410 Alk,Tot (As CACO3) 8 00440 Bicarbonate 12 00915 Calcium Diss 15 00940 Chloride Diss 28 70301 Residue Dis Calc Sum 29 70303 Residue Dis Ton/Aft 30 70302 Residue Dis Ton/Day 31 00950 Fluoride Diss 32 00902 Hardness Noncarb 33 00900 Hardness Total 36 01046 Iron Dissolved 40 00925 Magnesium Diss 42 01056 Manganese Dissolved 54 00935 Potassium Diss 56 00955 Silica Dissolved 57 00931 SAR 59 00930 Sodium Diss 60 00932 Sodium Percent 63 00945 Sulfate Diss 69 00000 Sp. Conductance Lab 74 00660 Phosphate Dis Ortho 128 00666 Phosphorus Dis As P 162 00671 Phos Ortho Dis As P 228 00631 NO2-NO3 as n Diss Temp Conductivity pH D.O. Total Coli. Fecal Coliform	Monthly

TABLE 3.0-B Larimer/Weld Water Quality Monitoring Stations-Big Thompson River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Olympus Tunnel at Lake Estes (U.S.G.S.)	06734900	No	LAB WATSTR NAME 2 00410 Alk,Tot (As CACO3) 8 00440 Bicarbonate 12 00915 Calcium Diss 15 00940 Chloride Diss 28 70301 Residue Dis Calc Sum 29 70303 Residue Dis Ton/Aft 30 70302 Residue Dis Ton/Day 31 00950 Fluoride Diss 32 00902 Hardness Noncarb 33 00900 Hardness Total 36 01046 Iron Dissolved 40 00925 Magnesium Diss 42 01056 Manganese Dissolved 54 00935 Potassium Diss 56 00955 Silica Dissolved 57 00931 SAR 59 00930 Sodium Diss 60 00932 Sodium Percent 63 00945 Sulfate Diss 69 00000 Sp. Conductance Lab 74 00660 Phosphate Dis Ortho 128 00666 Phosphorus Dis As P 162 00671 Phos Ortho Dis As P 228 00631 NO2-NO3 as n Diss (Continued on next page.)	Monthly

TABLE 3.0-B Larimer/Weld Water Quality Monitoring Stations-Big Thompson River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Olympus Tunnel at Lake Estes (U.S.G.S.) (Continued)	06734900	No	27 70300 Residue Dis 180C 29 70303 Residue Dis Ton/Aft 30 70302 Residue Dis Ton/Day 45 71851 NITR. NO3 as NO3 DIS 46 71856 NITR. NO2 AS NO2 DIS 69 00000 Sp. Conductance Lab 123 00610 Nitrogen NH4 Asn Tot 129 00665 Phosphorus Tot as P 160 00613 Nitrogen NO2 ASN Dis 167 00618 Nitrogen NO3 ASN Dis 228 00631 NO2 NO3 as N Diss A55 Algal Growth Potential 309 (3 depths) Temp Conductivity pH D.O. Total Coli Fecal Coli	Monthly

TABLE 3.0-B Larimer/Weld Water Quality Monitoring Stations-Big Thompson River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Big Thompson River at Estes Park (U.S.G.S.), on right bank 600' downstream from bridge on State Hwy 7 & 66, .3 miles northwest of Estes Power Plant	06733000	yes (1946-)	Map shows station sampled for water quality - no information on constituents sampled.	
Big Thompson below Estes Park (State). 1st bridge by Chief Motel	125		Temperature, pH, Dissolved Oxygen, 5-day BOD, Turbidity, Suspended Solids, Dissolved Solids, Ammonia-N, NO_2-N, NO_3-N, Total Phosphorus as P, Calcium, Magnesium, Sodium, Chloride, SAR (calculated), Total Hardness, Total Copper, Total Iron, Total Lead, Total Manganese, Total Zinc and Fecal Coliforms.	Bi-Monthly
			Specific Conductivity, Total Kjeldahl-N, Sulfate, Total Cyanide, Total Cadmium.	
			Total Alkalinity, Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron and Potassium.	High & Low Flow

