ESN
ROCKY MOUNTAIN
Environmental
Services Network

FINAL REPORT

PRODUCED GAS AND WATER TESTING OF CBM GAS WELLS IN THE RATON BASIN, HUERFANO AND LAS ANIMAS COUNTIES, COLORADO

PREPARED FOR

COLORADO OIL AND GAS
CONSERVATION COMMISSION
DENVER, COLORADO

FINAL REPORT DATE: FEBRUARY 11, 2002
REVISED DATA REPORT JANUARY 13, 2003
FINAL WRITTEN REPORT REVISED JUNE 13, 2003

PREPARED BY
ESN ROCKY MOUNTAIN
GOLDEN, COLORADO
(303) 278-1911

ESN PROJECT NO. 1372.01

TABLE OF CONTENTS

Table of Analytes and Maps

1. Sampled Well Locations

ANIONS

2. Fluoride *
3. Chloride
4. Nitrite *
5. Phosphate *
6. Bromide
7. Nitrate *
8. Sulfate *
9. Carbonate
10. Bicarbonate

CATIONS

11. Lithium
12. Sodium
13. Ammonium *
14. Potassium
15. Magnesium
16. Calcium
17. Manganese

METALS

18. Iron
19. Arsenic *
20. Barium
21. Cadmium *
22. Chromium *
23. Copper *
24. Lead *
25. Selenium *
26. Silver *

PHYSICAL PROPERTIES

27. pH
28. Temperature
29. TDS (Total Dissolved Solids)

FIXED GASES (normalized)

30. Helium*
31. Hydrogen*
32. Argon
33. Oxygen *
34. Carbon Dioxide
35. Nitrogen
36. Carbon Monoxide*

HYDROCARBONS (normalized)

37. Methane
38. Ethane
39. Ethylene *
40. Propane
41. Iso-Butane *
42. Normal-Butane *
43. Iso-Pentane *
44. Normal-Pentane *
45. Hexanes + *

ISOTOPES

46. $d^{13}C$ of Carbon Dioxide
47. $d^{13}C$ of Methane
48. dD of Methane (Deuterium)

* Not enough data to map

ESN ROCKY MOUNTAIN ¦ 130 CAPITAL DRIVE, SUITE C ¦ GOLDEN, COLORADO 80401
Web Site: www.ESN-RM.com PH: 303.278.1911 ¦ FAX: 303.278.0104 E-Mail: info@ESN-RM.com

1.0 Introduction

The Colorado Oil and Gas Conservation Commission (COGCC) contracted ESN Rocky Mountain to collect and analyze produced gas and water samples from 50 selected coalbed methane gas wells in Huerfano and Las Animas Counties, Colorado. This sampling program is part of a multi-phase project being conducted by the COGCC to assess the potential impact to ground water resources in the Raton Basin. Analysis from these samples will be compared to samples collected from water wells in the area in a later phase of the project.

The 50 wells sampled were selected by the COGCC from various operators throughout the basin over an area that spanned about 20 townships. Well locations were confirmed using a handheld Global Positioning System (GPS) instrument. The gas wells are all located in the Raton Basin of south-central Colorado that covers an area of about 1,300 square miles. The producing coal bearing formations include the Raton and Vermejo Formations. Current operators of the wells include Barrett Resource, Cedar Ridge, Evergreen Operating, Petroglyph Operating and Sonat Raton.

Water samples were analyzed for pH, anions, cations, total dissolved solids (TDS) and selected dissolved metals. Gas samples were analyzed for gas hydrocarbon and fixed gas composition, including isotopic ratios. The results are presented in tables in the appendix of this report and in digital format (Microsoft Excel and Access) for input into COGCC's database. Maps of all the data variables were also generated in a color 8.5" x 14" format and are also provided in PDF format on data CD provided with this report.

2.0 Field Methods

COGCC provided a list of wells and operators to ESN. After communicating with the well operators, ESN began field sampling on August 15, 2001 and completed the sampling events on August 31, 2001. A single sampling technician completed the work with the aid of the well operators who helped locate the well locations. COGCC personnel returned at a later date to resample gases from three wells were the gas analysis results indicated potential leakage or air dilution.

Well locations were recorded on a Garmin (E-Trex Vista model) Global Positioning System (GPS) unit. This unit has the capability of storing the locations as waypoints, and performs real time differential corrections (DGPS) using WAAS[1]. Using the WAAS correction, the specifications for this GPS unit report an accuracy of <3 meter under ideal conditions (clear, unobstructed sky). Data was recorded using the North American Datum (NAD) of 1927 in UTM (meter) coordinates (to the nearest meter) and converted to Latitude and Longitude in decimal degrees carried out to six decimal places using a digitizing program capable of coordinate conversion. The coordinates for one well, the Explorer 33-16 were lost in the transfer of data somehow, so the coordinates from the COGCC online-database were used for mapping that well's data.

