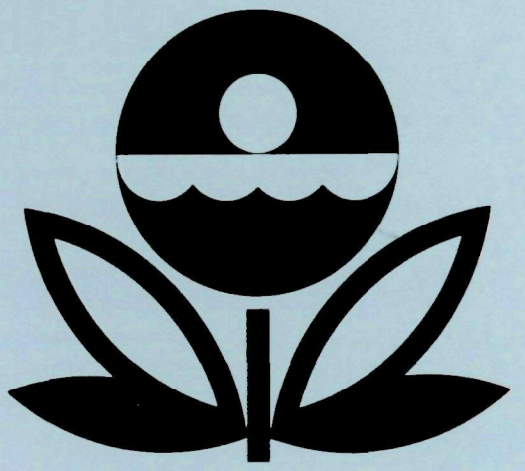
U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY

WORKING PAPER SERIES



REPORT

ON

DEER CREEK RESERVOIR

WASATCH COUNTY

UTAH

EPA REGION VIII

WORKING PAPER No. 837

CORVALLIS ENVIRONMENTAL RESEARCH LABORATORY - CORVALLIS, OREGON

and

ENVIRONMENTAL MONITORING & SUPPORT LABORATORY - LAS VEGAS, NEVADA

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WITH THE COOPERATION OF THE

UTAH STATE DIVISION OF HEALTH

AND THE

UTAH NATIONAL GUARD

OCTOBER, 1977

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGEMENT

The staff of the National Eutrophication Survey (Office of Research and Development, U.S. Environmental Protection Agency) expresses sincere appreciation to the Utah Department of Social Services and the Utah Department of Natural Resources for professional involvement, to the Utah National Guard for conducting the tributary sampling phase of the Survey, and to those Utah wastewater treatment plant operators who voluntarily provided effluent samples and flow data.

The staffs of the Bureau of Water Quality of the Division of Health and the Division of Wildlife Resources provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

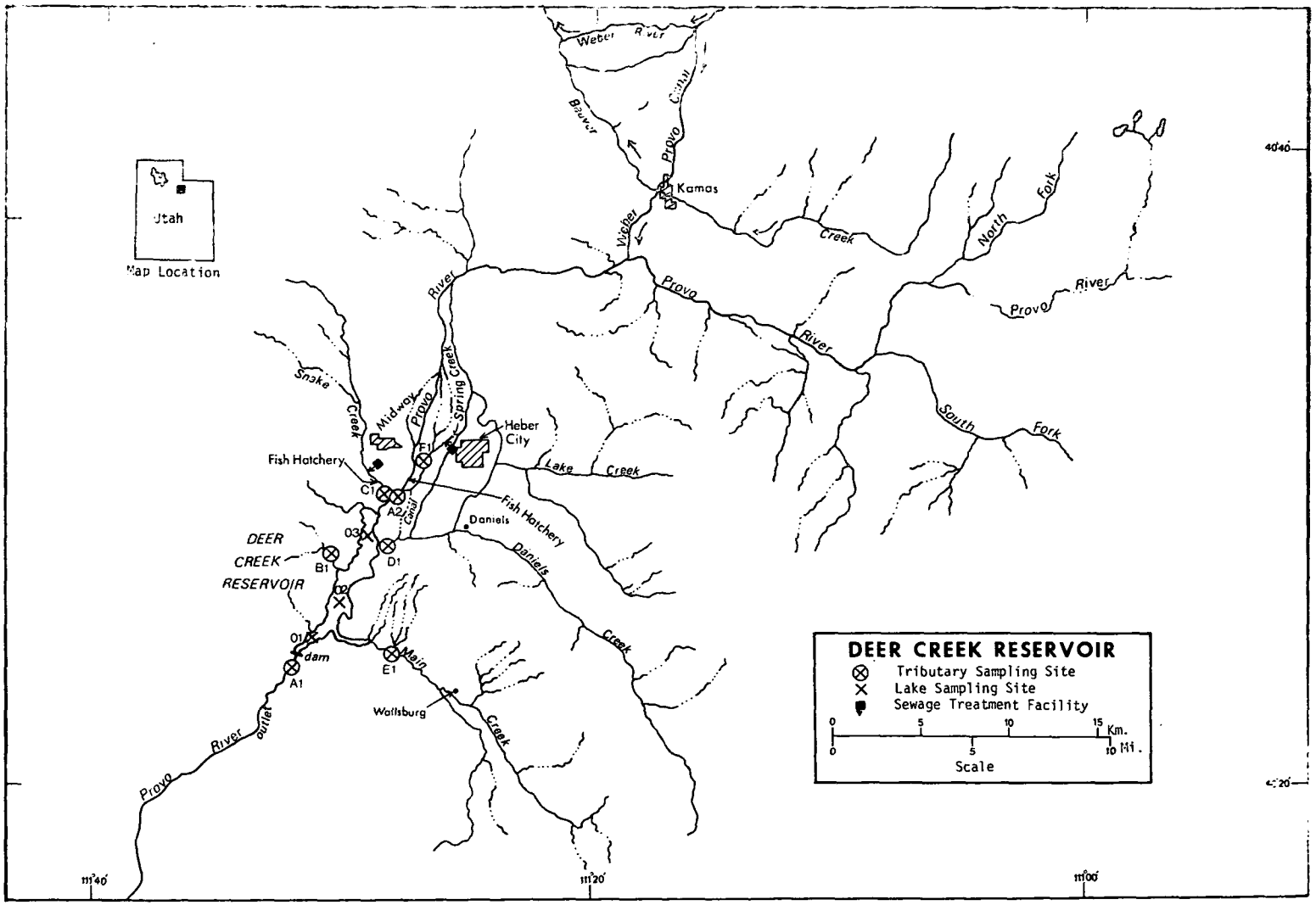
Major General Maurice L. Watts, the Adjutant General of Utah, and Project Officer Lt. Colonel T. Ray Kingston, who directed the volunteer efforts of the Utah National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES AND RESERVOIRS

STATE OF UTAH

NAME	COUNTY
Bear	Rich, UT; Bear Lake, ID
Deer Creek	Wasatch
Echo	Summit
Fish	Sevier
Flaming Gorge	Daggett, UT; Sweetwater, WY
Huntington	Emery
Joes Valley	Emery
Lower Bowns	Garfield
Lynn	Box Elder
Minersville	Beaver
Moon	Duchesne
Navajo	Kane
Newcastle	Iron
Otter Creek	Piute
Panguich	Garfield
Pelican	Uintah
Pineview	Weber
Piute	Piute
Porcupine	Cache
Powell	Garfield, Kane, San Juan, UT; Coconino, AZ
Pruess	Millard
Sevier Bridge	Juab, Sanpete
Starvation	Duchesne
Steinaker	Uintah
Tropic	Garfield
Utah	Utah
Willard Bay	Box Elder