TABLE 3.0-B Larimer/Weld Water Quality Monitoring Stations-Big Thompson River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Big Thompson River near Estes Park (U.S.G.S.)	06735500	yes (1930-)		
Big Thompson at Dille Tunnel near Drake (U.S.G.S.)	06736700	No	LAB WATSTR NAME 2 00410 Alk,Tot (As CACO3) 8 00440 Bicarbonate 12 00915 Calcium Diss 15 00940 Chloride Diss 28 70301 Residue Dis Calc Sum 29 70303 Residue Dis Ton/Aft 30 70302 Residue Dis Ton/Day 31 00950 Fluoride Diss 32 00902 Hardness Noncarb 33 00900 Hardness Total 36 01046 Iron Dissolved 40 00925 Magnesium Diss 42 01056 Manganese Dissolved 54 00935 Potassium Diss 56 00955 Silica Dissolved 57 00931 SAR 59 00930 Sodium Diss 60 00932 Sodium Percent 63 00945 Sulfate Diss 69 00000 Sp. Conductance Lab 74 00660 Phosphate Dis Ortho 128 00666 Phosphorus Dis As P 162 00671 Phos Ortho Dis As P 228 00631 NO2-NO3 as n Diss Temp Conductivity pH D.O. Total Coli Fecal Coliform	Monthly

TABLE 3.0-B Larimer/Weld Water Quality Monitoring Stations-Big Thompson River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Big Thompson near Loveland Big Thompson School (State)	114		Temperature, pH, Dissolved Oxygen, 5-day BOD, Turbidity, Suspended Solids, Dissolved Solids, Ammonia-N, NO_2-N, NO_3-N, Total Phosphorus assP, Calcium, Magnesium, Sodium, Chloride, SAR (calculated), Total Hardness, Total Copper, Total Iron, Total Lead, Total Manganese, Total Zinc and Fecal Coliforms. Specific Conductivity, Total Kjeldahl-N, Sulfate, Total Cyanide, Total Cadmium. Total Alkalinity, Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron and Potassium.	Bi-monthly High & Low Flow

TABLE 3.0-B Larimer/Weld Water Quality Monitoring Stations-Big Thompson River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Big Thompson at MOC near Drake (U.S.G.S.)	06738000	yes (1887-92, 1895-1903, 1926-33, 1938-41, 1951-)		
Handy Ditch near Arkine (U.S.G.S.)	06738500	yes (1899-1900, 1903-)	Not on Map	
Carter Lake near Berthoud (U.S.G.S.)	06742500	yes (1954-)	27 70300 Residue Dis 180C 29 70303 Residue Dis Ton/Aft 30 70302 Residue Dis Ton/Day 45 71851 NITR. NO3 as NO3 DIS 46 71856 NITR. NO2 AS NO2 DIS 69 00000 Sp. Conductance Lab 123 00610 Nitrogen NH4 Asn Tot 129 00665 Phosphorus Tot as P 160 00613 Nitrogen NO2 ASN Dis 167 00618 Nitrogen NO3 ASN Dis 228 00631 NO2 NO3 as N Diss A55 Algal Growth Potential 309 (3 depths) Temp Conductivity pH D.O. Total Coli Fecal Coli	Monthly

TABLE 3.0-B Larimer/Weld Water Quality Monitoring Stations-Big Thompson River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Little Thompson near Berthoud at Hwy 287 (State)	123	No	Temperature, pH, Dissolved Oxygen, 5-day BOD, Turbidity, Suspended Solids, Dissolved Solids, Ammonia-N, NO_2-N, NO_3-N, Total Phosphorus assP, Calcium, Magnesium, Sodium, Chloride, SAR (calculated), Total Hardness, Total Copper, Total Iron, Total Lead, Total Manganese, Total Zinc and Fecal Coliforms.	Bi-Monthly
			Specific Conductivity, Total Kjeldahl-N, Sulfate, Total Cyanide, Total Cadmium.	
			Total Alkalinity, Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron and Potassium.	High & Low Flow

TABLE 3.0-B Larimer/Weld Water Quality Monitoring Stations-Big Thompson River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Little Thompson (State) ½ mile west of Milliken on Diagonal to Windsor on Hwy 257 Bridge	124	No	Temperature, pH, Dissolved Oxygen, 5-day BOD, Turbidity, Suspended Solids, Dissolved Solids, Ammonia-N, NO_2-N, NO_3-N, Total Phosphorus assP, Calcium, Magnesium, Sodium, Chloride, SAR (calculated), Total Hardness, Total Copper, Total Iron, Total Lead, Total Manganese, Total Zinc and Fecal Coliforms.	Bi-weekly
			Specific Conductivity, Total Kjeldahl-N, Sulfate, Total Cyanide, Total Cadmium, Total Selenium.	Bi-monthly
			Total Alkalinity, Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron and Potassium.	Low and High Flow

