APPENDIX A

Proposed Changes to the 1998 303(d) List for the Lower Boise River

December 22, 1997

MEMORANDUM:

TO: Bill Clark, DEQ Central Office

FROM: Sally Goodell, Boise Regional Office

THROUGH: Craig Shepard, Boise Regional Office
Steve West, Boise Regional Administrator

SUBJECT: Proposed Changes To The 1998 303(d) List For The Lower Boise River

The Boise Regional Office has been reviewing data in detail as part of our development of a draft problem assessment for the lower Boise River. Based on our review of the available data we recommend the following changes to the 1998 303(d) list for the Boise River:

Segment	Change
Boise River, Barber Diversion to Star	Delete dissolved oxygen(DO) Delete oil and grease
Boise River, Star, to Notus	Delete DO
Boise River, Notus, to Snake River	Delete DO

These recommendations were reviewed by the lower Boise River Watershed Advisory Group (WAG) in October 1997.

Oil and Grease

These pollutants were originally listed for the Boise River from Barber Diversion to Star based on the 1992 305(b) report, "The 1992 Idaho Water Quality Status Report". Oil and grease was identified in the 305(b) report as a potential pollutant based on the best professional judgement of DEQ staff. It is our opinion that the data not substantiate that oil and grease are impairing uses in the River. The U.S. Geological Survey (USGS) under contract to the City of Boise, has collected oil and grease data at stormwater outfalls in Boise, and Garden City, during several stormwater events. The Bureau of Reclamation has collected oil and grease data in selected drains and streams in the Boise area that discharge to the Boise River. An analysis of the data supporting de-listing of this pollutant is attached for your review.

The USGS collected and analyzed their samples using standard USGS quality assurance methods that are described in the report "Data and Adjusted Regional Regression Models of Volume and Quality of Urban Storm-Water Runoff in Boise and Garden City, Idaho", USGS Water

Resources Investigation Report 95-4228. Quality assurance methods used by the Bureau of Reclamation for sampling and analysis are described in the report "Five Mile Drain Storm Water Quality Study, Draft Scope of Work".

DEQ's recommendation to de-list oil and grease for the Boise River was presented to the stormwater work group that supports the lower Boise River WAG. The work group supports the recommendation and further recommends that oil and grease in stormwater discharge to the Boise River be monitored in the future to detect any changes in conditions.

Dissolved Oxygen

All three of the segments of the Boise River that are currently listed for DO are designated for cold water biota. The DO criteria for cold water biota in the Idaho Water Quality Standards and Wastewater Treatment Requirements requires that DO remain above 6.0 mg/l at all times. DO has been measured by the USGS at four sites in the Boise River during synoptic sampling conducted between May 1994 and August 1997. DO data for earlier dates is available for three of the four sites (Boise River below Diversion Dam, at Glenwood Bridge, and near Parma). We confined our analysis to data available from the last five years. In addition, the USGS collected diel DO data at five sites in August and early September 1997. All data were collected using standard USGS methods for quality assurance.

Tables showing the synoptic DO data at the four major river sites and tables and graphs of the diel DO measurements are attached for your review. The sampling sites relate to listed segments as follows:

Boise River, above Barber Diversion	Boise River below Diversion Dam (13203510)
Boise River, Barber Diversion to Star	Boise River at Glenwood Bridge (13206000) Boise River at Eckert Road
Boise River, Star, to Notus	Boise River near Middleton (13210050) Boise River near Caldwell
Boise River, Notus, to Snake River	Boise River near Parma (13213000)

In all of these samples, there has not been a single measurement that did not meet the applicable DO criteria. Based on these data the Boise Regional Office recommends removing DO from the 303(d) list for all three segments of the lower Boise River.

If you have any questions or need additional information, please contact me at 373-0575, or Paul Schinke at 373-0589.

SG:cm h:\98-303d.wpd

Draft Oil and Grease Sampling Summary
Lower Boise River Watershed

Idaho Division of Environmental Quality, Boise Regional Office 11/18/97

The data summarized below were collected by the US Geological Survey (USGS) for the City of Boise in support of an NPDES storm water permit application, and by the Bureau of Reclamation (BOR) on selected drains. The USGS monitored the runoff from three storm events that caused precipitation over the watersheds of the outfalls in Table 1, below.

Table 1. Concentrations of Total Recoverable Oil and Grease in mg/l from WRI Report 95-4228, USGS

Outfall Location	Storm 1	Storm 2	Storm 3
Walnut Street	<1	<1	<1
Boise State University	5	2	3
9th Street	1	2	1
Americana Blvd.	2	2	2
43rd Street - Davis Drain	3	4	>1

The storm events that caused runoff ranged in size from 0.03 inches to 0.34 inches of precipitation, and cover a good cross section of storm sizes when compared to events recorded in B[illegible] from 1976 - 1993. A precipitation event larger than 0.50 inches did not occur in Boise during the USGS study, but events of that size represent only 10 percent of the storms in the historical record (USGS, 1995).

The water quality samples collected for the City of Boise were all gathered during the "first flush," and thus may represent concentrations of oil and grease that are higher than the average for the entire runoff event. The estimated concentrations of oil and grease in the Boise River after mixing of the storm water runoff with the river water are shown in Table 2, below. In the table, all estimated concentrations are reported only to four decimal places, and all are well below 1 mg/l. Since the 43rd Street outfall in Garden City enters the Davis Drain, for which flow data are not available, its contribution is assumed to enter the Boise River directly without the benefit of dilution in the drain. The spreadsheet and statement of assumptions used in the calculations shown in Table 2 is available from DEQ upon request.

Table 2. Estimated Concentrations of Oil and Grease in the Boise River after Mixing*, mg/l (R) indicates runoff from an outfall on a given date.