Water samples were collected from valves directly off the wellhead after flowing for a short period of time to flush the valve assembly. Water samples from each well were collected in two 250ml polyethylene bottles (provided by ESN) and the pH and Temperature were immediately measured from the fresh sample. The samples were then preserved by packing them in ice and were shipped at the end of each day to ESN's laboratory in Golden, Colorado. The overnight shipping was required to analyze the samples for nitrate and nitrite within the required holding time of 24 hours.

Gas samples were collected by connecting airtight fittings and sampling line to the sampling valves located on the gas well plumbing, after the separator. After purging a limited amount of gas to flush the sampling line, the sampling line was connected to 300cc multi-layer gas sampling bag (provided by Isotech) via a plunger valve on the gas bag. The bag was filled to approximately 80-90% capacity with a gas sample, allowing some room for expansion due to pressure changes during shipment. It appeared that some of the samples may have leaked and they were recollected or substituted with other well data.

[1] WAAS, or Wide Area Augmentation System, is a real time differential correction system recently implemented by the Federal Aviation Administration. The system consists of 25 permanent surveyed GPS base stations transmitting differential correction data to two geo-stationary satellites that transmit the correction data on two of the GPS satellite frequencies. Only newer GPS units with the required correction software are able to utilize the data and perform the real-time differential correction. This system improves the signal for up to 3 meter accuracy without post processing the data signal.

3.0 Analytical Methods

Water samples were analyzed by ESN Rocky Mountain using US-EPA SW-846 methodology and Standard Methods (see reference section). Major cations and anions are measured by Ion Chromatography using method 300.1; dissolved metals were measured using an ICP Spectrometer by method 6010, pH was measure using an electrode meter by method 150.1, and Total Dissolved Solids (TDS) were measured using Standard gravimetric methods. Carbonate and bicarbonate had to be calculated from the charge balance due to a shortage of sample in many of the samples from dilutions. The calculation method is described in the lab narrative. Included with the water analysis is a narrative from the laboratory that describes the methods and quality control procedures used for each analysis. In addition to temperature, pH and TDS, which were measured in the field, the following individual water constituents were measured:

Table 1. Water Constituents Measured

Method	Anions EPA 300.1	Cations EPA 300.1	Metals EPA 6010
Constituents	Bromide Chloride Fluoride Nitrate Nitrite Bicarbonate Carbonate Phosphate Sulfate	Sodium Calcium Magnesium Potassium Lithium Manganese	Aresenic Barium Copper Cadmium Chromium Iron Lead Silver Selenium

Gas samples were analyzed by Isotech Laboratories (Champagne, Illinois) for gas composition, carbon and hydrogen isotopes of methane, and carbon isotopes of the carbon dioxide gas. The data was included in this report and combined with the digital set of data for mapping purposes. Gas composition analysis includes methane through hexane hydrocarbons, helium, hydrogen, oxygen, argon, nitrogen, carbon dioxide and carbon monoxide.

4.0 Results

The GPS sample coordinates, water analysis and gas analysis results are reported in tabular form in the appendix of this report. Descriptive statistics are also included for the variables reported. The analytical data for the water samples includes a narrative that describes the methods and any problems that occurred during analysis. Some of the samples had high very high chlorides, which causes masking or higher detection limits of some of the other ions. The data is also provided in digital format and is included with this report as a Microsoft Excel (version 2000) spreadsheet and Microsoft Access database file on a CD-ROM.

The GPS data was recorded in UTM coordinates using the NAD 1927 datum system. These coordinates were recorded to the nearest meter. The UTM values were converted to Latitude and Longitude projections in decimal degrees also using NAD 1927 datum. The decimal degrees were reported to the 6^{th} decimal place, or 0.000001°. The values are included in the appended tables and in the CD-ROM digital data. Three well locations were relocated on different days to test the accuracy of the GPS. The variation was 0-11 meters in the latitude direction and 1-9 meters in longitude direction. Readings were later compared to a GPS owned by COGCC and were comparable.

Maps of each analysis component (that had measurable values above detection limits) were also generated. If the number of measurable values was limited, then a posted map (bubble map) was generated using symbols to represent the amount of the analyte measured at each well. If none or only a small percentage of the samples had measurable values for a particular analyte, then no map was generated. If enough wells had measurable values for a particular analyte, then a color contour map was generated for that analyte. Four of the gas samples had apparent air dilution which distorted the contoured data from what the real values would be, so these values were left out of the maps. Those samples included the Apached Canyon 17-14, BGR 12-11, BGR 43-3, and Oppossum 31-32. Some water and gas samples were later recollected by ESN and COGCC and were included in this revised report.