Utah
Map Location
Weber River
Beaver
Provo
Canal
Kamas
Weber
Provo River
Creek
North Fork
Provo River
Provo River
South Fork
Snake Creek
Midway
Provo
Spring Creek
Heber City
Lake Creek
Fish Hatchery
C1
A2
Canal
Fish Hatchery
Daniels
Daniels Creek
DEER CREEK RESERVOIR
03
D1
B1
02
01
dam
A1
E1
Main Creek
Wallsburg
Provo River outlet
DEER CREEK RESERVOIR
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
0 5 10 15 Km.
0 5 10 Mi.
Scale
40°40'
40°20'
111°40'
111°20'
111°00'

DEER CREEK RESERVOIR

STORET NO. 4903

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that Deer Creek Reservoir is eutrophic. It ranked twentieth in overall trophic quality among the 27 Utah lakes and reservoirs sampled in 1975 when compared using a combination of six water quality parameters*. Fifteen of the water bodies had less median total phosphorus, ten had less and three had the same median dissolved orthophosphorus, 21 had less median inorganic nitrogen, 17 had less mean chlorophyll a, and 15 had greater mean Secchi disc transparency. Marked depression of dissolved oxygen with depth occurred at sampling station 1 in August and September.

Survey limnologists noted submerged macrophytes near the shoreline in August and clumps of algae at the surface in September, particularly at sampling station 3.

B. Rate-Limiting Nutrient:

The algal assay results indicate phosphorus limitation at the times the samples were collected (05/12/75 and 09/19/75). The reservoir data also indicate phosphorus limitation in May and September but nitrogen limitation at two of the three sampling stations in August.

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* See Appendix A.

C. Nutrient Controllability:

1. Point sources--During the sampling year, point sources contributed 48.5% of the total phosphorus input to Deer Creek Reservoir. The wastewater treatment facilities at Midway and Heber City accounted for 6.2% and 24.7%, respectively. The Clearview Trout Farm added 2.9%, and the Midway Fish Hatchery contributed 14.7%; however, the proportion of these loads attributable to the hatchery operations is not known since the quality of the waters entering the hatcheries was not measured.

The present phosphorus loading of 2.47 g/m^2/year is 2.2 times that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic loading (see page 13). Because the reservoir is phosphorus limited much of the time, all phosphorus inputs should be minimized to the greatest practicable degree. It is calculated that the present phosphorus loading would have to be reduced 55% to achieve a level equal to the proposed eutrophic loading.

2. Non-point sources--Non-point sources accounted for 51.5% of the total phosphorus load during the sampling year. The Provo River contributed 37.8%, and three other gaged tributaries collectively contributed 11.3%. The ungaged minor tributaries and immediate drainage accounted for an estimated 1.7% of the total load.

II. RESERVOIR AND DRAINAGE BASIN CHARACTERISTICS†

A. Morphometry††:

1. Surface area: 9.66 kilometers^2.
2. Mean depth: 19.9 meters.
3. Maximum depth: 41.8 meters.
4. Volume: 192.301 x 10^6 m^3.
5. Mean hydraulic retention time: 211 days (based on outflow).

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
Provo River (includes area & flow of Spring Creek)	976.4	8.230
Decker Creek	4.7	0.011
Snake Creek	82.9	1.300
Daniels Creek	126.9	0.100
Main Creek (Spring Creek)	186.5 (150.2)	0.375 (0.510)
Minor tributaries & immediate drainage -	63.3	0.660
Totals	1,440.7	10.676

2. Outlet -

Provo River	1,450.4**	10.540

C. Precipitation***:

1. Year of sampling: 123.1 centimeters.
2. Mean annual: 110.0 centimeters.

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† Table of metric conversions--Appendix B.
†† Sudweeks, 1975; max. depth from Ikner (1974).
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Includes area of reservoir.
*** See Working Paper No. 175.

III. WATER QUALITY SUMMARY

Deer Creek Reservoir was sampled three times during the open-water season of 1975 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from a number of depths at three stations on the reservoir (see map, page v). During each visit, a single depth-integrated (4.6 m or near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the first and last visits, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 35.1 meters at station 1, 24.4 meters at station 2, and 5.5 meters at station 3.

The sampling results are presented in full in Appendix D and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR DEER CREEK RESERVOIR
STORET CODE 4903

PARAMETER	1ST SAMPLING (5/12/75) 3 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (8/11/75) 3 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (9/19/75) 3 SITES RANGE	MEAN	MEDIAN
TEMP (C)	5.0 - 9.5	7.6	8.2	12.7 - 23.8	19.8	22.4	13.3 - 18.8	17.6	18.2
DISS OXY (MG/L)	8.6 - 11.0	9.7	9.7	2.6 - 9.0	6.1	6.7	0.2 - 10.4	6.7	8.0
CNDCTVY (MCROMO)	294. - 316.	306.	307.	218. - 333.	283.	297.	223. - 338.	298.	303.
PH (STAND UNITS)	8.3 - 8.7	8.5	8.5	7.8 - 9.4	8.5	8.4	7.5 - 8.8	8.2	8.3
TOT ALK (MG/L)	136. - 149.	144.	145.	106. - 126.	115.	115.	120. - 158.	143.	145.
TOT P (MG/L)	0.027 - 0.054	0.040	0.042	0.020 - 0.089	0.040	0.040	0.014 - 0.285	0.055	0.035
ORTHO P (MG/L)	0.006 - 0.021	0.012	0.012	0.002 - 0.058	0.017	0.006	0.002 - 0.069	0.010	0.004
NO2+NO3 (MG/L)	0.180 - 0.270	0.213	0.200	0.020 - 0.390	0.170	0.080	0.030 - 0.440	0.159	0.140
AMMONIA (MG/L)	0.030 - 0.180	0.071	0.040	0.020 - 0.040	0.022	0.020	0.020 - 0.270	0.044	0.020
KJEL N (MG/L)	0.300 - 0.600	0.464	0.450	0.200 - 0.500	0.329	0.350	0.200 - 0.800	0.406	0.400
INORG N (MG/L)	0.210 - 0.450	0.284	0.230	0.040 - 0.410	0.192	0.110	0.050 - 0.510	0.203	0.160
TOTAL N (MG/L)	0.500 - 0.870	0.677	0.675	0.220 - 0.670	0.499	0.505	0.380 - 1.040	0.566	0.530
CHLRPYL A (UG/L)	4.3 - 9.3	7.4	8.5	1.3 - 1.5	1.4	1.3	11.6 - 25.2	18.5	18.7
SECCHI (METERS)	1.1 - 1.8	1.5	1.8	1.5 - 2.1	1.9	2.1	0.9 - 2.7	1.8	1.8