Storm Date	Downstream of Walnut Street	Downstream of Boise State	Downstream of 9th Street	Downstream of Americana	Downstream of 43rd Street
10/7/93	0.0001 (R)	0.0004 (R)	0.0006 (R)	0.0006	0.0006
12/7/93			0.0007 (R)	0.0023 (R)	0.0023
12/11/93	0.0006 (R)	0.0025 (R)	0.0025	0.0025	0.0025
4/23/94		0.0011 (R)	0.0011	0.0019 (R)	0.0019
5/4/94			0.0000 (R)	0.0000	0.0000
5/17/94	0.0002 (R)	0.0002	0.0002	0.0002	0.0002
6/1/94				0.0005 (R)	0.0005
9/13/94					0.0019 (R)
10/4/94					0.0285 (R)
10/14/94					0.0012 (R)

*Not every drainage area received precipitation during every storm. Concentrations are carried downstream from the first date when and location where runoff occurred.

Bureau of Reclamation Sampling in Drains

The Bureau of Reclamation has developed a study plan to monitor a group of pollutants during four storm events over the course of one year. Sampling sites are spaced along Fivemile Creek, Ninemile Creek, South Slough, Sky Pilot Drain, and Solomon Drain. One data set is available at present, and oil and grease concentrations at all sites are less than the detection limit (Table 3).

Table 3. Bureau of Reclamation Oil and Grease Sampling Results

Parameter	Fivemile Franklin	Fivemile Ustick	North Slough Fry St.	North Slough Eagle Road
Oil & Grease, mg/l	< 5.0	< 5.0	< 5.0	< 5.0
Parameter	**South Slough**	**Ninemile Creek**	**Solomon Drain**	**Sky Pilot Drain**
Oil & Grease, mg/l	< 5.0	< 5.0	< 5.0	< 5.0

Typical Oil and Grease Content of Urban Runoff

Oil and grease data from the Federal Highway administration indicate that typical concentrations in runoff range from 6 to 16 mg/l. A report from the Watershed '96 Conference in Washington, D.C., indicates that oil and grease in storm water derived from roads and parking lots may range from 0.7 to 6.6 mg/l. In comparison, the City of Boise storm water drains all have measured concentrations less than 6.0 mg/l, and are within normal the normal range for oil and grease.

Impacts of Oil and Grease

The concentrations of oil and grease that cause negative impacts on aquatic life are widely variable depending upon the specific petroleum hydrocarbon of interest. Given that oil and grease are washed into the Boise River at the low concentrations measured, and that runoff volumes are not large in comparison to the flow of the river itself, aquatic life forms are not exposed to concentrations that cause impairment.

Conclusions

- The 1996 303(d) listings of oil and grease as pollutants of concern for the Boise River from Barber Diversion to Star are incorrect and should be removed when the 1998 303(d) list is prepared.
- Storm water management activities already in place are sufficient to manage oil and grease runoff from the Boise urban area.

References

Bureau of Reclamation, Five Mile Drain Storm Water Quality Study, Draft Scope of Work, March, 1997.

Constituents of Highway Runoff, Vol. IV, Characteristics from Operating Highways, Research Report, Federal Highway Administration, Office of Research and Development, Washington, D.C., February, 1981.

Dupuis, Tom, CH2M Hill Consulting, Milwaukee, Wisconsin. Personal communication on May 13, 1997.

Kjelstrom, L.C., "Data for and Adjusted Regional Regression Models of Volume and Quality of Urban Storm-Water Runoff in Boise and Garden City, Idaho, 1993-94," US Geological Survey, Water Resource Investigations Report 95-4228.

Shepp, David L., "Petroleum Hydrocarbon Concentrations Observed in Runoff from Discrete, Urbanized, Automotive-Intensive Land Uses," Watershed '96 Conference Proceedings, pp. 220-223.

DISTRICT CODE 16 UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE 10-16-97

13203510 - BOISE R BL DIVERSION DAM NR BOISE ID 02N03E0

WATER-QUALITY DATA

ALL DATA AFTER SEP. 96 AR

PROVISIONAL RECORDS

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)
NOV 1993									
03...	1530	258	72	7.5	16.5	11.5	0.70	12.3	126
JAN 1994									
18...	1300	210	76	7.7	3.0	2.5	--	12.7	100
MAR									
10...	1215	245	86	8.1	6.5	3.0	1.0	12.4	101
MAY									
11...	1530	1770	90	7.8	28.0	9.0	0.40	11.0	106
JUL									
20...	1245	2010	76	7.6	29.5	15.5	--	9.6	106
SEP									
13...	1500	620	101	7.9	19.0	17.0	1.0	9.1	105
NOV									
14...	1400	161	109	8.4	5.5	8.5	--	12.7	118
APR 1995									
13...	1100	1420	92	6.7	--	6.0	--	12.1	108
26...	0930	4640	87	7.5	--	7.0	--	11.5	104
MAY									
16...	0940	4610	77	7.8	21.5	7.5	--	12.4	115
JUN									
12...	0905	2620	60	7.7	18.0	10.5	--	10.7	107
AUG									
14...	0925	1830	62	6.9	20.0	14.0	--	13.9	114
OCT									
19...	1400	337	73	7.6	16.0	14.5 SS	--	9.4	101
DEC									
07...	1045	200	73	7.1	1.5	8.0	--	10.8	101
FEB 1996									
13...	1500	4000	81	7.8	11.0	2.0	--	13.3	106
APR									
11...	1005	5900	77	7.4	7.5	7.0	--	11.5	105
22...	0950	5400	74	7.7	14.0	7.5	--	14.0	120
MAY									
15...	1215	4650	71	7.7	22.0	8.0	--	12.2	116
JUN									
12...	1010	7800	59	7.8	20.5	10.5	--	10.6	104
AUG									
21...	0910	2100	61	6.6	16.0	14.5	--	9.5	102
OCT									
21...	1115	321	69	7.3	8.0	12.0	--	10.2	105
DEC									
16...	1330	240	74	8.0	10.0	6.0	--	12.1	107
FEB 1997									
13...	1000	7010	71	7.4	4.5	2.5	--	13.9	113
APR									
14...	1325	--	75	7.6	16	6.5	--	11.2	100
JUN									