For convenience, the maps were generated at a scale to fit 8.5” by 11” paper and folded to fit in the report. An Adobe PDF file of each map and the data files is included on the CDROM and can be printed from this file at various scales. A free copy of Adobe Reader can be downloaded at http://www.adobe.com/products/acrobat/readstep.html.

References

1. 1997, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Third Edition, CD-ROM Version 2, Integrate Manual through update III, USEPA
2. 1998, Standard Methods for the Examination of Water and Wastewater, 20th ed., Ed. L. S. Clesceri, A. E. Greenberg, A. D. Eaton, published by American Public Heath Association.

APPENDIX A – DATA AND MAPS

ESN ROCKY MOUNTAIN Environmental Services Network

Project Narrative Report

(Revised Report: January 13, 2003)

ESN Project Number: 1372.01
Date: January 13, 2003

Client: Colorado Oil and Gas Conservation Commission
Client Contact: Loren Avis

Sample Receipt:
The samples for this project were collected by ESN Rocky Mountain Field Services personnel and delivered by Federal Express to ESN Rocky Mountain's Laboratory in Golden, Colorado. The gas samples were shipped directly to Isotech Laboratories in Champaign, IL, and are not discussed in this narrative. The water samples and their containers appeared to be in good condition and the chain of custody form was complete and accurate.

Holding Times:
All samples were prepared and analyzed within the method required holding times.

Methodology:
The determinations were carried out using modified SW-846 Methods or appropriate Methods as noted below:

ANALYSIS	METHOD	EXTRACTION	CLEAN-UP	INSTRUMENT INTRODUCTION	DETECTOR	REPORTING UNITS
Anions	300.1	None	None	Sample Loop	Conductivity	mg/L
Metals (Cations)	300.1	None	None	Sample Loop	Conductivity	mg/L
Metals – Waters Metals – Soils	6010B 6010B	3010A 3050B	None	Peristaltic Pump and Nebulization	ICP	mg/L mg/Kg
Total Dissolved Solids (TDS)	Calculated	Calculated	Calculated	Calculated	Calculated	mg/L
pH	150.1	None	None	Pipette Transfer	pH Meter	pH

Laboratory Equipment:

- *Dionex Advanced Chromatography System:* This instrument uses a carbonate / bicarbonate carrier solution and a conductivity detector for sample elution and detection. Introduction is by a Dionex Automated Sampler to a 50µL sample loop. Instrument control, data collection and processing are done using Peak Simple software. This instrument is used for Method 300.1.

- *Thermo Jarrel Ash Enviro II PolyScan 61E ICP Spectrometer:* This instrument uses an argon plasma to atomize the sample, and detection is done with radial viewing optics. Data collection is done using TJA Workstation software. This instrument is used for method 6010B.

Calculations:
All the detectors on the chromatographs in the laboratory are calibrated to respond to absolute masses (in nanograms) of analyte. Calculations are then carried out by the data system to compute the actual concentration of the analyte in the original sample.

The default volume of sample for ion chromatography is 50µL. Dividing nanograms of analyte by microliters of sample is equivalent to mg/L.

Carbonate and bicarbonate were not analyzed for due to a lack of sample volume. They were calculated based on pH and charge balance. Since anions and cations should balance out, the difference between the two was

used for carbonate and bicarbonate. The ratios of carbonate to bicarbonate are easy to calculate from the pH of the water. In all cases the ratio was very strongly in favor of bicarbonate.

Total Dissolved Solids were calculated by summing all of the results of all the anions and cations analyzed.

Calibration:
The analytical work for this project was carried out using ESN Level II QC and employed a five point initial calibration for Anions and a three point initial calibration for metal by 6010. On each additional project day the calibration was verified with a mid-level continuing calibration verification.

Method Blanks:
A method blank is used after each calibration run to verify system cleanliness post analysis of samples containing analytes greater than the high calibration level at the discretion of the analyst.

Data Qualifier Explanations:

- **B:** Indicates that the analyte was found in the associated blank, as well as in the sample. Blank contaminants are flagged "B" only when they are detected in the sample.
- **D:** Indicates sample was diluted to bring analyte within instrument calibration range or to remove matrix interference.
- **E:** Identifies compounds whose concentrations exceed the calibration range for that specific analysis.
- **J:** Indicates an estimated value.
- **JH:** Indicates an estimated value due to exceeding holding times.
- **M:** Indicates probable matrix interference.
- **R:** Sample rejected.
- **U:** Indicates compound was analyzed for but not detected at the reporting limit.
- **UJ:** Indicates an estimated value below the reporting limit.

