

# WATER QUALITY MEMORANDUM

Utah Coal Regulatory Program

February 21, 2008

TO: Internal File

THRU: Daron R. Haddock, Permit Supervisor *DRH*

FROM: *DD* Dana Dean, P.E., Senior Reclamation Hydrologist

RE: 2007 Third Quarter Water Monitoring, West Ridge Resources, Inc, West Ridge Mine, C/007/0041-WQ07-3, Task ID #2732

The West Ridge Mine is a currently operational longwall mine. Water monitoring data is evaluated from the data that is submitted quarterly by the mine to the Division EDI database. Water monitoring protocols, and surface, groundwater and monitoring wells, and UPDES sample parameters are outlined in the mine's MRP on Tables 7-1 to 7-6.

1. Was data submitted for all of the MRP required sites? YES  NO

### ***Springs***

*The MRP requires the Permittee to monitor 10 springs each quarter.*

The Permittee submitted all required samples for the spring sites.

### ***Streams***

*The MRP requires the Permittee to sample 12 streams each quarter.*

The Permittee submitted all required samples for the stream sites.

### ***Wells***

*The MRP requires the Permittee to monitor one well each quarter.*

The Permittee submitted the required well site sample.

### ***UPDES***

*The UPDES Permit/MRP require monthly monitoring of two outfalls: 001, Sedimentation Pond Discharge; and 002, Mine Water Discharge.*

The Permittee submitted all required samples for the UPDES sites. Only outfall 002 reported flow.

2. Were all required parameters reported for each site? YES  NO

3. Were any irregularities found in the data? YES  NO

Several parameters fell outside of two standard deviations from the mean encountered at the respective sites. They were:

Site	Parameter	Value	Standard Deviations from Mean	Mean
ST-5	Flow	583.41 gpm	2.61	74 gpm
ST-6	Total Hardness	562.33 mg/L	2.10	454.13 mg/L
ST-9	Total Suspended Solids	308 mg/L	3.91	48 mg/L
ST-9	Total Iron	6.699 mg/L	2.95	1.26 mg/L
ST-10	Dissolved Calcium	32.95 mg/L	3.43	51.32 mg/L
ST-10	Total Hardness	216.03 mg/L	3.35	270.59 mg/L
SP-15	Total Dissolved Solids	487 mg/L	3.38	402.52 mg/L
WR-1	Total Iron	8.123 mg/L	2.39	2.48 mg/L
SP-101	Dissolved Calcium	59.34 mg/L	2.24	55.16 mg/L
DH-86-2	Total Cations	35.55 meq/L	2.18	24.20 meq/L
DH-86-2	Dissolved Sodium	359.8 mg/L	2.54	223.58 mg/L
DH-86-2	Chloride	228 mg/L	2.50	58.77 mg/L
UTG040023-002 July 13	Dissolved Iron	1.316 mg/L	2.06	0.23 mg/L

ST-5 is an ephemeral streams that mostly flows from the mine water discharge. The flow this quarter is right in line with that of the discharge. It is interesting to note, that ST-6, an ephemeral stream down-channel had no flow this quarter.

There is a weak upward trend in the chloride at DH-86-2, however it has a sharp increase in the last two years. The drinking water criterion for chloride is 250 mg/L. It has only exceeded that value once (last quarter), and the value is down 42 mg/L from last quarter. This well is not used for drinking water, and regardless of the origin, the chloride levels are not of concern at this time.

There is no trend in dissolved calcium at ST-10 ( $R^2 = 0.0576$ ) and the upward trend at SP-101 is weak ( $R^2 = 0.3815$ ). There are only 7 samples in the population at SP-101. There are no criteria for this metal, but it does contribute to water hardness. The total hardness is unusually low at ST-10, in concert with the lower calcium, but is within the expected range at SP-101.

The dissolved iron at Outfall 002 does not really have an upward trend ( $R^2 = 0.2$ ), and the level dropped from 1.316 in July to 0.166 in August.

There is no trend in dissolved sodium at DH-86-2 ( $R^2 = 0.1273$ ), and the level has dropped 27 mg/L from last quarter.

The total amount of cations is slightly higher than usual at DH-82-6. The cation anion balance is within recommended limits and the total dissolved solids is not out of the ordinary at this site.

There is a fairly strong upward trend in total dissolved solids at SP-15 ( $R^2 = 0.6175$ ), with a weak negative correlation to flow ( $R^2 = 0.276$ ). The number is exactly the same as last quarter, and down from the first quarter.

There is no trend in total hardness at ST-10, and a weak upward trend at ST-5 ( $R^2 = 0.3965$ ). The water at ST-10 has always fallen into the "very hard" category (>300 mg/L).

There is no trend in total iron at ST-9 or WR-1 ( $R^2 = 0.1189$ , and 0.1242).

There is no trend in total suspended solids at ST-9.