PROVISIONAL RECORDS

PROVINCIAL RECORDS

AUG 11...	1230	--	51	7.8	0	14.0	55 --	13.4	145
	1525	--	56	7.8	0	15.0	--	12.0	132

Diversion Dam

DISTRICT CODE 16

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
13206000 - BOISE RIVER AT GLENWOOD BRIDGE NR BOISE ID

PROCESS DATE 10-16-97

WATER-QUALITY DATA

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)
NOV 1992									
02...	1345	83	198	7.9	11.5	12.0	1.2	10.9	111
JAN 1993									
07...	1345	71	274	7.4	-3.5	3.5	--	11.1	121
MAR									
10...	1245	120	251	8.0	6.5	8.0	3.3	10.8	101
MAY									
12...	1130	2570	99	8.1	28.5	8.5	6.2	12.3	116
AUG									
06...	1050	1130	71	7.3	22.5	14.0	--	9.7	102
SEP									
14...	1245	626	82	8.1	25.0	17.0	1.2	10.3	117
NOV									
01...	1630	240	127	7.8	12.0	10.5	0.60	15.4	152
JAN 1994									
19...	1345	336	116	7.8	-1.5	3.0	--	13.0	104
MAR									
04...	1145	248	143	8.3	17.0	7.0	0.60	13.6	124
MAY									
13...	1500	806	98	8.8	22.0	13.0	0.40	12.0	123
JUL									
12...	1345	1260	84	8.3	32.0	16.5 SS	--	10.5	118
SEP									
09...	0930	398	116	7.8	17.0	17.0	0.90	8.4	96
NOV									
10...	1115	188	163	--	6.5	8.5	1.2	10.9	104
JAN 1995									
17...	1345	100	226	7.6	4.0	5.5	--	13.7	122
FEB									
14...	1500	195	174	8.7	4.5	4.0	--	14.3	121
MAR									
20...	1230	167	175	8.4	12.5	9.0	4.6	11.3	111
APR									
13...	1500	923	104	7.1	12.0	7.5	--	11.5	106
26...	1245	3450	90	7.4	--	8.0	--	10.2	102
MAY									
16...	1315	3990	80	8.2	15.5	8.0	2.0	11.2	106
JUN									
12...	1125	1710	70	8.0	28.0	12.0	--	10.0	101
JUL									
21...	1255	1040	70	7.9	26.5	16.0	--	10.0	111
AUG									
14...	1220	790	73	7.0	24.5	15.0	--	10.0	108
SEP									
19...	0930	811	86	7.6	16.5	16.0	13	11.1	124
OCT									
19...	1130	[illegible]	121	[illegible]	[illegible]				

DEC									
07...	0850	235	109	7.2	1.0	5.0	--	11.0	95
FEB 1996									
13...	1540	3760	84	7.9	9.0	3.0	--	12.3	99
APR									
11...	1200	5690	83	7.9	10.0	7.5	2.9	11.6	108
22...	1300	4910	78	8.0	16.0	8.0	--	13.7	130
MAY									
16...	1130	3790	78	7.8	14.5	8.5	2.0	10.8	104
JUN									
11...	1350	5060	64	7.6	21.5	11.5	2.0	10.9	109
JUL									
12...	1340	1340	72	8.1	30.0	15.5 SS	0.60	11.0	121
AUG									
21...	1025	1250	76	7.7	15.0	14.5	1.1	9.5	102
SEP									
24...	1354	743	91	8.1	16.0	16.0	1.5	10.7	120
OCT									
21...	1335	386	106	8.2	9.5	11.0	--	11.8	116
DEC									
16...	1205	446	126	7.9	4.5	5.0	--	13.3	115
FEB 1997									
10...	1300	6860	77	7.5	11.0	3.0	--	12.3	101

PROVISIONAL RECORDS

Glenwood

DISTRICT CODE 16

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY PROCESS DATE 10-16-97
13210050 - BOISE RIVER NR MIDDLETON ID

WATER-QUALITY DATA

Spawning Window Oct 15 -- March 15
Mountain whitefish

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)
MAY 1994									
12...	1045	234	177	8.1	20.5	16.0	--	10.6	119
NOV									
09...	1215	258	293	--	5.0	7.0	1.2	10.9	100
JAN 1995									
18...	1400	206	347	8.3	4.5	5.5	--	12.9	110
FEB									
14...	1130	271	298	8.9	4.0	3.0	--	13.1	108
MAR									
10...	1350	224	314	8.5	15.5	9.5	1.4	12.7	119
APR									
13...	1745	765	136	6.7	8.0	8.5	--	11.0	104
28...	1415	3630	105	8.0	16.0	9.0	--	11.0	105
MAY									
17...	1320	3760	97	8.0	19.0	13.0	2.7	10.3	109
JUN									
13...	1215	1160	96	8.4	--	13.5	--	11.5	121
JUL									
20...	1500	871	105	8.1	31.0	18.5	--	10.6	124
AUG									
15...	1415	573	122	8.0	29.0	18.0	--	12.5	145
SEP									
11...	1440	417	148	8.8	20.0	18.5	1.0	11.6	134
OCT									
19...	0930	356	219	7.5	5.0	10.0	--	10.8	104
DEC									
05...	1420	382	222	7.5	0.0	4.5	--	14.1	116
FEB 1996									
14...	1335	4000	101	7.6	16.0	3.0	--	13.2	105
APR									
11...	1140	4800	93	7.5	15.0	7.0	--	10.6	93
23...	1235	4200	91	7.7	14.0	8.5	--	13.7	130
MAY									
15...	1330	3240	90	8.2	22.0	11.0	--	--	--
JUN									
13...	1225	4690	74	7.9	26.5	12.0	--	9.7	97
AUG									
22...	1030	620	121	7.9	19.0	15.5	--	9.6	105
OCT									
24...	1310	412	179	8.3	11.5	11.5	--	11.5	115
DEC									
16...	1005	342	233	7.6	4.0	5.0	--	11.3	95
APR 1997									
16...	1130	--	91	7.9	22.0	7.5	--	11.5	103
JUN									
12...	1230	--	281	7.7	16.0	12.5	--	10.4	106
JUL									