Analysis Comments:

- Due to the high concentration of sodium present in some of the water samples, cations eluting near sodium were unable to be resolved without large amounts of dilution. This dilution raises the detection limit of the cations (lithium and ammonium) accordingly:

2X dilution	=	0.2mg/L
100X dilution	=	10mg/L
200X dilution	=	20mg/L

- Data is reported in a combined summary page format as requested by the client and is also provided in a digital format – MS Excel (2000) spreadsheet.

- All gas and isotope analysis was performed by Isotech Labs, Champaign, IL.

- This report was revised and resubmitted on January 13, 2003. This version of the report was revised from the original data report dated February 11, 2002. This corrected data report is now dated January 13, 2003. A combined summary style data report was used at the request of COGCC.

_____ _____

Analyst\Date Reviewer\Date

Well Location Information

Well_Name	Survey_Date	Abbreviated Well Name - Map Key	Well_Operator	UTM Zone	UTM Easting meters	UTM Northing meters	Longitude	Latitude	Qtr/Qtr	Section	Township	Range	Location	API Well Number
19 VPR-"C"	08/23/2001	19 VPRC	Sonat Raton LLC	13S	515401	4095025	-104.826899	37.003090	NW/NW	18	35S	66W	NW/NW-18-35S-66W	05-071-06959
35 VPR-"C"	08/23/2001	35 VPRC	Sonat Raton, LLC	13S	519069	4098364	-104.785590	37.033122	NE/NW	4	35S	66W	NE/NW-4-35S-66W	05-071-06957
Apache Canyon 02-13	08/20/2001	APAC0213	Barrett Resource Corp	13S	502567	4106629	-104.971111	37.107794	SW/SW	2	34S	68W	SW/SW-2-34S-68W	05-071-06124
Apache Canyon 04-07	08/15/2001	APAC0407	Barrett Resource Corp	13S	509927	4107238	-104.888273	37.113234	SW/NE	4	34S	67W	SW/NE-4-34S-67W	05-071-06344
Apache Canyon 12-14	08/15/2001	APAC1214	Barrett Resource Corp	13S	504769	4105088	-104.946338	37.093897	SE/SW	12	34S	68W	SE/SW-12-34S-68W	05-071-06128
Apache Canyon 17-14	08/15/2001	APAC1714	Barrett Resource Corp	13S	507818	4103291	-104.912050	37.077674	SE/SW	17	34S	67W	SE/SW-17-34S-67W	05-071-06341
BGR 12-11	08/23/2001	BGR1211	Evergreen Operating Corp	13S	531488	4105810	-104.645657	37.099886	SW/NW	11	34S	65W	SW/NW-11-34S-65W	05-071-06538
BGR 43-3	08/23/2001	BGR4303	Evergreen Operating Corp	13S	530821	4106995	-104.653116	37.110594	NE/SE	3	34S	65W	NE/SE-3-34S-65W	05-071-06525
Bones 24-30	08/22/2001	BONES2430	Evergreen Operating Corp	13S	525434	4110057	-104.713636	37.138369	SE/SW	30	33S	65W	SE/SW-30-33S-65W	05-071-06528
Buck 43-03	08/22/2001	BUCK4303	Evergreen Operating Corp	13S	521442	4106834	-104.758678	37.109399	NE/SE	3	34S	66W	NE/SE-3-34S-66W	05-071-06631
C. Brown 14-34	08/21/2001	CBRN1434	Evergreen Operating Corp	13S	529716	4118086	-104.665103	37.210617	SW/SW	34	32S	65W	SW/SW-34-32S-65W	05-071-06629
Celica 32-26	08/22/2001	CELC3226	Evergreen Operating Corp	13S	513073	4120393	-104.852628	37.231800	SW/NE	26	32S	67W	SW/NE-26-32S-67W	05-071-06943