TABLE 3.0-B Larimer/Weld Water Quality Monitoring Stations-Big Thompson River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Big Thompson near Mouth (State)	28		Temperature, pH, Dissolved Oxygen, 5-day BOD, Turbidity, Suspended Solids, Dissolved Solids, Ammonia-N, NO_2-N, NO_3-N, Total Phosphorus as P, Calcium, Magnesium, Sodium, Chloride, SAR (calculated), Total Hardness, Total Copper, Total Iron, Total Lead, Total Manganese, Total Zinc and Fecal Coliforms.	Bi-weekly
			Specific Conductivity, Total Kjeldahl-N, Sulfate, Total Cyanide, Total Cadmium.	Bi-monthly
			Total Arsenic, Total Alpha[2/] and Total Beta[3/] analyses.	
			Total Alkalinity, Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron and Potassium.	High and Low Flow

2/ If >15 pCi/l, particular radionuclide(s) determined.
3/ If >50 pCi/l, particular radionuclide(s) determined.

TABLE 3.0-B Larimer/Weld Water Quality Monitoring Stations-Big Thompson River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Big Thompson River at Mouth near LaSalle (U.S.G.S.)	06744000	yes (1914 & 15, 1927-)	LAB WATSTR NAME 2 00410 Alk,Tot (As CACO3) 8 00440 Bicarbonate 12 00915 Calcium Diss 15 00940 Chloride Diss 28 70301 Residue Dis Calc Sum 29 70303 Residue Dis Ton/Aft 30 70302 Residue Dis Ton/Day 31 00950 Fluoride Diss 32 00902 Hardness Noncarb 33 00900 Hardness Total 36 01046 Iron Dissolved 40 00925 Magnesium Diss 42 01056 Manganese Dissolved 54 00935 Potassium Diss 56 00955 Silica Dissolved 57 00931 SAR 59 00930 Sodium Diss 60 00932 Sodium Percent 63 00945 Sulfate Diss 69 00000 Sp. Conductance Lab 74 00660 Phosphate Dis Ortho 128 00666 Phosphorus Dis As P 162 00671 Phos Ortho Dis As P 228 00631 NO2-NO3 as n Diss Temp Conductivity pH D.O. Total Coli Fecal Coliform	Monthly

TABLE 3.0-C Larimer/Weld Water Quality Monitoring Stations-St. Vrain River

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Boulder Creek at Boulder/Weld County Line (State)	33		Temperature, pH, Dissolved Oxygen, 5-day BOD, Turbidity, Suspended Solids, Dissolved Solids, Ammonia-N, NO_2-N, NO_3-N, Total Phosphorus as P, Calcium, Magnesium, Sodium, Chloride, SAR (calculated), Total Hardness, Total Copper, Total Iron, Total Lead, Total Manganese, Total Zinc and Fecal Coliforms.	Bi-Weekly
			Specific Conductivity, Total Kjeldahl-N, Sulfate, Total Cyanide, Total Cadmium, Total Arsenic.	Bi-Monthly
			Total Alkalinity, Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron and Potassium.	High & Low Flow

TABLE 3.0-C Larimer /Weld Water Quality Monitoring Stations-St. Vrain River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
Boulder Creek at Mouth near Platteville (U.S.G.S.)	06730500	yes (1927-49, 1951-55 1979-)	LAB WATSTR NAME 2 00410 Alk,Tot (As CACO3) 8 00440 Bicarbonate 12 00915 Calcium Diss 15 00940 Chloride Diss 28 70301 Residue Dis Calc Sum 29 70303 Residue Dis Ton/Aft 30 70302 Residue Dis Ton/Day 31 00950 Fluoride Diss 32 00902 Hardness Noncarb 33 00900 Hardness Total 36 01046 Iron Dissolved 40 00925 Magnesium Diss 42 01056 Manganese Dissolved 54 00935 Potassium Diss 56 00955 Silica Dissolved 57 00931 SAR 59 00930 Sodium Diss 60 00932 Sodium Percent 63 00945 Sulfate Diss 69 00000 Sp. Conductance Lab 74 00660 Phosphate Dis Ortho 128 00666 Phosphorus Dis As P 162 00671 Phos Ortho Dis As P 228 00631 NO2-NO3 as n Diss Temp Conductivity pH D.O.	No Data Available