15...	1020	--	101	7.7	22.5	17.5	--	11.3	125
AUG 11...	1200	--	102	7.9	24.0	17.5	--	11.3	130

Middleton

DISTRICT CODE 16

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
13213000 - BOISE RIVER NR PARMA ID

PROCESS DATE 10-16-97

WATER-QUALITY DATA

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)
NOV 1992									
03...	1030	648	591	8.3	10.5	9.5	4.5	10.4	96
JAN 1993									
05...	1245	576	604	8.1	-2.5	1.5	3.5	9.5	96
MAR									
11...	1330	723	577	8.6	9.5	8.5	8.0	13.7	126
MAY									
13...	1330	2170	203	8.0	29.0	15.5	15	9.8	107
SEP									
08...	1320	772	451	8.5	30.5	18.5	4.4	11.8	137
NOV									
02...	1200	981	537	8.6	15.0	9.0	0.80	17.3	161
JAN 1994									
04...	1330	859	507	8.2	5.0	6.5	--	13.2	118
19...	0930	870	515	7.9	-2.0	4.5	3.7	11.5	96
MAR									
01...	1430	800	509	8.7	21.5	9.0	2.8	13.7	135
MAY									
10...	1145	587	420	8.0	27.0	18.5	34	8.7	100
SEP									
07...	1230	444	536	8.3	16.0	17.0	2.2	12.0	138
NOV									
08...	1330	779	559	--	1.5	8.0	3.2	12.4	114
FEB 1995									
15...	1520	686	585	8.8	3.5	4.5	4.5	14.3	121
MAR									
21...	1200	757	540	8.9	13.0	9.5	--	9.9	98
APR									
14...	1200	1270	294	8.5	10.0	8.5	--	10.7	101
27...	1020	3560	163	7.7	20.0	10.5	--	9.4	92
MAY									
18...	1500	4380	159	8.3	22.0	13.0	5.1	10.5	108
JUN									
14...	0915	1010	301	8.1	17.5	16.5	--	8.3	93
JUL									
19...	1300	1420	308	8.0	29.0	21.0	12	8.3	102
AUG									
16...	0920	1080	361	7.6	22.0	18.0	--	6.9	78
OCT									
18...	0920	942	491	7.9	10.0	12.5	--	9.1	92
DEC									
05...	1130	935	501	7.9	-1.0	6.0	--	11.3	102
FEB 1996									
15...	1015	5360	174	7.7	3.5	3.5	--	11.7	95
APR									
10...	1015	6320	138	7.3	12.5	10.5	--	9.2	90
24...	1015	5040	139	7.8	11.0	[illegible]		[illegible]	[illegible]