Charlie 43-11	08/21/2001	CHAR4311	Evergreen Operating Corp	13S	522963	4124826	-104.740995	37.271570	NE/SE	11	32S	66W	NE/SE-11-32S-66W	05-071-06886
Chips 43-12	08/23/2001	CHIP4312	Evergreen Operating Corp	13S	534215	4105981	-104.614954	37.101348	NE/SE	12	34S	65W	NE/SE-12-34S-65W	05-071-06531
Earthquake 44-27	08/23/2001	ERTH4427	Evergreen Operating Corp	13S	530975	4110045	-104.651245	37.138100	SE/SE	27	33S	65W	SE/SE-27-33S-65W	05-071-06885
Ernestine 12-35	08/21/2001	ERNE1235	Evergreen Operating Corp	13S	521616	4118632	-104.756367	37.215766	SW/NW	35	32S	66W	SW/NW-35-32S-66W	05-071-07023
Eureka 33-32	08/21/2001	EURK3332	Evergreen Operating Corp	13S	527362	4118225	-104.691628	37.211938	NW/SE	32	32S	65W	NW/SE-32-32S-65W	05-071-06388
Explorer 33-16	08/23/2001	EXPL3316	Evergreen Operating Corp	13S	529104	4103820	-104.672548	37.082045	NW/SE	16	34S	65W	NW/SE-16-34S-65W	05-071-07039
Falcon 41-18	08/21/2001	FALC4118	Evergreen Operating Corp	13S	526117	4123973	-104.705453	37.263793	NE/NE	18	32S	65W	NE/NE-18-32S-65W	05-071-06549
Fish Eye 41-21	08/22/2001	FISH4121	Evergreen Operating Corp	13S	519658	4112583	-104.778592	37.161279	NE/NE	21	33S	66W	NE/NE-21-33S-66W	05-071-06918
Ginnie 24-10	08/21/2001	GINN2410	Evergreen Operating Corp	13S	529958	4124535	-104.662115	37.268745	SE/SW	10	32S	65W	SE/SW-10-32S-65W	05-071-06849
Gourdin 24-21	08/21/2001	GOUR2421	Evergreen Operating Corp	13S	519029	4121257	-104.785455	37.239482	SE/SW	21	32S	66W	SE/SW-21-32S-66W	05-071-06859
Highlands 41-25	08/21/2001	HIGH4125	Evergreen Operating Corp	13S	524558	4120590	-104.723142	37.233345	NE/NE	25	32S	66W	NE/NE-25-32S-66W	05-071-07059
Hill Ranch 29-15	08/15/2001	HILL2915	Barrett Resource Corp	13S	508215	4100285	-104.907612	37.050575	SW/SE	29	34S	67W	SW/SE-29-34S-67W	05-071-06458
Huber-Andreatta 01-33	08/31/2001	ANDE0133	Evergreen Operating Corp	13S	508957	4147350	-104.898695	37.474841	SE/SW	33	29S	67W	SE/SW-33-29S-67W	05-055-06181
Huber-Marshall 03-30	08/31/2001	HUBE0330	Evergreen Operating Corp	13S	515402	4149242	-104.825767	37.491812	NE/SW	30	29S	66W	NE/SW-30-29S-66W	05-055-06201
Hurtado 13-02	08/16/2001	HURT1302	Petroglyph Operating Co Inc	13S	514286	4153418	-104.838307	37.529456	NW/NE	13	29S	67W	NW/NE-13-29S-67W	05-055-06171
Hyon 23-32	08/22/2001	HYON2332	Evergreen Operating Corp	13S	517155	4118433	-104.806653	37.214063	NE/SW	32	32S	66W	NE/SW-32-32S-66W	05-071-07003
Lance 22-34	08/21/2001	LANC2234	Evergreen Operating Corp	13S	520332	4118692	-104.770844	37.216332	SE/NW	34	32S	66W	SE/NW-34-32S-66W	05-071-06919
Llama 32-24	08/22/2001	LAMA3224	Evergreen Operating Corp	13S	524272	4102634	-104.726962	37.071470	SW/NE	24	34S	66W	SW/NE-24-34S-66W	05-071-06621
Lonesome 22-10	08/22/2001	LONE2210	Evergreen Operating Corp	13S	520521	4115626	-104.768801	37.188692	SE/NW	10	33S	66W	SE/NW-10-33S-66W	05-071-06365