Several routine reliability checks fell outside of standard values:

Site	Reliability Check	Value Should Be...	Value is...
ST-3	Conductivity/Cations	>90 & < 110	83
ST-3	Mg/(Ca + Mg)	< 40 %	62%
ST-5	Conductivity/Cations	>90 & < 110	84
ST-5	Mg/(Ca + Mg)	< 40 %	67%
ST-5	Ca/ (Ca + SO4)	> 50 %	17%
ST-6	Conductivity/Cations	>90 & < 110	79
ST-6	Mg/(Ca + Mg)	< 40 %	57%
ST-6	Ca/ (Ca + SO4)	> 50 %	24%
ST-8	Conductivity/Cations	>90 & < 110	71
ST-8	Mg/(Ca + Mg)	< 40 %	59%
ST-9	Conductivity/Cations	>90 & < 110	82
ST-9	Mg/(Ca + Mg)	< 40 %	62%
ST-10	Conductivity/Cations	>90 & < 110	84
ST-10	Mg/(Ca + Mg)	< 40 %	62%
SP-12	TDS/Conductivity	>0.55 & <0.75	0.81
SP-12	Conductivity/Cations	>90 & < 110	67
SP-12	Mg/(Ca + Mg)	< 40 %	70%
SP-13	TDS/Conductivity	>0.55 & <0.75	0.90
SP-13	Conductivity/Cations	>90 & < 110	62
SP-13	Mg/(Ca + Mg)	< 40 %	73%

SP-13	Ca/ (Ca + SO4)	> 50 %	40%
SP-15	Conductivity/Cations	>90 & < 110	78
SP-15	Mg/(Ca + Mg)	< 40 %	59%
WR-1	Conductivity/Cations	>90 & < 110	78
WR-1	Mg/(Ca + Mg)	< 40 %	51%
SP-16	Conductivity/Cations	>90 & < 110	74
SP-16	Mg/(Ca + Mg)	< 40 %	66%
SP-8	TDS/Conductivity	>0.55 & <0.75	0.76
SP-8	Conductivity/Cations	>90 & < 110	71
SP-8	Mg/(Ca + Mg)	< 40 %	76%
SP-8	Ca/ (Ca + SO4)	> 50 %	25%
SP-101	Conductivity/Cations	>90 & < 110	78
SP-101	Mg/(Ca + Mg)	< 40 %	58%
SP-102	Conductivity/Cations	>90 & < 110	74
SP-102	Mg/(Ca + Mg)	< 40 %	70%
S-80	Mg/(Ca + Mg)	< 40 %	58%
DH-86-2	TDS/Conductivity	>0.55 & <0.75	1.46
DH-86-2	Conductivity/Cations	>90 & < 110	38
DH-86-2	Mg/(Ca + Mg)	< 40 %	71%
DH-86-2	Ca/ (Ca + SO4)	> 50 %	33%
UTG040023-002 Aug. 29	TDS/Conductivity	>0.55 & <0.75	0.76