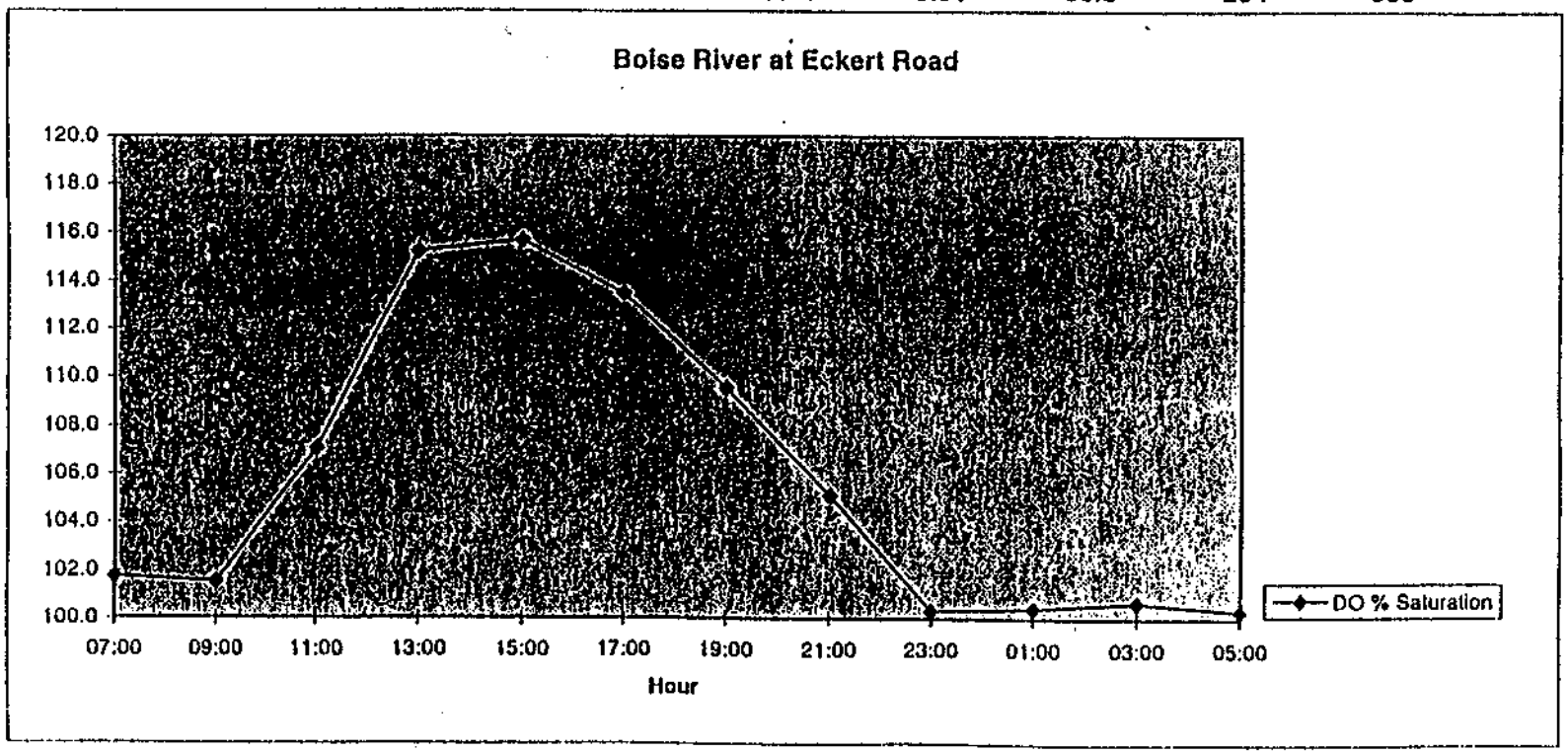
PROVISIONAL RECORDS

MAY									
17...	1055	5320	171	7.8	21.5	12.0	--	10.3	103
JUN									
10...	1415	5100	136	7.8	25.5	15.0	--	9.1	97
AUG									
21...	1235	1140	331	7.5	23.5	17.5	--	8.9	102
OCT									
23...	1215	1190	491	8.0	9.5	10.0	--	11.1	106
DEC									
17...	1015	929	515	8.3	-1.0	4.0	--	13.6	111
FEB 1997									
11...	1025	8000	144	7.8	9.0	3.5	--	11.7	96
APR									
17...	1120	6340	127	7.9	19.0	9.5	--	10.5	100
MAY									
22...	1025	4760	145	7.8	17.0	13.5	--	9.7	101
JUN									
10...	1115	4540	154	7.8	25.0	15.0	10	7.1	79
JUL									
18...	1035	1420	317	8.0	20.0	18.0	20	6.7	77
AUG									
12...	1227	1580	314	8.1	25.0	19.0	6.2	8.6	100