B. Biological Characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
05/12/75	1. Stephanodiscus sp.	5,047
	2. Chroomonas sp.	3,426
	3. Flagellates	2,100
	4. Cryptomonas sp.	700
	5. Asterionella sp.	74
	Total	11,347
08/11/75	1. Fragilaria sp.	7,571
	2. Sphaerocystis sp.	55
	Total	7,626
09/19/75	1. Aphanizomenon sp.	2,365
	2. Chroomonas sp.	377
	3. Flagellates	240
	4. Stephanodiscus sp.	69
	5. Coelosphaerium sp.	69
	Other genera	102
	Total	3,222

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
05/12/75	1	8.5
	2	9.3
	3	4.3
08/11/75	1	1.5
	2	1.3
	3	1.3
09/19/75	1	11.6
	2	18.7
	3	25.2

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

a. May sample -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.015	0.299	3.3
0.050 P	0.065	0.299	11.7
0.050 P + 1.0 N	0.065	1.299	20.5
1.0 N	0.015	1.299	2.0

b. September sample -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.010	0.185	1.0
0.050 P	0.060	0.185	7.1
0.050 P + 1.0 N	0.060	1.185	22.3
1.0 N	0.010	1.185	1.0

2. Discussion -

The control yields of the assay alga, Selenastrum capricornutum, indicate the potential primary productivity of Deer Creek Reservoir was moderately high at the times the samples were collected. Also, in both assays the significant increase in yields with the addition of phosphorus alone indicates the reservoir was limited by phosphorus at those times. Note that the addition of nitrogen alone in both assays resulted in yields no greater than those of the controls.

The reservoir data indicate phosphorus limitation in May and September as well; i.e., the mean inorganic nitrogen/ortho-

phosphorus ratios were 16/1 or greater at all stations in May and 13/1 or greater at all stations in September. However, nitrogen limitation is indicated at two of the three stations in August; i.e., the mean N/P ratios were 9/1 at station 1 and 5/1 at station 3. The mean N/P ratio was 21/1 at station 2 in August, and phosphorus limitation would be expected.

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Utah National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of May and June when two samples were collected. Sampling was begun in November, 1974, and was completed in October, 1975.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Utah District Office of the U.S. Geological Survey for the tributary sites nearest the reservoir.

Except for Snake and Decker creeks, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads shown are those measured minus point-source loads, if any.

The combined nutrient loads of the Midway wastewater treatment plant and the Midway Fish Hatchery exceeded the loads measured in Snake Creek at station C-1; and, although Decker Creek was sampled nine times at station B-1, most of the flows were too low to be measured accurately. Therefore, the loads for these streams and the unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in $kg/km^2/year$, at stations D-1 and E-1 and multiplying the means by the B-1, C-1, and ZZ areas in km^2.

* See Working Paper No. 175.

Also, the nutrient loads measured in Spring Creek at station F-1 are included in the Provo River loads at station A-2 and, hence, are not listed separately in the loading tables that follow.

The operators of the Heber City and Midway wastewater treatment plants provided monthly effluent samples and corresponding flow data, and the personnel of Clearview Trout Farm and the Midway Fish Hatchery provided monthly discharge samples and corresponding flows.

A. Waste Sources*:

1. Known municipal -

Name	Pop. Served	Treatment	Mean Flow (m^3/d)	Receiving Water
Heber City	3,000	tr. filter	9,490.0	Spring Creek/ Provo River
Midway	1,000	tr. filter	1,106.9	Snake Creek

2. Known industrial - None

3. Fish hatcheries -

Name	Type Waste	Treatment	Mean Flow (m^3/d)	Receiving Water
Clearview Trout Farm	fish propagation	none	11,255.3	Provo River
Midway Fish Hatchery	fish propagation	none	76,200.2	Snake Creek

* Hopkins and Hinshaw, 1974.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
Provo River	9,005	37.8
Decker Creek	30	0.1
Snake Creek	540	2.3
Daniels Creek	760	3.2
Main Creek	1,380	5.8
b. Minor tributaries & immediate drainage (non-point load) -	410	1.7
c. Known municipal STP's -		
Heber City	5,875	24.6
Midway	1,485	6.2
d. Septic tanks - Unknown	?	-
e. Known industrial - None	-	-
f. Fish hatcheries -		
Clearview Trout Farm	695	2.9
Midway Fish Hatchery	3,500	14.7
g. Direct precipitation* -	170	0.7
Total	23,850	100.0

2. Outputs -

Lake outlet - Provo River 15,605

3. Net annual P accumulation - 8,245 kg.

* See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/yr	% of total
a. Tributaries (non-point load) -		
Provo River	199,385	64.0
Decker Creek	240	0.1
Snake Creek	4,270	1.4
Daniels Creek	4,405	1.4
Main Creek	12,655	4.1
b. Minor tributaries & immediate drainage (non-point load) -	3,260	1.0
c. Known municipal STP's -		
Heber City	25,030	8.0
Midway	4,680	1.5
d. Septic tanks - Unknown	?	-
e. Known industrial - None	-	-
f. Fish hatcheries -		
Clearview Trout Farm	6,190	2.0
Midway Fish Hatchery	40,810	13.1
g. Direct precipitation* -	10,430	3.3
Total	311,355	100.0

2. Outputs -

Lake outlet - Provo River 242,720

3. Net annual N accumulation - 68,635 kg.

D. Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km^2/yr	kg N/km^2/yr
Provo River	9	204
Daniels Creek	6	35
Main Creek	7	68

* See Working Paper No. 175.

E. Mean Nutrient Concentrations in Estimated or Unlisted Streams:

Tributary	Mean Total P Conc. (mg/l)	Mean Total N Conc. (mg/l)
Decker Creek	0.059	0.324
Snake Creek	0.090	1.282
Spring Creek	0.300	1.492

F. Yearly Loads:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m^2/yr	2.47	0.85	32.2	7.1

Vollenweider phosphorus loadings ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Deer Creek Reservoir:

"Dangerous" (eutrophic loading)	1.12
"Permissible" (oligotrophic loading)	0.56

V. LITERATURE REVIEWED

Anderson, Donald R., John A. Dracup, Thomas J. Fogarty, and Robert Willis; 1976. Water quality modeling of deep reservoirs. Jour. Water Poll. Contr. Fed. 48 (1): 134-146.

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Vollenweider, R. A., and P. J. Dillon, 1974. The application of the phosphorus loading concept to eutrophication research. Natl. Res. Council of Canada Publ. No. 13690, Canada Centre for Inland Waters, Burlington, Ontario.

VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	SOO- MEAN SEC	MEAN CHLORA	15- MIN DO	MEDIAN DISS ORTHO P
0408	LAKE POWELL	0.010	0.410	339.830	3.081	13.800	0.007
4901	BEAR LAKE	0.011	0.040	253.167	0.945	9.200	0.003
4902	LOWER BOWN'S RESERVOIR	0.031	0.040	336.000	5.567	9.400	0.006
4903	DEER CREEK RESERVOIR	0.038	0.215	430.333	9.078	14.800	0.006
4904	ECHO RESERVOIR	0.047	0.170	450.333	6.967	14.000	0.012
4905	LYNN RESERVOIR	0.121	0.200	417.667	39.600	10.400	0.052
4906	FISH LAKE	0.023	0.040	152.000	12.483	10.400	0.004
4907	HUNTINGTON NORTH RESERVO	0.013	0.040	392.000	1.900	7.800	0.005
4908	JOE'S VALLEY RESERVOIR	0.012	0.045	400.000	2.483	11.200	0.003
4909	MINERSVILLE RESERVOIR	0.192	0.060	445.000	33.583	8.600	0.107
4910	MOON LAKE	0.008	0.040	381.000	2.700	9.600	0.002
4911	NAVAJO LAKE	0.016	0.040	368.000	2.000	6.000	0.003
4912	NEWCASTLE RESERVOIR	0.051	0.040	428.667	12.467	13.600	0.009
4913	OTTER CREEK RESERVOIR	0.067	0.040	453.667	11.767	10.600	0.033
4914	PANGUITCH LAKE	0.071	0.040	426.500	45.950	14.200	0.010
4915	PELICAN LAKE	0.044	0.050	438.500	6.350	8.400	0.004
4916	PINEVIEW RESERVOIR	0.028	0.300	435.083	5.692	14.600	0.006
4917	PIUTE RESERVOIR	0.047	0.150	482.625	25.329	11.600	0.007
4918	PORCUPINE RESERVOIR	0.025	0.110	440.000	7.860	12.400	0.011
4919	PRUESS RESERVOIR (GARRIS	0.057	0.140	491.000	4.533	8.800	0.008
4920	SEVIER BRIDGE RESERVOIR	0.026	0.355	449.778	18.222	12.400	0.008
4921	STARVATION RESERVOIR	0.016	0.040	394.583	5.675	13.200	0.004
4922	STEINAKER RESERVOIR	0.011	0.040	316.750	1.844	12.600	0.005
4923	TROPIC RESERVOIR	0.021	0.050	425.000	7.200	8.400	0.006
4924	UTAH LAKE	0.132	0.320	490.583	72.012	11.400	0.012
4925	WILLARD BAY RESERVOIR	0.044	0.060	457.182	7.567	11.000	0.009
5605	FLAMING GORGE RESERVOIR	0.011	0.690	285.636	2.500	10.400	0.003

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500= MEAN SEC	MEAN CHLORA	15= MIN DO	MEDIAN DISS ORTHO P	INDEX NO
0408	LAKE POWELL	96 (25)	4 (1)	81 (21)	73 (19)	15 (4)	42 (11)	311
4901	BEAR LAKE	90 (23)	87 (19)	96 (25)	100 (26)	77 (20)	90 (23)	540
4902	LOWER BOWN'S RESERVOIR	46 (12)	87 (19)	85 (22)	65 (17)	73 (19)	50 (13)	406
4903	DEER CREEK RESERVOIR	42 (11)	19 (5)	42 (11)	35 (9)	0 (0)	58 (14)	196
4904	ECHO RESERVOIR	31 (8)	27 (7)	19 (5)	50 (13)	12 (3)	13 (3)	152
4905	LYNN RESERVOIR	8 (2)	23 (6)	58 (15)	8 (2)	62 (15)	4 (1)	163
4906	FISH LAKE	62 (16)	65 (16)	100 (26)	23 (6)	62 (15)	79 (20)	391
4907	HUNTINGTON NORTH RESERVO	77 (20)	65 (16)	69 (18)	92 (24)	96 (25)	69 (18)	468
4908	JOE'S VALLEY RESERVOIR	81 (21)	58 (15)	62 (16)	85 (22)	46 (12)	96 (25)	428
4909	MINERSVILLE RESERVOIR	0 (0)	44 (11)	27 (7)	12 (3)	85 (22)	0 (0)	168
4910	MOON LAKE	100 (26)	87 (19)	73 (19)	77 (20)	69 (18)	100 (26)	506
4911	NAVAJO LAKE	69 (18)	87 (19)	77 (20)	88 (23)	100 (26)	85 (22)	506
4912	NEWCASTLE RESERVOIR	23 (6)	87 (19)	46 (12)	27 (7)	19 (5)	27 (7)	229
4913	OTTER CREEK RESERVOIR	15 (4)	87 (19)	15 (4)	31 (8)	54 (14)	8 (2)	210
4914	PANGUITCH LAKE	12 (3)	65 (16)	50 (13)	4 (1)	8 (2)	23 (6)	162
4915	PELICAN LAKE	37 (9)	54 (14)	35 (9)	54 (14)	90 (23)	73 (19)	343
4916	PINEVIEW RESERVOIR	50 (13)	15 (4)	38 (10)	58 (15)	4 (1)	58 (14)	223
4917	PIUTE RESERVOIR	27 (7)	31 (8)	8 (2)	15 (4)	38 (10)	46 (12)	165
4918	PORCUPINE RESERVOIR	58 (15)	38 (10)	31 (8)	38 (10)	33 (8)	19 (5)	217
4919	PRUESS RESERVOIR (GARRIS	19 (5)	35 (9)	0 (0)	69 (18)	81 (21)	37 (9)	241
4920	SEVIER BRIDGE RESERVOIR	54 (14)	8 (2)	23 (6)	19 (5)	33 (8)	37 (9)	174
4921	STARVATION RESERVOIR	73 (19)	87 (19)	65 (17)	62 (16)	23 (6)	79 (20)	389
4922	STEINAKER RESERVOIR	85 (22)	87 (19)	88 (23)	96 (25)	27 (7)	65 (17)	448
4923	TROPIC RESERVOIR	65 (17)	50 (13)	54 (14)	46 (12)	90 (23)	58 (14)	363
4924	UTAH LAKE	4 (1)	12 (3)	4 (1)	0 (0)	42 (11)	13 (3)	75
4925	WILLARD BAY RESERVOIR	37 (9)	44 (11)	12 (3)	42 (11)	50 (13)	31 (8)	216
5505	FLAMING GORGE RESERVOIR	90 (23)	0 (0)	92 (24)	81 (21)	62 (15)	90 (23)	415