Longhorn 32-01	08/23/2001	LONG3201	Evergreen Operating Corp	13S	524212	4097981	-104.727787	37.029526	SW/NE	1	35S	66W	SW/NE-1-35S-66W	05-071-06825
Lorencito 4-8-34-66	08/23/2001	LORN0408	Evergreen Operating Corp	13S	517088	4106109	-104.807691	37.102956	NW/NW	8	34S	66S	NW/NW-8-34S-66S	05-071-06667
Louderback 12-27	08/21/2001	LOUD1217	Evergreen Operating Corp	13S	520151	4120327	-104.772838	37.231081	SW/NW	27	32S	66W	SW/NW-27-32S-66W	05-071-07043
Luis Canyon 5-2	08/16/2001	LC0502	Cedar Ridge LLC	13S	516954	4136788	-104.808504	37.379504	NE/NW	5	31S	66W	NE/NW-5-31S-66W	05-071-07067
Mauricio Canyon 33-1	08/16/2001	MC3301	Cedar Ridge LLC	13S	519270	4138340	-104.782305	37.393453	SW/NE	33	30S	66W	SW/NE-33-30S-66W	05-071-07033
Midway 23-10	08/21/2001	MDWY2310	Evergreen Operating Corp	13S	530006	4115087	-104.661959	37.183572	NE/SW	10	33S	65W	NE/SW-10-33S-65W	05-071-06546
Oppossum 31-32	08/22/2001	OPPO3132	Evergreen Operating Corp	13S	527438	4099985	-104.691444	37.047503	NW/NE	32	34S	65W	NW/NE-32-34S-65W	05-071-06783
PCW 33-05	08/22/2001	PCW3305	Evergreen Operating Corp	13S	527380	4107199	-104.691832	37.112538	NW/SE	5	34S	65W	NW/SE-5-34S-65W	05-071-06334
Piaskoski 33-29	08/21/2001	PIAS3329	Evergreen Operating Corp	13S	517828	4119881	-104.799043	37.227104	NW/SE	29	32S	66W	NW/SE-29-32S-66W	05-071-06303
Pikes Peak 33-02	08/22/2001	PIKES3302	Evergreen Operating Corp	13S	512996	4116832	-104.853554	37.199703	NW/SE	2	33S	67W	NW/SE-2-33S-67W	05-071-06967
ROHR 09-10	08/16/2001	ROHR0910	Petroglyph Operating Co Inc	13S	509495	4154277	-104.892521	37.537256	NW/SE	9	29S	67W	NW/SE-9-29S-67W	05-055-06165
Spring 22-02	08/22/2001	SPRG2202	Evergreen Operating Corp	13S	522171	4116917	-104.750169	37.200287	SE/NW	2	33S	66W	SE/NW-2-33S-66W	05-071-06474
Spring Canyon 21-5	08/16/2001	SC2105	Cedar Ridge LLC	13S	518469	4141583	-104.791269	37.422696	SW/NW	21	30S	66W	SW/NW-21-30S-66W	05-055-06234
State of Colorado 12-16	08/21/2001	STAT1216	Evergreen Operating Corp	13S	518381	4123420	-104.792712	37.258996	SW/NW	16	32S	66W	SW/NW-16-32S-66W	05-071-06083
State 4W	08/16/2001	STAT4W	Petroglyph Operating Co Inc	13S	513821	4158173	-104.843487	37.572322	NE/NW	36	28S	67W	NE/NW-36-28S-67W	05-055-06216
Taylor 12-08	08/22/2001	TAYL1208	Evergreen Operating Corp	13S	526686	4115380	-104.699353	37.186320	SW/NW	8	33S	65W	SW/NW-8-33S-65W	05-071-06194
Thunderbird 32-36	08/21/2001	THUN3236	Evergreen Operating Corp	13S	524079	4118803	-104.728603	37.217244	SW/NE	36	32S	66W	SW/NE-36-32S-66W	05-071-06791
Vonda D#23-12 *	05/17/2002	VOND2312	Evergreen Operating Corp	13S	533426	4105390	-104.624393	37.096086	NE/SW	12	34S	65W	NE/SW-12-34S-65W	05-071-06533
Wharton 33-32	08/22/2001	WHAR3332	Sonat Raton LLC	13S	517745	4118164	-104.800014	37.211627	NW/SE	32	32S	66W	NW/SE-32-32S-66W	05-071-06296