Parma

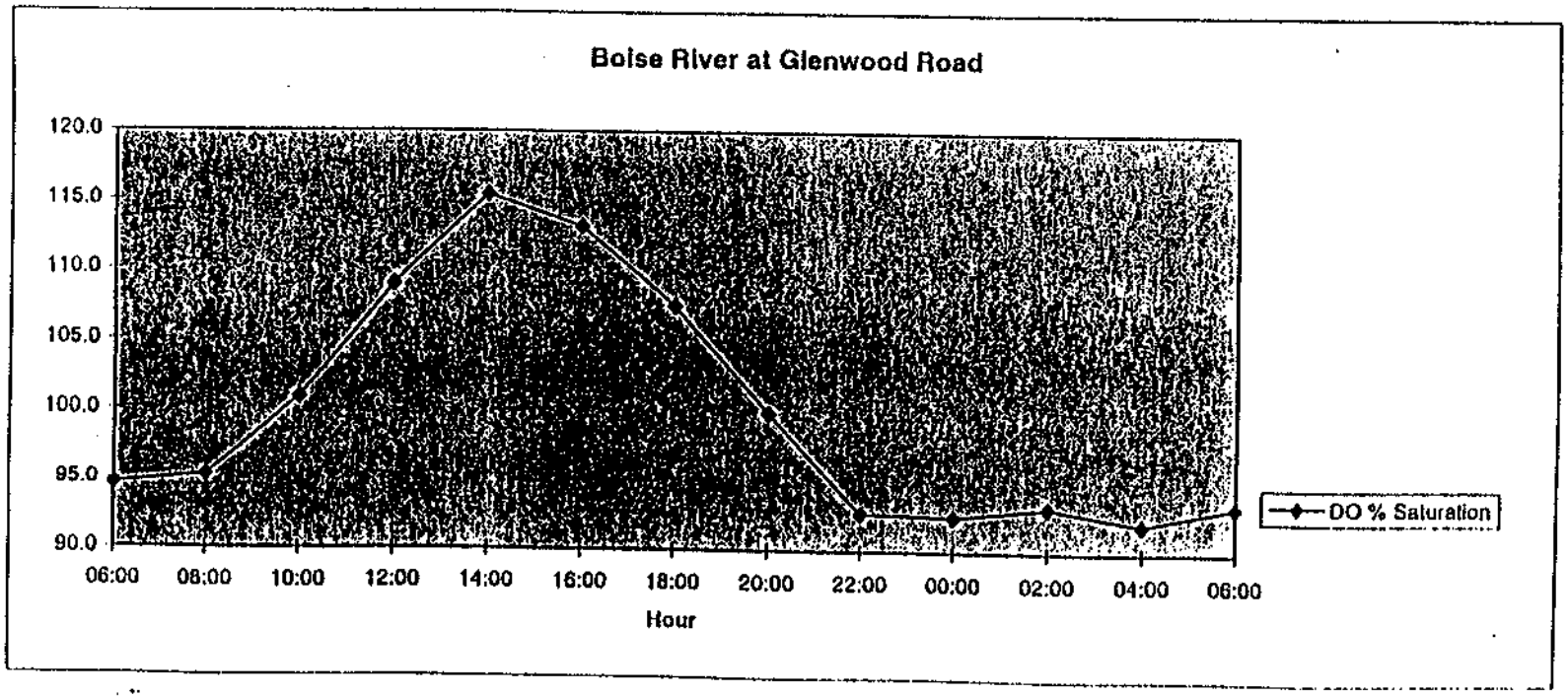
Eckert Road 8/21-22/1997

Time (24hr)	DO % Saturation	H20 Temp	Air Temp	pH	DO-Meas	Cond-True	Cond-Meas	Barometer
07:00	101.8	14.7	15.0	7.41	9.28	58.4	292	686
09:00	101.5	15.0	19.0	7.48	9.26	58.6	293	687
11:00	107.1	15.7	26.4	7.68	9.55	58.2	291	687
13:00	115.2	16.7	31.2	7.87	9.77	58.4	292	674
15:00	115.7	17.1	33.0	7.99	9.81	58.6	293	674
17:00	113.5	17.1	35.2	7.99	9.77	58.6	293	685
19:00	109.6	16.4		7.83	9.63	58.4	292	684
21:00	105.1	15.6	21.5	7.54	9.24	58.8	294	684
23:00	100.3	15.0	21.0	7.39	9.01	58.6	293	684
01:00	100.4	14.8	16.5	7.34	9.02	58.6	293	684
03:00	100.7	14.7	16.0	7.32	9.04	58.8	294	684
05:00	100.3	14.7	14.5	7.31	9.01	58.8	294	685



Glenwood Road 8/21-22/1997

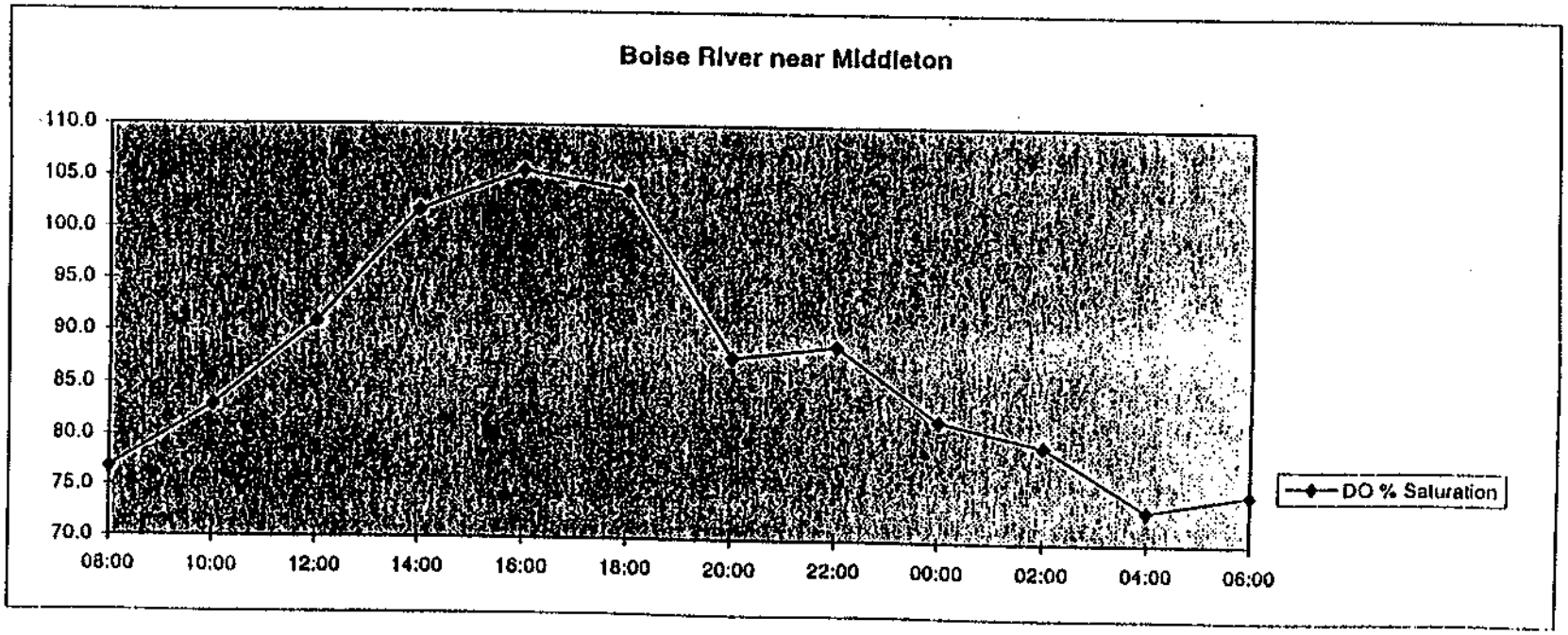
Time (24hr)	DO % Saturation	H20 Temp	Air Temp	pH	DO-Meas	Cond-True	Cond-Meas	Barometer
06:00	94.6	15.0	16.0	7.55	8.63	62.0	310	691
08:00	95.3	14.8	17.0	7.45	8.69	61.8	309	691
10:00	100.9	15.3	24.0	7.63	9.20	67.4	337	691
12:00	109.0	16.4	28.0	8.07	9.58	69.2	346	677
14:00	115.4	17.6	27.5	8.37	9.58	69.8	349	674
16:00	113.1	18.4	32.0	8.43	9.39	70.0	350	674
18:00	107.5	18.7		8.21	9.01	70.0	350	688
20:00	99.9	18.2	22.0	7.81	8.54	64.0	320	687
22:00	92.7	17.4	23.0	7.50	8.10	78.0	390	687
00:00	92.5	16.5	17.5	7.40	8.25	68.2	341	688
02:00	93.2	15.8	18.0	7.35	8.31	68.4	342	688
04:00	92.0	15.2	16.0	7.34	8.39	66.8	334	688
06:00	93.3	14.9	14.5	7.33	8.51	65.8	329	689