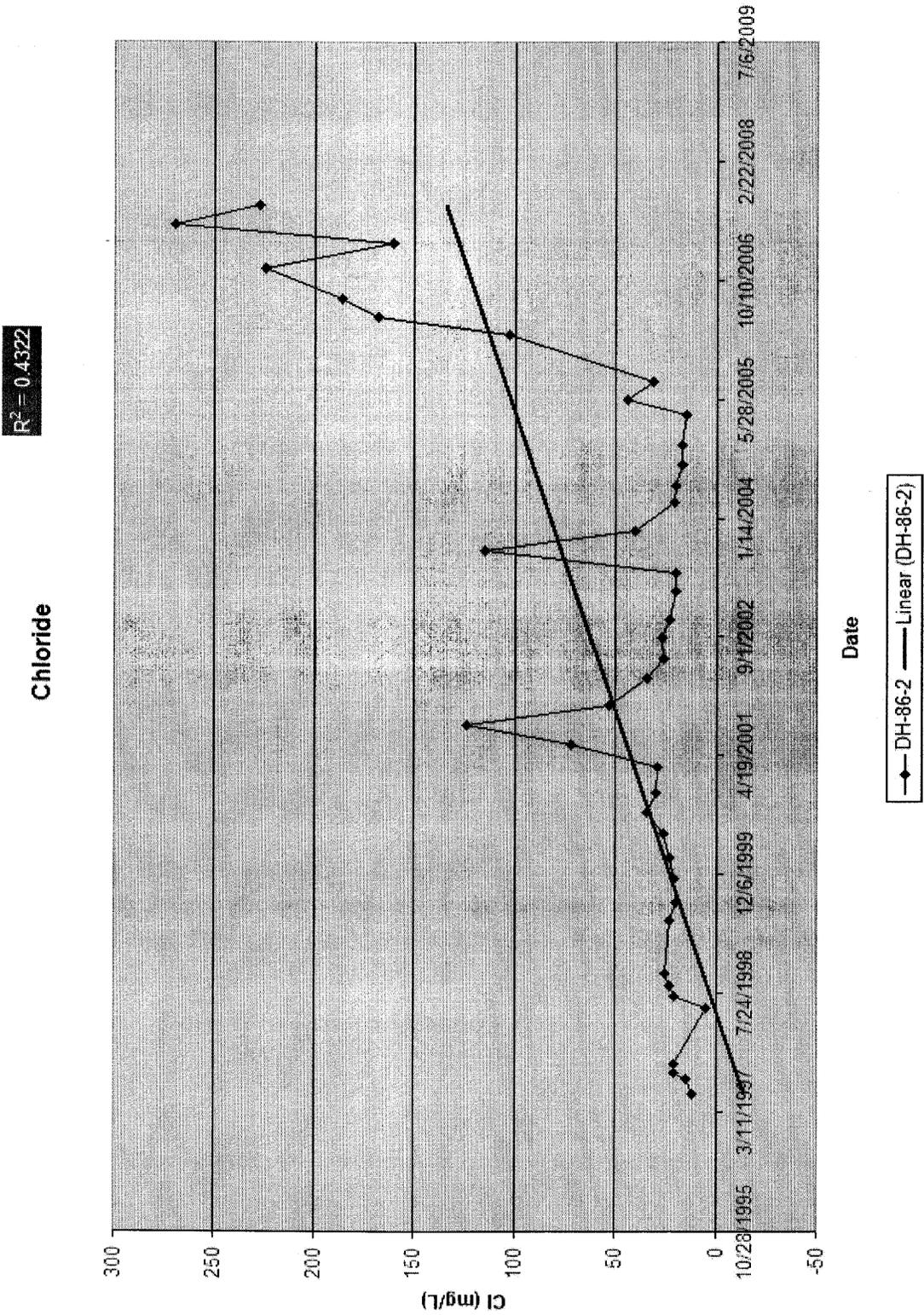
These inconsistencies do not necessarily mean that a sample is wrong, but it does indicate that something is unusual. An analysis and explanation of the inconsistencies by the Permittee would help to increase the Division's confidence in the samples. The Permittee should work with the lab to make sure that samples pass all quality checks so that the reliability of the samples does not come into question. The Permittee can learn more about these reliability checks and some of the geological and other factors that could influence them by reading Chapter 4 of *Water Quality Data: Analysis and Interpretation* by Arthur W. Hounslow.

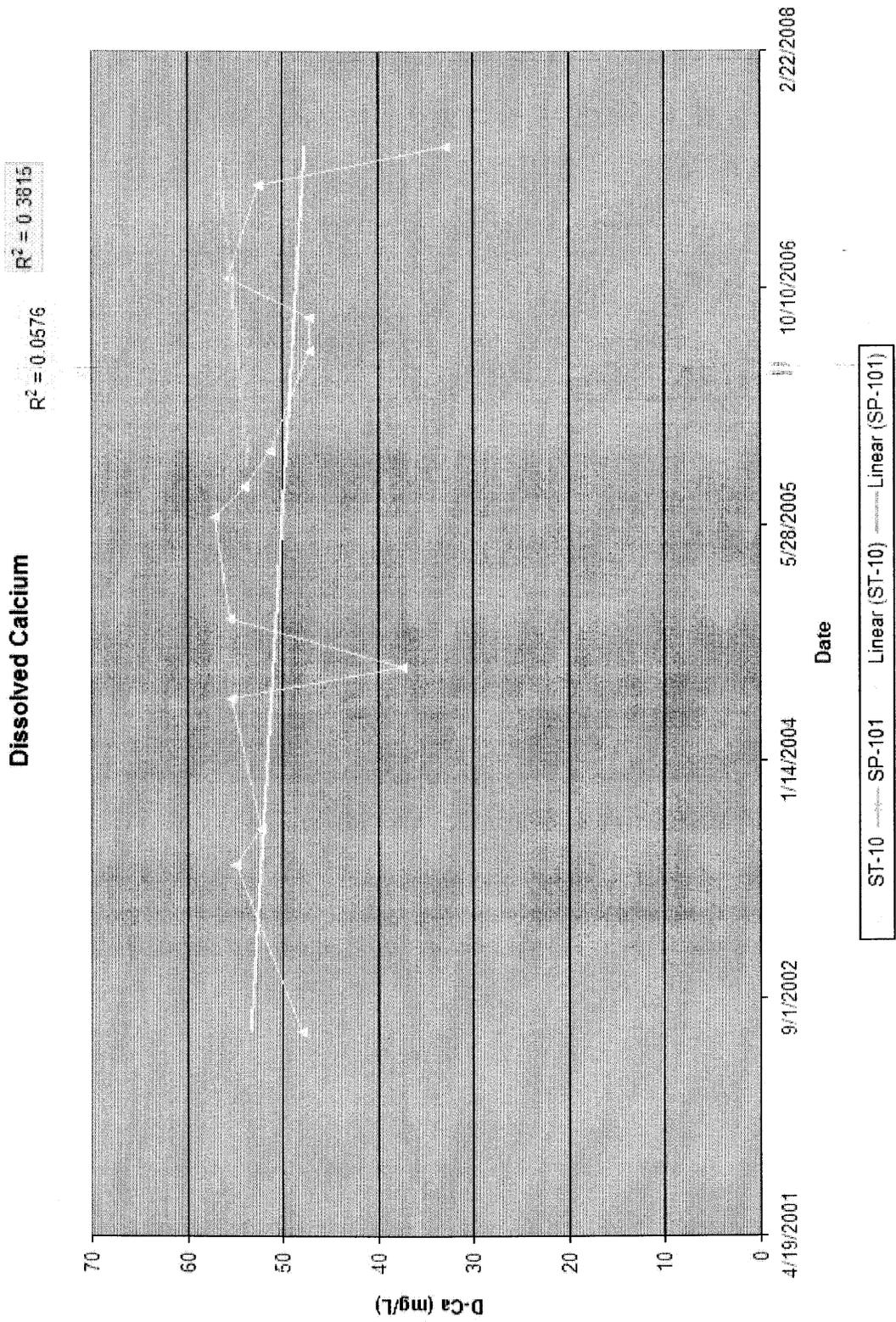
**4. On what date does the MRP require a five-year re-sampling of baseline water data.**