ND = Not Detected at Reporting Limit
NA = Not Analyzed
* Sample collected later and analyzed by Evergreen Laboratories
NC = Not Calculated

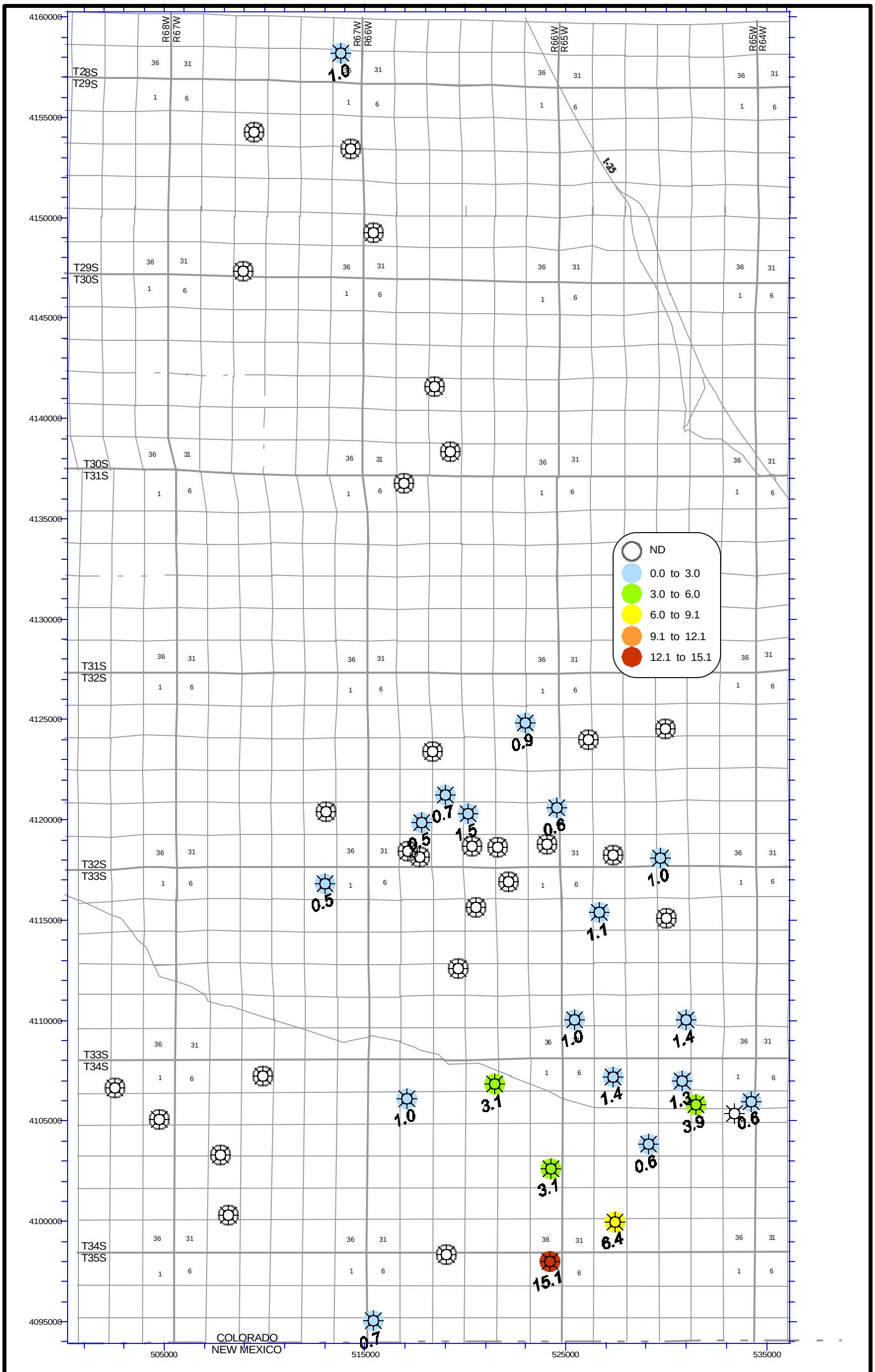
Water Analysis

Well_Name	Fluoride mg/L	Chloride mg/L	Nitrite mg/L	Phosphate mg/L	Bromide mg/L	Nitrate mg/L	Sulfate mg/L	Bicarbonate mg/L	Carbonate mg/L	Lithium mg/L	Sodium mg/L	Ammonium mg/L	Potassium mg/L	Magnesium mg/L	Calcium mg/L	Iron mg/L	Arsenic mg/L	Barium mg/L	Cadmium mg/L	Chromium mg/L	Copper mg/L	Lead mg/L	Manganese mg/L	Selenium mg/L	Silver mg/L	TDS mg/L	pH (Field Measurement)	Temperature (deg C, Field)
19 VPR-"C"	3.72	185	ND	ND	<20	ND	ND	1933	34.38	0.29	850	ND	4.7	<1	<4	ND	ND	0.69	ND	ND	ND	ND	ND	ND	ND	3012	8.277	
35 VPR-"C"	2.24	965	ND	ND	<20	<20	ND	2426	9.078	0.71	1534	ND	5.8	2.6	18.0	ND	ND	ND	ND	ND	ND	ND	0.27	ND	ND	4964	7.6	30.3
Apache Canyon 02-13	1.85	47	ND	ND	ND	ND	<10	660.5	60.12	<.2	280	ND	1.4	<1	<4	0.55	ND	ND	ND	ND	ND	ND	ND	ND	ND	1051	8.986	16.9
Apache Canyon 04-07	5.14	219	ND	ND	ND	ND	ND	1995	67.31	0.24	898	ND	2.7	<1	<4	0.93	ND	ND	ND	ND	ND	ND	ND	ND	ND	3188	8.555	23.1
Apache Canyon 12-14	4.22	28	ND	ND	ND	ND	ND	897.9	46.6	<.2	355	ND	11.8	<1	<4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1344	8.742	27.7
Apache Canyon 17-14	5.16	12	ND	ND	ND	ND	ND	981.2	85.29	<.2	376	ND	12.5	<1	<4	0.63	ND	ND	ND	ND	ND	ND	ND	ND	ND	1472	8.966	15.8
BGR 12-11	<2	4328	ND	ND	26	ND	ND	NC	NC	0.40	2494	ND	12.6	14.6	58.0	ND	ND	3.94	ND	ND	ND	ND	0.12	ND	ND	6938	7.762	18.5
BGR 43-3	<10	1376	ND	ND	ND	ND	ND	1471	16.29	0.35	1412	ND	4.6	5.2	19.3	ND	ND	1.31	ND	ND	ND	ND	0.28	ND	ND	4307	8.071	23.6
Bones 24-30	<2	1653	ND	ND	<20	ND	ND	1621	10.37	<.2	1654	ND	3.7	4.6	15.4	2.28	ND	1.00	ND	ND	ND	ND	0.04	ND	ND	4965	7.833	27.5