Middleton 8/28-29/1997

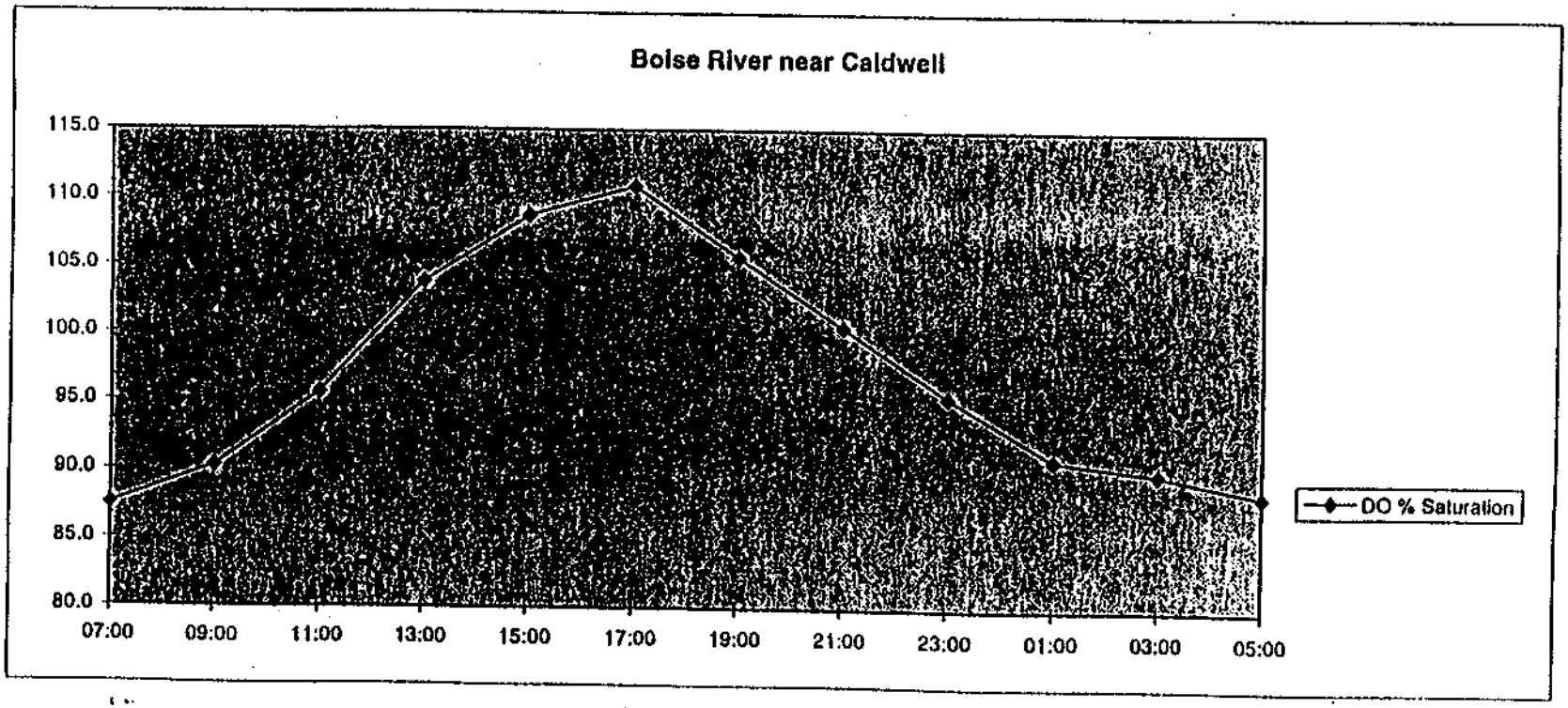
Time (24hr)	DO % Satur	H20 Temp	Air Temp	pH	DO-Meas*	Cond-True	Cond-Meas	Barometer
08:00:00	76.8	16.5	16.5	7.08	6.71	63	63	692
10:00:00	83.0	16.5	18.0	7.00	7.40	60	60	692
12:00:00	91.0	17.0	25.0	7.25	7.95	62	62	692
14:00:00	101.8	17.5	26.5	7.37	8.70	63	63	691
16:00:00	105.6	18.5	31.0	7.50	8.85	63	63	691
18:00:00	103.8	18.8	30.0	7.40	8.70	60	60	690
20:00:00	87.7	18.6	24.5	7.25	7.35	60	60	690
22:00:00	88.9	18.4	18.5	7.25	7.60	59	59	690
00:00:00	81.9	18.0	17.0	7.08	7.00	60	60	690
02:00:00	79.5	17.7	15.0	7.05	6.80	60	60	692
04:00:00	73.2	17.3	15.5	6.95	6.40	60	60	692
06:00:00	74.9	16.9	13.5	6.94	6.55	61	61	693