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	4901	BEAR LAKE	540
2	4911	NAVAJO LAKE	506
3	4910	MOON LAKE	506
4	4907	HUNTINGTON NORTH RESERVO	468
5	4922	STEINAKER RESERVOIR	448
6	4908	JOE'S VALLEY RESERVOIR	428
7	5005	FLAMING GORGE RESERVOIR	415
8	4902	LOWER BOWN'S RESERVOIR	406
9	4906	FISH LAKE	391
10	4921	STARVATION RESERVOIR	389
11	4923	TROPIC RESERVOIR	363
12	4915	PELICAN LAKE	343
13	0408	LAKE POWELL	311
14	4919	PRUESS RESERVOIR (GARRIS	241
15	4912	NEWCASTLE RESERVOIR	229
16	4916	PINEVIEW RESERVOIR	223
17	4918	PORCUPINE RESERVOIR	217
18	4925	WILLARD BAY RESERVOIR	216
19	4913	OTTER CREEK RESERVOIR	210
20	4903	DEER CREEK RESERVOIR	196
21	4920	SEVIER BRIDGE RESERVOIR	174
22	4909	MINERSVILLE RESERVOIR	168
23	4917	PIUTE RESERVOIR	165
24	4905	LYNN RESERVOIR	163
25	4914	PANGUITCH LAKE	162
26	4904	ECHO RESERVOIR	152
27	4924	UTAH LAKE	75

APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR UTAH 10/18/76

LAKE CODE 4903 DEER CRK RES

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 1450.4

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
4903A1	1450.4	6.80	6.80	7.36	8.78	16.42	24.35	15.01	12.18	10.19	5.95	5.38	7.08	10.54
4903A2	976.4	3.40	3.40	4.25	10.48	28.32	25.20	6.80	3.40	2.83	3.11	3.68	3.68	8.23
4903B1	4.7	0.003	0.003	0.003	0.011	0.037	0.037	0.017	0.008	0.006	0.006	0.003	0.003	0.011
4903C1	82.9	1.19	1.16	1.27	1.30	1.59	1.67	1.27	1.10	1.10	1.30	1.36	1.25	1.30
4903D1	126.9	0.113	0.142	0.142	0.340	0.227	0.028	0.003	0.006	0.011	0.028	0.085	0.085	0.100
4903E1	186.5	0.263	0.396	0.481	1.048	1.104	0.311	0.102	0.088	0.091	0.139	0.232	0.246	0.375
4903F1	150.2	0.14	0.14	0.17	0.54	1.61	1.73	0.74	0.31	0.23	0.20	0.17	0.14	0.51
4903ZZ	72.5	0.42	0.42	0.51	0.82	1.70	1.70	0.54	0.31	0.28	0.34	0.45	0.45	0.66

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 1450.4
SUM OF SUB-DRAINAGE AREAS = 1600.1
TOTAL FLOW IN = 134.04
TOTAL FLOW OUT = 126.29

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
4903A1	11	74	4.757	10	3.030				
	12	74	9.203	14	10.845				
	1	75	8.184	11	8.269				
	2	75	5.947	8	8.240				
	3	75	3.710	8	2.520				
	4	75	10.024	5	10.137				
	5	75	12.856	3	9.713	17	15.886		
	6	75	40.068	7	46.723	21	44.457		
	7	75	22.342	12	28.883				
	8	75	15.574	16	16.509				
	9	75	13.819	13	14.696				
	10	75	6.768	5	11.327				
4903A2	11	74	5.097	10	4.814				
	12	74	3.681	14	4.814				
	1	75	3.964	11	4.248				
	2	75	3.964	8	4.248				
	3	75	4.531	8	4.814				
	4	75	5.380	5	4.814				
	5	75	21.521	3	7.929	17	40.493		
	6	75	40.210	7	62.297	21	33.980		
	7	75	14.725	12	25.485				
	8	75	5.947	9	9.061				
	9	75	3.964	13	6.230				
	10	75	5.947	4	4.814				

LAKE CODE 4903 DEER CRK RES

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
490381	11	74	0.003						
	12	74	0.003						
	1	75	0.003						
	2	75	0.003						
	3	75	0.003						
	4	75	0.003						
	5	75	0.028						
	6	75	0.076						
	7	75	0.051						
	8	75	0.017						
	9	75	0.008						
	10	75	0.006						
4903C1	11	74	1.982	10	1.671				
	12	74	1.133	14	1.444				
	1	75	1.133	11	1.388				
	2	75	1.416	8	1.472				
	3	75	1.699	8	1.812				
	4	75	2.265	5	2.010				
	5	75	1.699	3	2.152	17	2.067		
	6	75	2.549	7	2.832	21	2.832		
	7	75	1.133	12	2.237				
	8	75	0.850	9	1.048				
	9	75	0.850	13	1.161				
	10	75	1.416	5	1.104				
4903D1	11	74	0.113	10	0.963				
	12	74	0.085	14	0.085				
	2	75	0.113						
	3	75	0.113	8	0.113				
	4	75	0.198	5	0.198				
	5	75	0.368	3	0.198	17	0.368		
	6	75	0.368	7	0.991	21	0.283		
	7	75	0.003	12	0.003				
	8	75	0.011	9	0.014				
	9	75	0.017	13	0.023				
	10	75	0.113	5	0.028				
4903E1	11	74	0.198	10	0.198				
	12	74	0.142	14	0.170				
	1	75	0.227	11	0.227				
	2	75	0.227	8	0.227				
	3	75	0.283	8	0.283				
	4	75	0.283	5	0.227				
	5	75	0.538	3	0.311	17	0.510		
	6	75	1.614	7	1.699	21	1.133		
	7	75	0.481	12	0.566				
	8	75	0.340	9	0.368				
	9	75	0.227	13	0.255				
	10	75	0.170	5	0.170				

LAKE CODE 4913 DEER CRK RES

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
4903F1	11	74	0.170						
	12	74	0.142						
	1	75	0.142						
	2	75	0.142						
	3	75	0.142						
	4	75	0.170						
	5	75	1.274						
	6	75	3.398						
	7	75	2.265						
	8	75	0.736						
	9	75	0.425						
	10	75	0.255						
4903Z2	11	74	0.566						
	12	74	0.368						
	1	75	0.425						
	2	75	0.453						
	3	75	0.566						
	4	75	0.623						
	5	75	1.642						
	6	75	2.718						
	7	75	1.019						
	8	75	0.425						
	9	75	0.340						
	10	75	0.510						