TABLE 3.0-C Larimer/Weld Water Quality Monitoring Stations-St. Vrain River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
St. Vrain below Longmont (State)	31		Temperature, pH, Dissolved Oxygen, 5-day BOD, Turbidity, Suspended Solids, Dissolved Solids, Ammonia-N, NO_2-N, NO_3-N, Total Phosphorus assP, Calcium, Magnesium, Sodium, Chloride, SAR (calculated), Total Hardness, Total Copper, Total Iron, Total Lead, Total Manganese, Total Zinc and Fecal Coliforms.	Monthly
			Specific Conductivity, Total Kjeldahl-N, Sulfate, Total Cyanide, Total Cadmium.	Bi-monthly
			Total Alkalinity, Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron and Potassium.	High & Low Flow

TABLE 3.0-C Larimer/Weld Water Quality Monitoring Stations-St. Vrain River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
St. Vrain Creek below Longmont (U.S.G.S.)	06725450	yes (1977-)	LAB WATSTR NAME 2 00410 Alk,Tot (As CACO3) 8 00440 Bicarbonate 12 00915 Calcium Diss 15 00940 Chloride Diss 28 70301 Residue Dis Calc Sum 29 70303 Residue Dis Ton/Aft 30 70302 Residue Dis Ton/Day 31 00950 Fluoride Diss 32 00902 Hardness Noncarb 33 00900 Hardness Total 36 01046 Iron Dissolved 40 00925 Magnesium Diss 42 01056 Manganese Dissolved 54 00935 Potassium Diss 56 00955 Silica Dissolved 57 00931 SAR 59 00930 Sodium Diss 60 00932 Sodium Percent 63 00945 Sulfate Diss 69 00000 Sp. Conductance Lab 74 00660 Phosphate Dis Ortho 128 00666 Phosphorus Dis As P 162 00671 Phos Ortho Dis As P 228 00631 NO2-NO3 as n Diss A129 Phos Tot as P A268 Nitrogen Diss KJD A301 Nitrogen NH4 ASN DIS Temp Conductivity pH D.O. Sediment	Monthly
			474 Pesticides	Annually

TABLE 3.0-C Larimer/Weld Water Quality Monitoring Stations-St. Vrain River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
St. Vrain near Mouth (State)	29		Temperature, pH, Dissolved Oxygen, 5-day BOD, Turbidity, Suspended Solids, Dissolved Solids, Ammonia-N, NO_2-N, NO_3-N, Total Phosphorus as P, Calcium, Magnesium, Sodium, Chloride, SAR (calculated), Total Hardness, Total Copper, Total Iron, Total Lead, Total Manganese, Total Zinc and Fecal Coliforms.	Bi-monthly
			Specific Conductivity, Total Kjeldahl-N, Sulfate, Total Cyanide, Total Cadmium, Total Arsenic.	
			Total Alkalinity, Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron and Potassium.	High & Low Flow

TABLE 3.0-C Larimer/Weld Water Quality Monitoring Stations-St. Vrain River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
St. Vrain at Mouth near Platteville (U.S.G.S.)	06731000	yes	LAB WATSTR NAME 2 00410 Alk,Tot (As CACO3) 8 00440 Bicarbonate 12 00915 Calcium Diss 15 00940 Chloride Diss 28 70301 Residue Dis Calc Sum 29 70303 Residue Dis Ton/Aft 30 70302 Residue Dis Ton/Day 31 00950 Fluoride Diss 32 00902 Hardness Noncarb 33 00900 Hardness Total 36 01046 Iron Dissolved 40 00925 Magnesium Diss 42 01056 Manganese Dissolved 54 00935 Potassium Diss 56 00955 Silica Dissolved 57 00931 SAR 59 00930 Sodium Diss 60 00932 Sodium Percent 63 00945 Sulfate Diss 69 00000 Sp. Conductance Lab 74 00660 Phosphate Dis Ortho 128 00666 Phosphorus Dis As P 162 00671 Phos Ortho Dis As P 228 00631 NO2-NO3 as n Diss Temp Conductivity pH D.O.	Monthly

TABLE 3.0-D Larimer/Weld Water Quality Monitoring Stations-South Platte River				
Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
South Platte River near Platteville (State)	130		Temperature, pH, Dissolved Oxygen, 5-day BOD, Turbidity, Suspended Solids, Dissolved Solids, Ammonia-N, NO_2-N, NO_3-N, Total Phosphorus as P, Calcium, Magnesium, Sodium, Chloride, SAR (calculated), Total Hardness, Total Copper, Total Iron, Total Lead, Total Manganese, Total Zinc and Fecal Coliforms.	Bi-Monthly
			Specific Conductivity, Total Kjeldahl-N, Sulfate, Total Cyanide, Total Cadmium.	
			Total Chromium[1/], Total Alpha[2/], and Total Beta[3/] Analyses.	
			Total Alkalinity, Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron and Potassium.	High & Low Flow
Owl Creek Trib. near Rockpoint (U.S.G.S.)	06753800	yes (1970-)		

1/ If positive, tests for trivalent and hexavalent cromium will be run.
2/ If 15 pCi/l, particular radionuclide(s) determined.
3/ If 50 pCi/l, particular radionuclide(s) determined.