There is no commitment in the MRP to resample for baseline parameters.

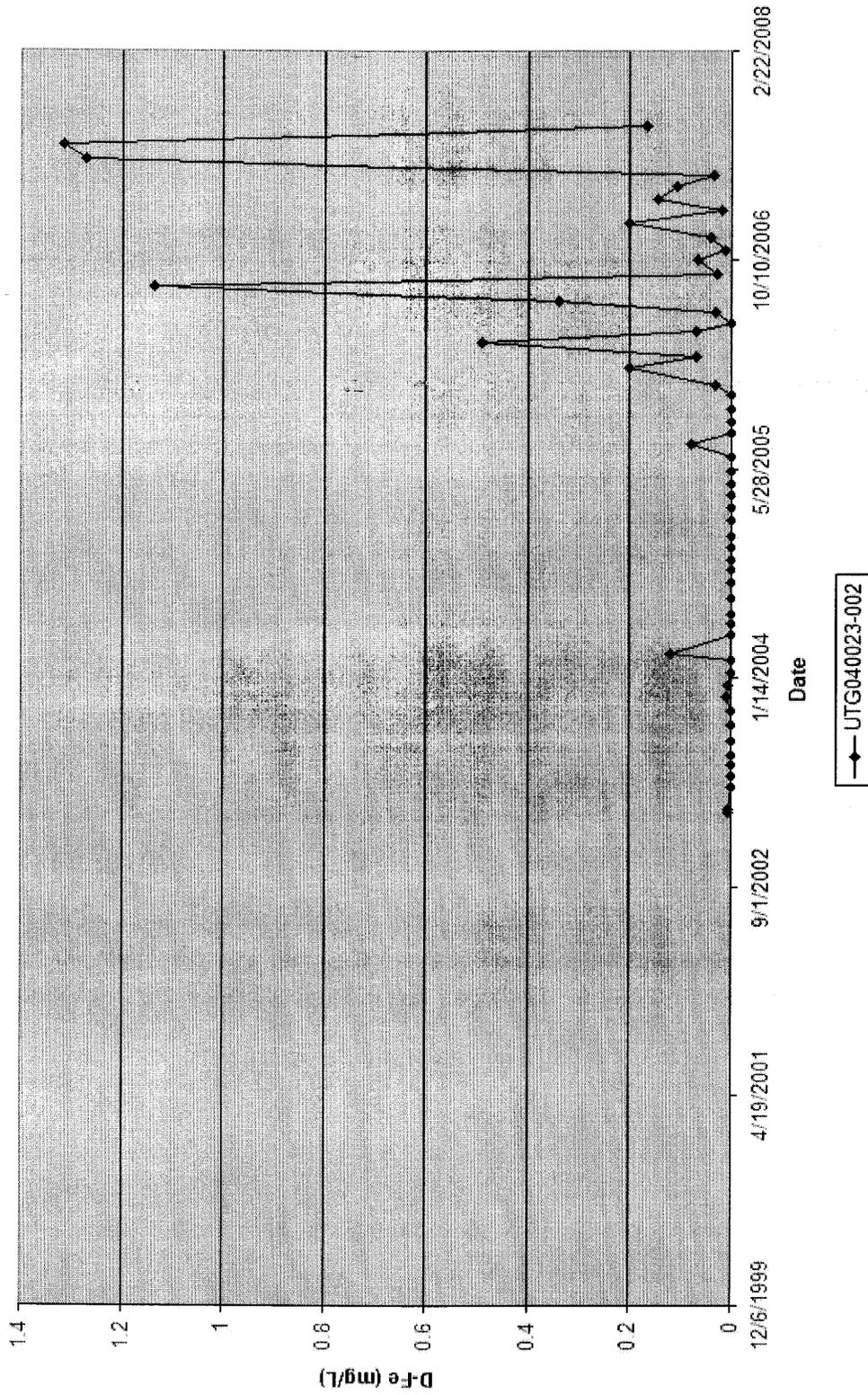
**5. Based on your review, what further actions, if any, do you recommend?**