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 76/08/12

490301
40 24 35.0 111 31 20.0 3
DEER CREEK RESERVOIR
49051 UTAH

150791

11EPALES 2111202
0110 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/05/12	16 40	0000	8.5	10.4	72	315	8.65	145	0.040	0.400	0.190	0.006
	16 40	0005	8.4	10.4		315	8.70	145	0.040	0.500	0.190	0.006
	16 40	0025	7.6	9.8		305	8.60	147	0.080	0.600	0.210	0.011
	16 40	0050	6.6	9.2		301	8.40	149	0.120	0.500	0.250	0.013
	16 40	0075	5.4	8.8		297	8.35	148	0.130	0.400	0.270	0.014
	16 40	0106	5.0	8.6		294	8.30	148	0.180	0.600	0.270	0.021
75/08/11	15 05	0000	23.1	7.2	84	300	8.70	115	0.020K	0.400	0.070	0.008
	15 05	0005	23.2	7.0		294	8.60	116	0.020	0.400	0.070	0.005
	15 05	0020	22.5	6.4		290	8.20	115	0.040	0.400	0.090	0.007
	15 05	0050	15.4	3.8		218	7.90	113	0.020K	0.300	0.370	0.044
	15 05	0085	13.1	3.2		228	7.80	112	0.020	0.200K	0.380	0.050
	15 05	0115	12.7	2.6		238	7.80	114	0.020	0.200K	0.390	0.058
75/09/19	14 15	0000	18.4	8.0	108	301	8.45	143	0.020K	0.400	0.130	0.004
	14 15	0005	18.4	8.0		300	8.40	145	0.020K	0.400	0.130	0.003
	14 15	0015	17.9	7.2		300	8.30	142	0.020K	0.300	0.150	0.002
	14 15	0030	17.8	7.0		300	8.10	141	0.020K	0.200	0.180	0.002
	14 15	0050	17.8	6.2		300	8.00	141	0.020K	0.200	0.200	0.004
	14 15	0080	15.3	1.0		248	7.60	126	0.040	0.300	0.440	0.024
	14 15	0115	13.3	0.2		223	7.50	120	0.270	0.800	0.240	0.069

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/12

490301
40 24 35.0 111 31 20.0 3
DEER CREEK RESERVOIR
49051 UTAH

150791

11EPALES 2111202
0110 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/05/12	16	40 0000	0.036	8.5	
	16	40 0005	0.044		
	16	40 0025	0.041		
	16	40 0050	0.032		
	16	40 0075	0.030		
	16	40 0106	0.054		
75/08/11	15	05 0000	0.028	1.5	
	15	05 0005	0.020		
	15	05 0020	0.020		
	15	05 0050	0.046		
	15	05 0085	0.066		
	15	05 0115	0.089		
75/09/19	14	15 0000	0.019	11.6	
	14	15 0005	0.017		
	14	15 0015	0.016		
	14	15 0030	0.016		
	14	15 0050	0.014		
	14	15 0080	0.087		
	14	15 0115	0.285		

STORET RETRIEVAL DATE 76/08/12

490302
40 26 04.0 111 28 48.0 3
DEER CREEK RESERVOIR
49051 UTAH

11EPALES 2111202
0071 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/05/12	16	10 0000	9.0	10.4	69	316	8.65	143	0.030	0.500	0.180	0.011
	16	10 0005	8.8	10.4		315	8.65	143	0.030	0.600	0.180	0.010
	16	10 0025	8.1	9.6		308	8.45	147	0.100	0.500	0.220	0.013
	16	10 0050	6.1	9.0		298	8.35	148	0.120	0.400	0.240	0.011
	16	10 0071	5.4	11.0		295	8.65	143	0.030	0.400	0.190	0.006
75/08/11	14	40 0000	23.3	7.8	84	314	8.70	117	0.020	0.400	0.050	0.004
	14	40 0005	23.8	7.2		313	8.80	116	0.020	0.400	0.050	0.004
	14	40 0020	21.3	5.8		308	8.13	121	0.030	0.400	0.140	0.002
	14	40 0045	16.1	4.4		244	7.95	106	0.020K	0.300	0.350	0.013
	14	40 0080	12.9	4.8		223	8.10	106	0.020K	0.300	0.360	0.029
75/09/19	13	35 0000	18.7	9.0	72	304	8.50	146	0.020K	0.400	0.070	0.002
	13	35 0005	18.7	9.0		302	8.50	142	0.020K	0.500	0.070	0.004
	13	35 0015	18.3	8.2		303	8.50	146	0.020K	0.500	0.070	0.003
	13	35 0030	18.3	8.6		308	8.00	147	0.030	0.500	0.150	0.003
	13	35 0050	17.5	3.6		321	7.70	151	0.040	0.400	0.350	0.004
	13	35 0071	16.6	3.4		338	7.80	158	0.100	0.400	0.280	0.019

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/05/12	16	10 0000	0.046	9.3	
	16	10 0005	0.035		
	16	10 0025	0.027		
	16	10 0050	0.028		
	16	10 0071	0.045		
75/08/11	14	40 0000	0.024	1.3	
	14	40 0005	0.025		
	14	40 0020	0.020		
	14	40 0045	0.045		
	14	40 0080	0.052		
75/09/19	13	35 0000	0.039	18.7	
	13	35 0005	0.033		
	13	35 0015	0.033		
	13	35 0030	0.037		
	13	35 0050	0.030		
	13	35 0071	0.099		

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/12

490303
40 28 06.0 111 29 58.0 3
DEER CREEK RESERVOIR
49051 UTAH

11EPALES 2111202
0016 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/05/12	15 50	0000	9.5	9.6	42	310	8.55	138	0.030	0.400	0.190	0.015
	15 50	0005	9.3	9.8		306	8.50	136	0.030	0.400	0.200	0.014
	15 50	0012	8.5	9.0		307	8.50	136	0.030	0.300	0.200	0.013
75/08/11	14 20	0000	23.2	8.8	60	333	9.00	114	0.020K	0.200	0.020K	0.003
	14 20	0005	23.8	9.0		331	9.40	114	0.020K	0.200K	0.020K	0.004
	14 20	0014	22.3	8.1		330	9.40	126	0.020K	0.500	0.020K	0.006
75/09/19	13 15	0000	18.8	10.4	36	311	8.80	146	0.020	0.400	0.030	0.004
	13 15	0005	18.3	9.0		305	8.70	146	0.020	0.400	0.030	0.004
	13 15	0018	18.2	9.0		303	8.70	145	0.020K	0.400	0.030	0.003

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/05/12	15 50	0000	0.052	4.3	
	15 50	0005	0.045		
	15 50	0012	0.048		
75/08/11	14 20	0000	0.042	1.3	
	14 20	0005	0.045		
	14 20	0014	0.038		
75/09/19	13 15	0000	0.050	25.2	
	13 15	0005	0.050		
	13 15	0018	0.051		