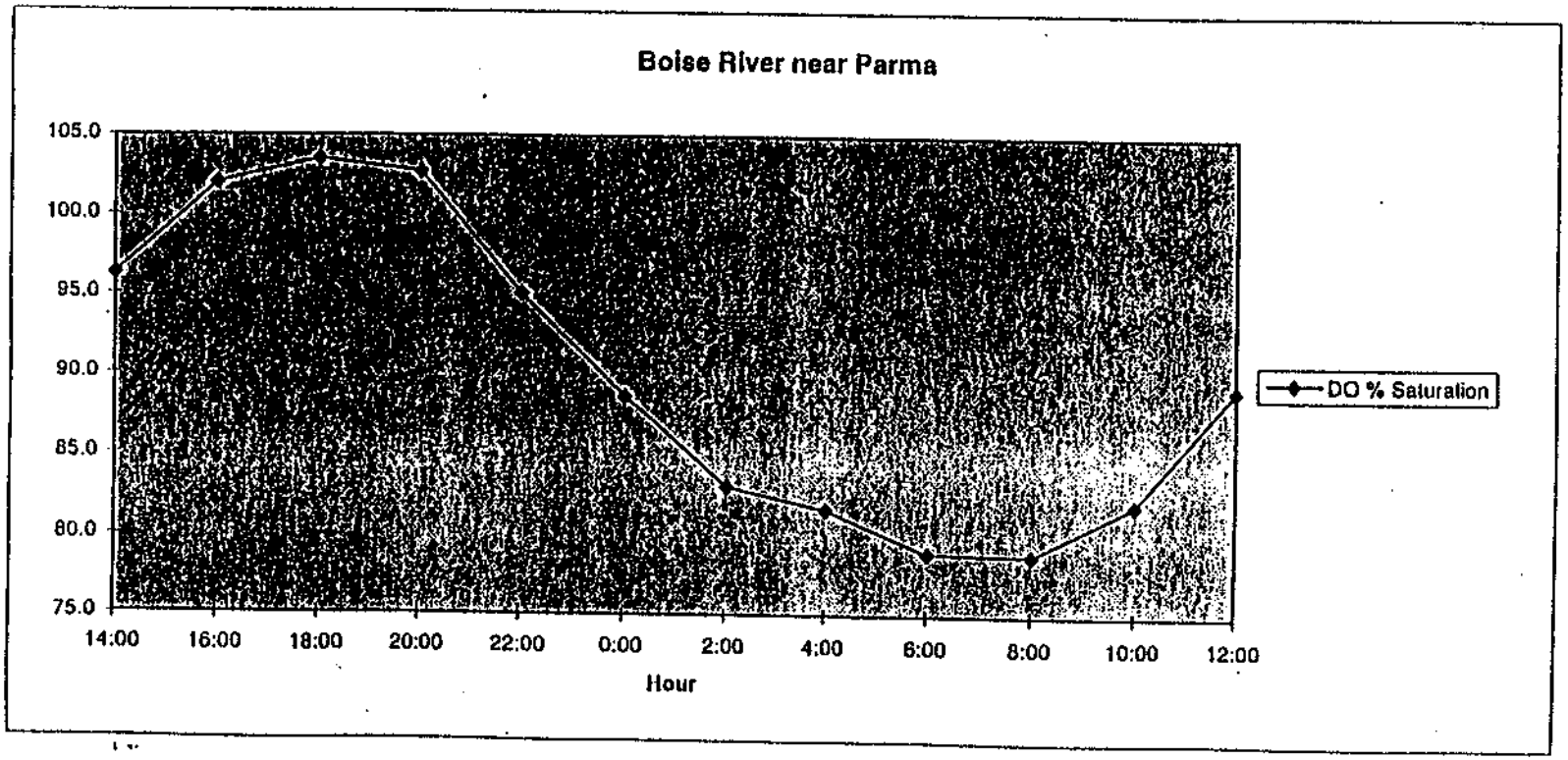
*Mean



Caldwell 8/28-29/97

Time (24hr)	DO % Satur	H20 Temp	Air Temp	pH	DO-Meas	Cond-True	Cond-Meas	Barometer
07:00	87.5	17.4	14.0	7.52	7.65	105.4	105.400	694
09:00	90.3	17.0	17.5	7.48	7.89	105.5	105.500	694
11:00	95.7	17.1	24.5	7.55	8.36	105.4	105.400	694
13:00	103.7	17.5	28.0	7.69	8.87	105.0	105.000	694
15:00	108.7	18.3	28.5	7.86	9.29	103.7	103.700	694
17:00	110.9	19.0	29.0	7.99	9.29	102.4	102.400	692
19:00	105.6	19.2	28.0	7.87	8.85	101.5	101.500	692
21:00	100.5	19.0	23.5		8.42	102.6	102.600	692
23:00	95.5	18.6	23.5	7.60	8.00	102.1	102.100	693
01:00	91.0	18.2	18.0	7.51	7.78	103.6	103.600	693
03:00	90.1	17.7	16.0	7.45	7.70	104.5	104.500	693
05:00	88.6	17.3	16.5	7.42	7.74	105.3	105.300	694



Parma 9/4-5/1997

Time (24hr)	DO % Saturation	H20 Temp	Air Temp	pH	DO-Meas	Cond-True	Cond-Meas	Barometer
14:00	96.3	20.2	27.0	7.91	8.78	58.4	292	701
16:00	102.0	20.8	26.0	7.95	9.30	58.4	292	699
18:00	103.5	21.3	24.0	8.01	9.23	58.6	293	698
20:00	102.7	21.2	19.5	7.98	8.71	59.0	295	697
22:00	95.0	20.8	12.5	7.90	8.06	59.0	295	697
0:00	88.6	20.4	14.5	7.81	7.63	59.0	295	697
2:00	83.0	20.0	12.0	7.72	7.30	58.6	293	697
4:00	81.7	19.6	10.5	7.68	7.18	58.6	293	697
6:00	79.0	19.3	9.5	7.64	7.09	58.6	293	697
8:00	78.8	18.9	10.5	7.64	7.08	58.6	293	697
10:00	82.1	18.9	21.5	7.65	7.37	59.0	295	698
12:00	89.2	19.4	29.0	7.73	8.01	59.2	296	698