No further actions are necessary at this time.  
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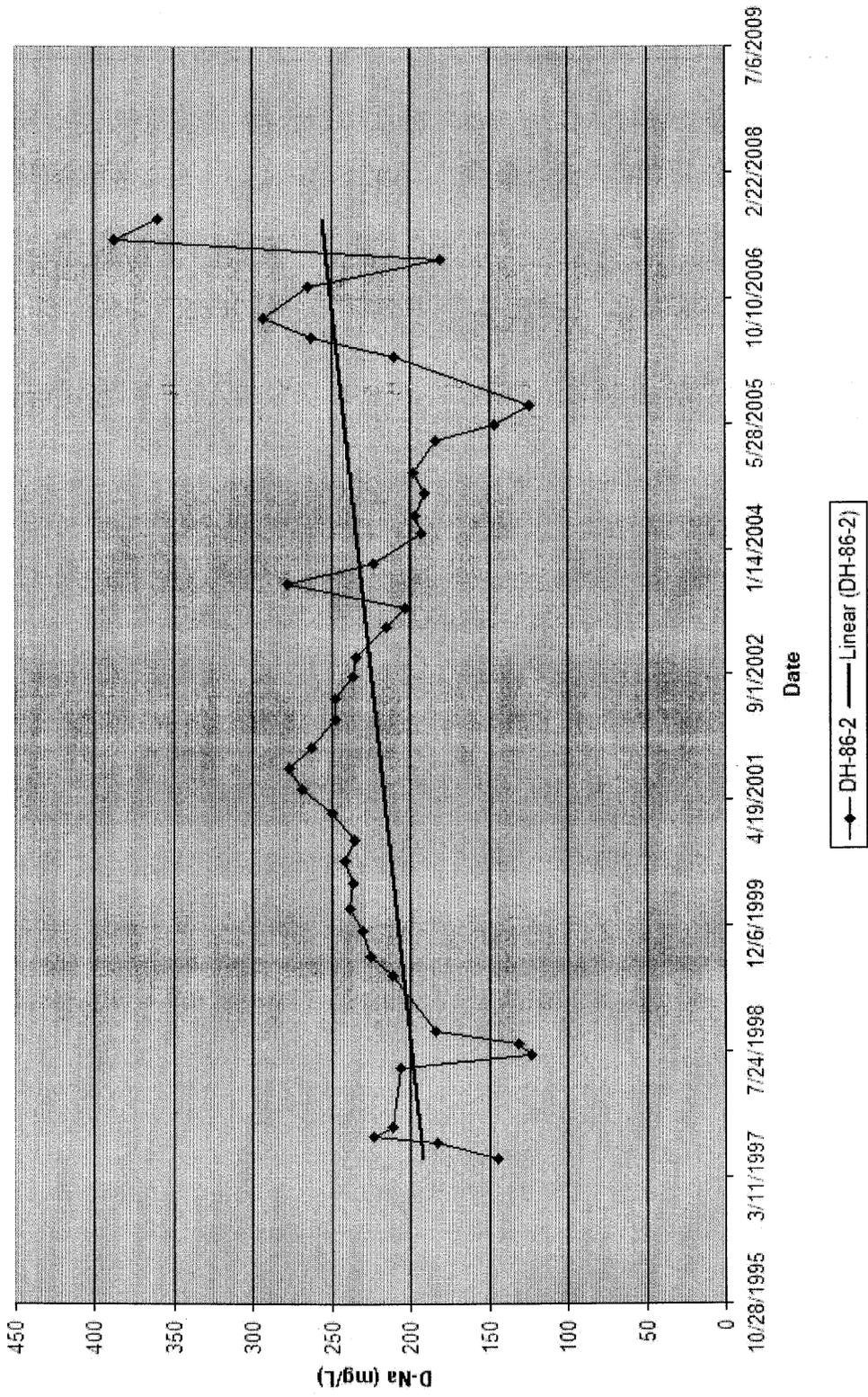