K VALUE KNOWN TO BE
LESS THAN INDICATED

APPENDIX E

TRIBUTARY AND WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 76/08/12

4903A1
40 24 16.0 111 31 42.0 4
PROVO RIVER
49 7.5 ASPEN GROVE
0/DEER CREEK RESERVOIR 150791
GAGE STATN .2 MI S OF DEER CREEK DAM
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/10	13	00	0.216	0.600	0.230	0.025	0.040
74/12/14	10	00	0.272	0.600	0.220	0.020	0.040
75/01/11	09	40	0.432	0.800	0.180	0.030	0.040
75/02/08	10	00	0.504	0.200	0.072	0.040	0.050
75/03/08			0.480	0.600	0.056	0.032	0.050
75/04/05	09	30	0.480	0.350	0.090	0.045	0.070
75/05/03	09	15	0.220	0.350	0.040	0.005	0.040
75/05/17	10	00	0.230	0.150	0.125	0.015	0.040
75/06/07	09	45	0.220	0.450	0.050	0.020	0.060
75/06/21	10	00	0.190	0.450	0.030	0.010	0.040
75/07/12	10	10	0.155	0.250	0.035	0.010	0.040
75/08/16	08	50	0.375	0.300	0.030	0.060	0.070
75/09/13	12	30	0.375	0.500	0.035	0.045	
75/10/05	09	30	0.170	0.300	0.040	0.005	0.030

STORET RETRIEVAL DATE 76/08/12

4903A2
40 29 03.0 111 27 52.0 4
PROVO RIVER
49 7.5 CHARLESTON
T/DEER CREEK RESERVOIR
DRT RD BRDG 1.2 MI N OF CHARLESTON
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/10	14	50	0.368	0.200	0.020	0.035	0.040
74/12/14	09	55	0.480	0.750	0.035	0.025	0.035
75/01/11	11	50	0.416		0.027	0.027	0.040
75/03/08			0.284	1.100	0.040	0.028	0.060
75/04/05	09	15	0.195	0.250	0.045	0.030	0.070
75/05/03	12	20	0.130	0.300	0.030	0.010	0.050
75/05/17	09	45	0.370	0.150	0.030	0.030	0.020
75/06/07	08	45	0.185	1.000	0.030	0.015	
75/06/21	09	35	0.240	0.300	0.015	0.020	0.050
75/07/12	10	00	0.260	0.300	0.015	0.025	0.090
75/08/09	14	45	0.970	0.700	0.032	0.065	0.080
75/09/13	13	00	0.720	0.300	0.030	0.070	0.120
75/10/04	09	40	0.870	0.200	0.040	0.075	0.120

STORET RETRIEVAL DATE 76/08/12

490381
40 27 30.0 111 30 40.0 4
DECKER CREEK
49 7.5 ASPEN GROVE
T/DEER CREEK RESERVOIR 150791
BNK 100 FT E OF DRT RD 6 M W OF CHRLSTON
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/10	13 40		0.088	0.100	0.040	0.005	0.020
75/05/03	10 30		0.190	0.250	0.026	0.030	0.080
75/05/17	14 45		0.060	0.150	0.025	0.007	0.010
75/06/07	10 50		0.120	0.250	0.015	0.030	0.090
75/06/21	11 10		0.090	0.450	0.017	0.027	0.080
75/07/12	11 30		0.130	0.400	0.010	0.035	0.060
75/08/09	10 00		0.115	0.100	0.055	0.020	0.020
75/09/13	14 00		0.065	0.200	0.010	0.030	0.110
75/10/05	13 15		0.060	0.100K	0.005K	0.045	0.060

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/12

4903C1
40 29 16.0 111 28 00.0 4
SNAKE CREEK
49 7.5 CHARLESTON
T/DEER CREEK RESERVOIR
RR BRDG 1.4 MI N OF CHARLESTON
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/10	14	20	0.720	0.300	0.170	0.035	0.035
74/12/14	10	10	0.576	0.700	0.100	0.040	0.050
75/01/11	11	30	0.528	0.500	0.100	0.055	0.090
75/02/08	09	55	0.490	0.600	0.128	0.072	0.100
75/03/08			0.485	1.200	0.136	0.068	0.070
75/04/05	09	10	0.540	0.500	0.135	0.060	0.130
75/05/03	11	20	0.620	0.600	0.185	0.110	0.160
75/05/17	10	00	1.100	0.100	0.095	0.100	0.116
75/06/07	09	00	0.760	0.875	0.130	0.050	0.120
75/06/21	09	50	0.780	0.350	0.085	0.040	0.050
75/07/12	10	30	1.200	0.665	0.090	0.045	0.091
75/08/09	09	50	1.050	0.350	0.065	0.040	0.050
75/09/13	13	15	0.770	0.600	0.230	0.045	0.120
75/10/05	16	25	0.790	0.200	0.040	0.040	0.080

STORET RETRIEVAL DATE 76/08/12

490301
40 27 40.0 111 28 15.0 4
DANIELS CREEK
49 7.5 CHARLESTON
T/DEER CREEK RESERVOIR
HWY 113 BRDG .1 MI S OF CHARLESTON
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/10	12	00	0.810	0.400	0.015	0.315	0.340
74/12/14	10	30	0.672	0.800	0.185	0.185	0.280
75/04/05	09	00	0.590	0.700	0.035	0.070	0.170
75/05/03	11	00	0.280	0.800	0.200	0.210	0.320
75/05/17	09	30	0.430	0.150	0.065	0.050	
75/06/07	08	30	0.230	1.350	0.030	0.030	0.230
75/06/21	09	20	0.820	0.900	0.025	0.120	0.210
75/07/12	09	45	1.100	0.350	0.060	0.185	0.213
75/08/09	09	40	1.050	0.600	0.025	0.175	0.200
75/09/13	12	50	1.050	0.400	0.020	0.180	0.230
75/10/05			0.085	0.100	0.005	0.050	0.060

STORET RETRIEVAL DATE 76/08/12

4903E1
40 24 17.0 111 27 52.0 4
MAIN CHANNEL
49 7.5 CHARLESTON
T/DEER CREEK RESERVOIR
PRVT RD BRDG 2.2 MI NW OF WALLSBURG
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/10	11	10	0.384	0.500	0.015	0.030	0.050
74/12/14	11	25	0.576	1.000	0.045	0.035	0.070
75/01/11	12	20	0.576	0.300	0.030	0.035	0.070
75/02/08	09	15	0.520	0.700	0.040	0.040	0.080
75/03/08			0.624	1.250	0.080	0.048	0.140
75/04/05	08	50	0.610	0.400	0.025	0.030	0.100
75/05/03	13	00	0.315	0.700	0.060	0.035	0.160
75/05/17	09	10	0.280	0.500	0.050	0.063	0.252
75/06/07	08	20	0.145	0.650	0.020	0.040	0.140
75/06/21	09	00	0.280	0.600	0.020	0.035	0.070
75/07/12	09	30	0.210	0.700	0.050	0.070	0.190
75/08/09	09	30	0.095	0.600	0.030	0.045	0.060
75/09/13	12	30	0.220	0.900	0.050	0.060	0.170