TABLE 3.0-D Larimer/Weld Water Quality Monitoring Stations-South Platte River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
South Platte River at Kersey (U.S.G.S.)	06754000	yes (1901-03, 1905-)	LAB WATSTR NAME 2 00410 Alk,Tot (As CACO3) 8 00440 Bicarbonate 12 00915 Calcium Diss 15 00940 Chloride Diss 28 70301 Residue Dis Calc Sum 29 70303 Residue Dis Ton/Aft 30 70302 Residue Dis Ton/Day 31 00950 Fluoride Diss 32 00902 Hardness Noncarb 33 00900 Hardness Total 36 01046 Iron Dissolved 40 00925 Magnesium Diss 42 01056 Manganese Dissolved 54 00935 Potassium Diss 56 00955 Silica Dissolved 57 00931 SAR 59 00930 Sodium Diss 60 00932 Sodium Percent 63 00945 Sulfate Diss 69 00000 Sp. Conductance Lab 74 00660 Phosphate Dis Ortho 128 00666 Phosphorus Dis As P 162 00671 Phos Ortho Dis As P 228 00631 NO2-NO3 as n Diss Temp Conductivity pH D.O.	Bi-Weekly April thru Sept. Monthly other
			A55 Algal Growth Potential	Monthly

TABLE 3.0-D Larimer/Weld Water Quality Monitoring Stations-South Platte River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
South Platte near Kersey (State)	22		Temperature, pH, Dissolved Oxygen, 5-day BOD, Turbidity, Suspended Solids, Dissolved Solids, Ammonia-N, NO_2-N, NO_3-N, Total Phosphorus as P, Calcium, Magnesium, Sodium, Chloride, SAR (calculated), Total Hardness, Total Copper, Total Iron, Total Lead, Total Manganese, Total Zinc and Fecal Coliforms.	Bi-weekly
			Specific Conductivity, Total Kjeldahl-N, Sulfate, Total Cyanide, Total Cadmium.	Bi-monthly
			Total Alkalinity, Total Aluminum, Total Arsenic, Total Beryllium, Total Mercury, Total Nickel, Total Selenium, Total Silver, Total Uranium, Boron and Potassium.	High & Low Flow
Geary Creek Trib. near Rockpoint (U.S.G.S.)	06756200	yes (1970-)		
Goose Creek near Hoyt (U.S.G.S.)	06758400	yes (1970-)		

TABLE 3.0-D Larimer/Weld Water Quality Monitoring Stations-South Platte River (Continued)

Station Location	Station Number	Stream Flow	Water Quality Constituents Sampled	Frequency
South Platte River near Weldona (vicinity of Larimer/Weld Co's) (U.S.G.S.)	06758500	yes (1952-)	LAB WATSTR NAME 2 00410 Alk,Tot (As CACO3) 8 00440 Bicarbonate 12 00915 Calcium Diss 15 00940 Chloride Diss 28 70301 Residue Dis Calc Sum 29 70303 Residue Dis Ton/Aft 30 70302 Residue Dis Ton/Day 31 00950 Fluoride Diss 32 00902 Hardness Noncarb 33 00900 Hardness Total 36 01046 Iron Dissolved 40 00925 Magnesium Diss 42 01056 Manganese Dissolved 54 00935 Potassium Diss 56 00955 Silica Dissolved 57 00931 SAR 59 00930 Sodium Diss 60 00932 Sodium Percent 63 00945 Sulfate Diss 69 00000 Sp. Conductance Lab 74 00660 Phosphate Dis Ortho 128 00666 Phosphorus Dis As P 162 00671 Phos Ortho Dis As P 228 00631 NO2-NO3 as n Diss Temp Conductivity | A55 Algal Growth Potential pH D.O.	Bi-weekly April thru Sept. monthly other times
Igo Creek Trib. near Keota (U.S.G.S.)	06760200	yes (1970-)		Monthly