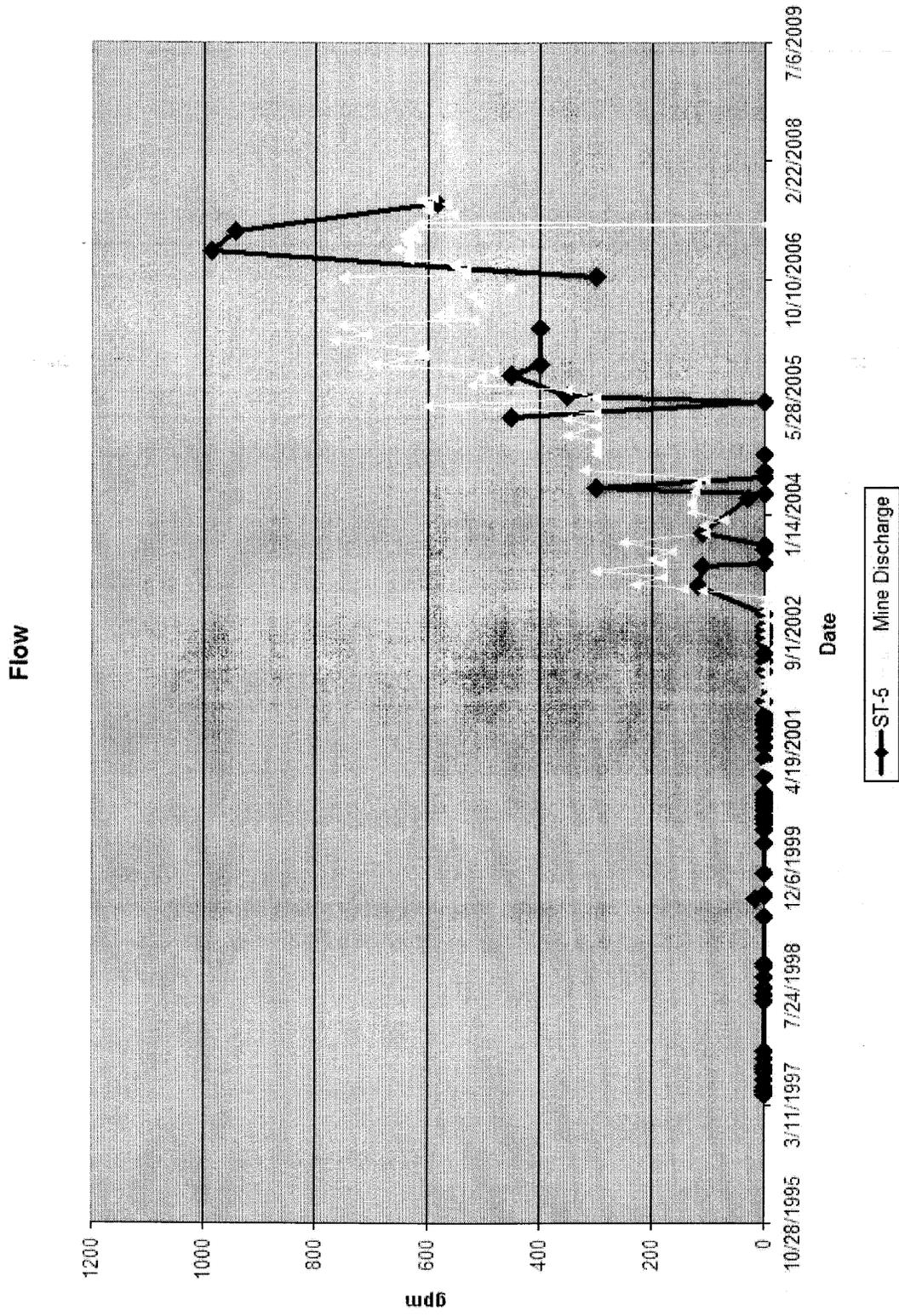
Dissolved Iron

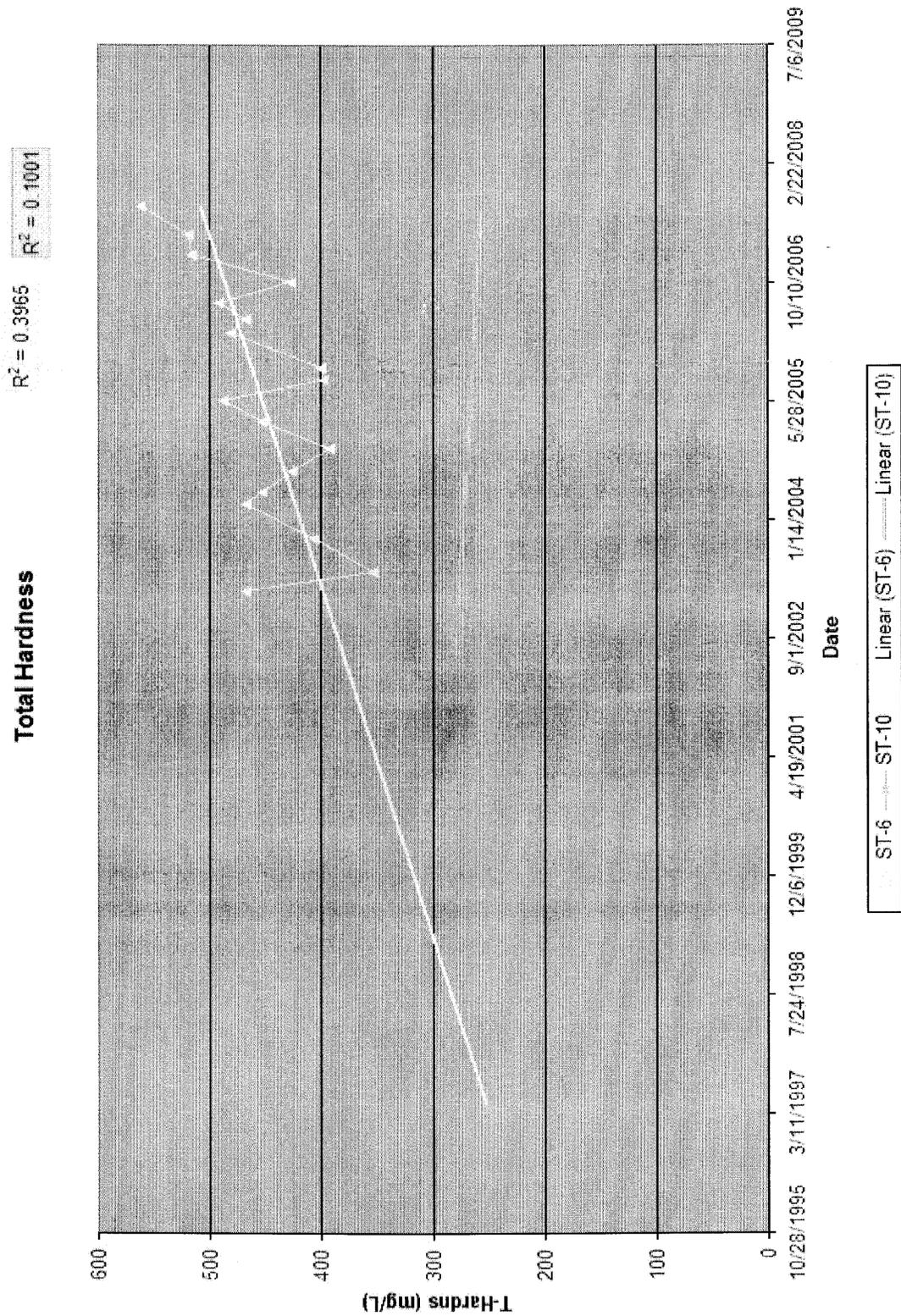