STORET RETRIEVAL DATE 76/08/12

4903F1
40 30 26.0 111 26 26.0 4
SPRING CREEK
49 7.5 HEBER CITY
T/DEER CREEK RESERVOIR 150791
HWY 113 BRDG BELOW HEBER CITY STP
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/10	12	15	0.650	0.500	0.065	0.330	0.370
74/12/10	18	35	0.624	0.600	0.125	0.210	0.300
75/01/11	10	00	0.540	1.100	0.280	0.250	0.400
75/02/08	10	15	0.384	1.000	0.256	0.208	0.320
75/03/08			0.232	1.850	0.168	0.152	0.280
75/04/05	10	00	0.340	0.950	0.240	0.200	0.335
75/05/03	10	00	0.210	0.850	0.195	0.210	0.320
75/05/17	10	14	0.230	2.000	0.140	0.115	0.210
75/06/07	09	10	0.480	0.850	0.050	0.105	0.220
75/06/21	10	05	0.660	1.050	0.060	0.115	0.190
75/08/09	10	20	0.990	0.900	0.145	0.230	0.280
75/09/13	13	30	0.750	0.900	0.175	0.280	0.460
75/10/05	10	30	0.550	0.200	0.020	0.190	0.220

STORET RETRIEVAL DATE 76/08/12

4903AA N04903AA P000000
40 30 00.0 111 28 00.0 4
CLEARVIEW TROUT FARM
49 7.5 HEBER
T/DEER CREEK RES. 150791
PROVO RIVER
11EPALES 2141204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/01/15	14	10	0.080	1.000K	0.050K	0.050K	0.205	2.780	2.800
75/05/02	13	45	0.150	1.100	0.050K	0.100K	0.100K	2.780	2.800
75/05/29	10	30	0.150	1.400	0.120	0.093	0.100K	3.000	3.000
75/06/09	14	55	0.150	0.500K	0.050K	0.100	0.100	3.070	2.760
75/07/02	13	00	0.100	1.900		0.074	0.400	3.000	3.000
75/08/13	11	30	0.100	1.500	0.050K	0.140	0.240	3.030	3.100
75/09/09	12	30	0.125	1.000	0.025K	0.110	0.110	3.020	3.100
75/10/30	10	30	0.100	2.750	0.025K	0.025K	0.170	3.000	3.100
75/12/16	11	05	0.125	1.300	0.025K	0.050	0.100K	3.000	3.100

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/12

4903CA TF4903CA P001000
40 29 00.0 111 28 00.0 4
MIDWAY
49 7.5 HEBER
T/DEER CREEK RES.
SNAKE CREEK
11EPALES 2141204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/01/15	13	10	2.400	9.000	0.080K	2.500	3.800	0.240	0.194
75/04/10	11	30	4.200	3.600	0.088	2.300	2.800	0.162	0.180
75/05/02	12	10	4.400	5.500	0.083	3.300	5.000	0.170	0.180
75/05/29	09	30	5.400	6.900	0.120	1.750	2.600	0.190	0.250
75/06/04	14	15	5.250	5.600	0.050K	1.900	3.900	0.260	0.370
75/07/02	09	30	4.200	10.500	0.075	1.450	3.100	0.500	
75/08/13	12	30	4.500	10.500	0.450	4.300	5.400	0.300	0.300
75/09/09	09	15	5.700	6.600	0.050	2.400	3.400	0.300	0.300
75/10/31	09	00	6.600	3.000	0.092	3.000	4.000	0.400	0.400
75/12/16	10	00	2.500	5.200	0.035	2.000	2.700	0.260	0.250

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/12

4903C8 N04903C8 P *
40 29 00.0 111 28 00.0 4
MIDWAY FISH HAT.
49 7.5 HEBER
T/DEER CREEK RES.
SNAKE CREEK
11EPALES 2141204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/01/15	13	20	0.720	1.000K	0.050K	0.089	0.100K	11.300	11.000
75/04/10	11	35	0.700	0.500K	0.050K	0.130	0.200	14.700	12.700
75/05/02	12	30	0.700	0.500K	0.060	0.095	0.100	15.000	
75/05/29	09	10	0.350	1.400	0.081	0.073	0.180	20.900	
75/06/09	14	00	0.350	0.500K	0.050K	0.071	0.100	26.800	17.700
75/07/02	09	40	0.575	0.320	0.025K	0.040	0.050K	27.500	
75/08/13	12	45	0.575	0.900	0.055	0.050	0.100K	25.300	28.000
75/09/09	09	30	0.575	0.885	0.025K	0.069	0.100K	18.600	23.500
75/10/30	08	50	0.650	1.400	0.025K	0.063	0.280	18.500	22.500
75/12/16	10	00	0.775	1.800	0.025K	0.062	0.100K	18.500	22.500

K VALUE KNOWN TO BE
LESS THAN INDICATED

RETRIEVAL DATE 75/09/12

4903FA TF4903FA P003000
40 30 26.0 111 26 26.0 4
HEBER CITY
49 7.5 HEBER CITY
T/DEER CREEK RES. 150791
SPRING CREEK
11EPALES 2141204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
75/01/15	13 50		0.720	18.000	3.150	4.300	6.400	0.800	1.100
75/04/10	12 00		1.150	18.500	3.700	4.500	5.600	0.420	0.700
75/05/02	13 20		1.450	17.500	1.250	5.300	7.500	0.500	0.470
75/05/29	10 00		2.700	6.900	0.100	1.050	1.800	1.500	1.800
75/06/09	14 35		3.000	6.000	0.140	0.860	1.850	3.990	1.300
75/07/02	12 05		2.900	0.750	0.025K	0.790	0.840	5.500	
75/08/13	12 00		3.100	4.100	0.095	0.740	1.100	6.500	6.500
75/09/09	10 00		2.750	1.600	0.025	0.690	1.200	6.500	6.500
75/10/30			2.800	11.000	0.375	2.200	3.500	0.400	0.400
75/12/16	10 40		1.350	12.000	0.100	3.200	4.200	0.800	0.800

K VALUE KNOWN TO BE
LESS THAN INDICATED