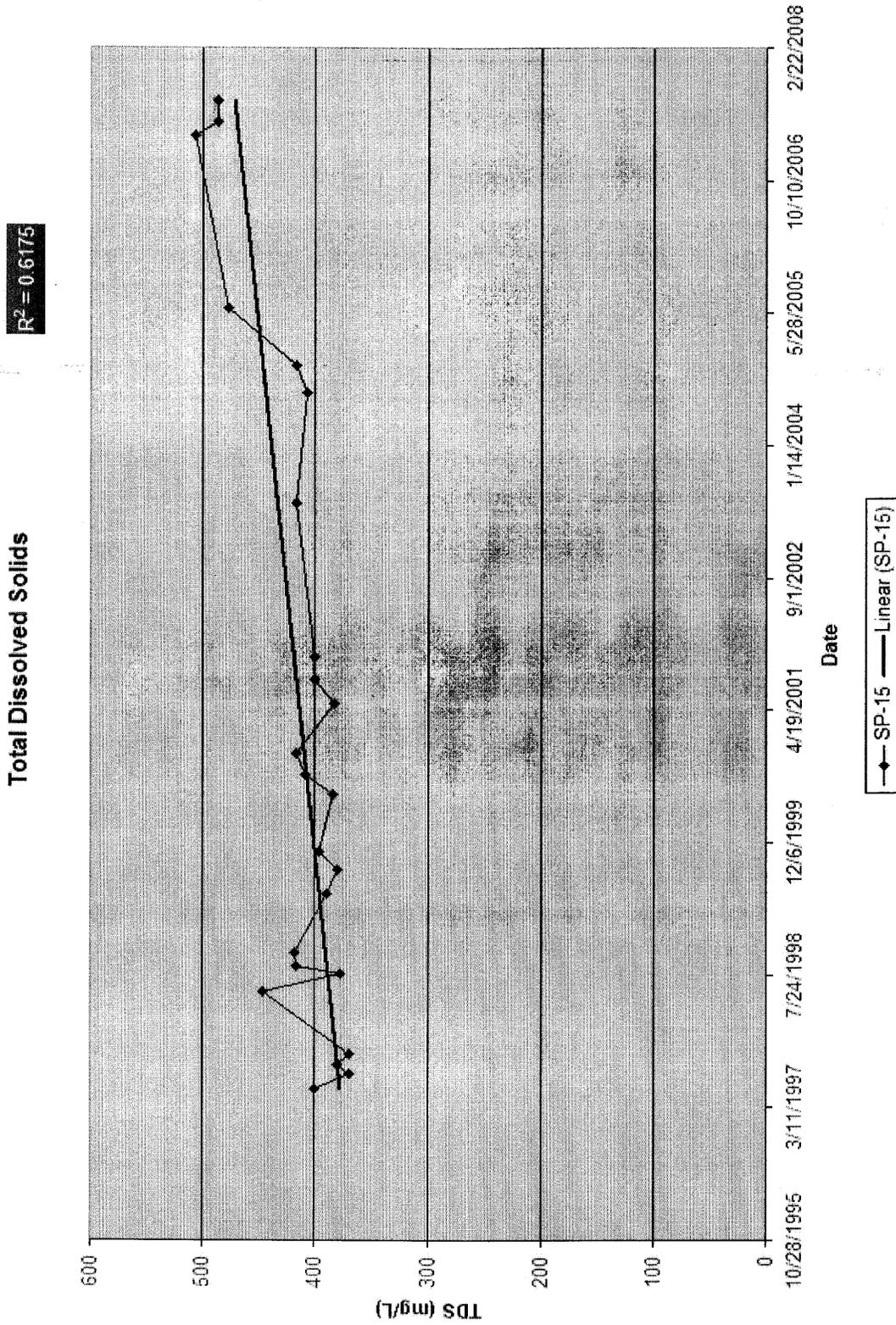
$R^2 = 0.1273$

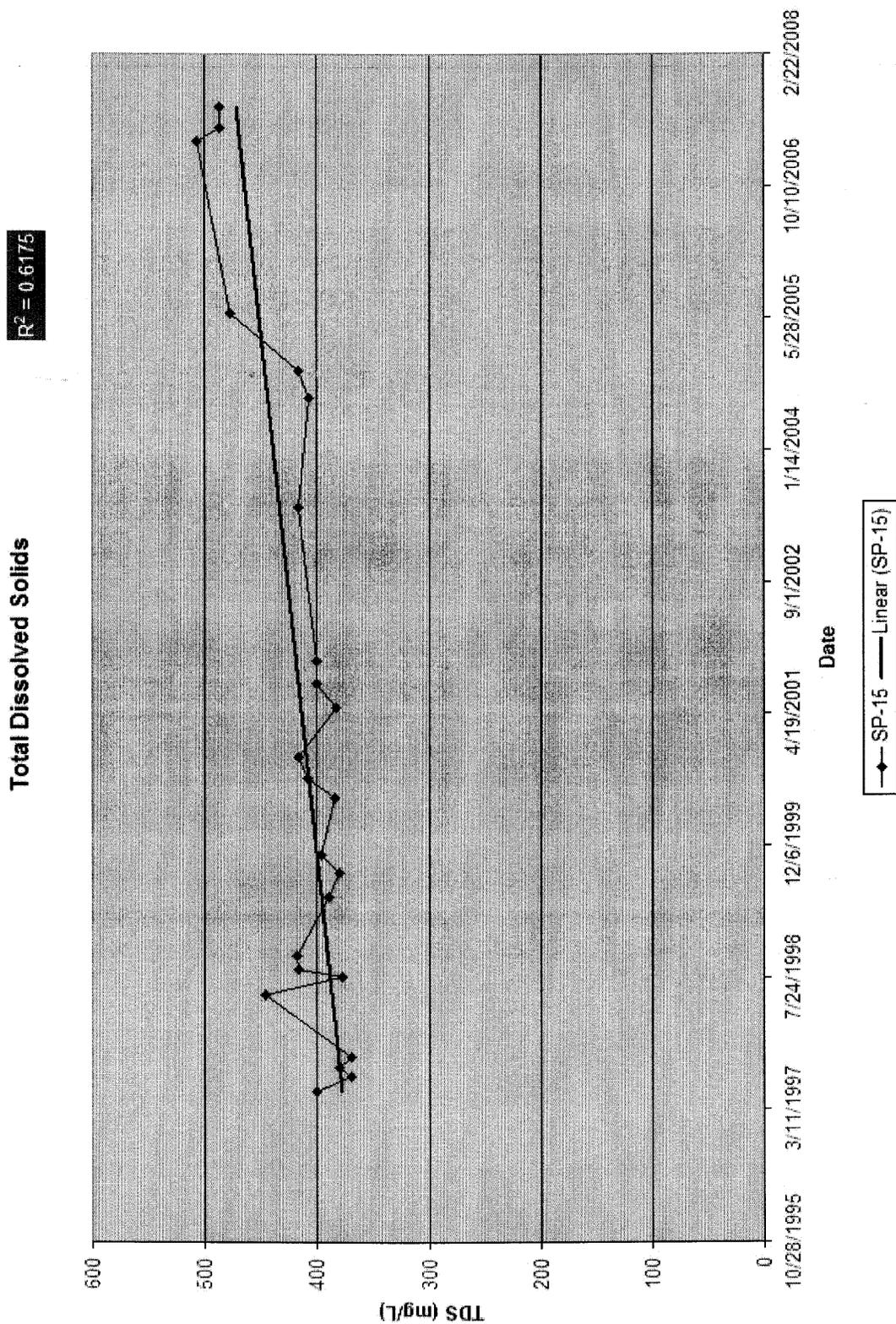
Dissolved Sodium











Total Iron

$R^2 = 0.1242$