Buck 43-03	2.12	2428	ND	ND	<20	ND	ND	2152	17.22	1.18	2334	ND	9.6	8.1	28.6	2.82	ND	3.14	ND	ND	ND	ND	0.04	ND	ND	6986	7.93	25.3
C. Brown 14-34	3.74	537	ND	ND	ND	ND	ND	2258	30.96	0.39	1186	ND	4.2	2.5	8.6	0.35	ND	1.02	ND	ND	ND	ND	ND	ND	ND	4032	8.164	28.7
Celica 32-26	8.68	30	ND	ND	ND	<20	ND	1170	52.05	<.1	464	ND	2.0	0.6	4.2	1.34	ND	ND	ND	ND	ND	ND	ND	ND	ND	1734	8.675	24.9
Charlie 43-11	3.96	498	ND	ND	ND	ND	ND	2224	46.48	<.2	1154	ND	4.1	1.7	5.0	0.45	ND	0.91	ND	ND	ND	ND	ND	ND	ND	3938	8.347	30.1
Chips 43-12	<2	2466	ND	ND	<20	ND	ND	316	217.7	0.40	1710	ND	7.5	2.0	<4	ND	ND	0.62	ND	ND	ND	ND	ND	ND	ND	4720	9.865	22.7
Earthquake 44-27	3.84	815	ND	ND	<20	ND	ND	1513	21.08	0.61	1086	ND	3.1	2.4	9.0	ND	ND	1.40	ND	ND	ND	ND	ND	ND	ND	3455	8.171	23.8
Ernestine 12-35	6.88	111	ND	ND	<20	ND	<20	1058	126.1	<.2	460	ND	7.4	3.7	6.6	5.52	ND	ND	ND	ND	ND	ND	0.04	ND	ND	1785	9.103	27.4
Eureka 33-32	2.80	215	ND	ND	ND	ND	ND	2614	50.18	<.2	1114	ND	7.0	1.8	5.3	0.65	ND	ND	ND	ND	ND	ND	ND	ND	ND	4011	8.31	27.2
Explorer 33-16	2.24	786	ND	ND	<20	ND	ND	2076	14.37	0.75	1272	ND	4.2	3.2	12.2	0.11	ND	0.59	ND	ND	ND	ND	0.16	ND	ND	4172	7.867	23.5
Falcon 41-18	4.72	55	ND	ND	ND	ND	ND	2289	46.22	<.2	902	ND	2.8	<1	<4	1.32	ND	ND	ND	ND	ND	ND	ND	ND	ND	3301	8.332	23.8
Fish Eye 41-21	3.98	855	ND	ND	<20	ND	ND	956.9	37.76	<.1	900	ND	4.3	0.6	14.3	0.83	ND	ND	ND	ND	ND	ND	ND	ND	ND	2774	8.623	23.1
Ginnie 24-10	3.90	31	ND	ND	ND	ND	ND	1946	37.69	<.2	756	ND	2.9	<1	<4	0.18	ND	ND	ND	ND	ND	ND	ND	ND	ND	2777	8.314	34.8
Gourdin 24-21	2.98	530	ND	ND	<10	ND	ND	1545	35.74	<.2	920	ND	11.4	1.6	<4	0.72	ND	0.74	ND	ND	ND	ND	ND	ND	ND	3049	8.391	22.9
Highlands 41-25	4.20	62	ND	ND	ND	ND	ND	1764	37.12	<.2	708	ND	3.4	<1	<4	0.43	ND	0.56	ND	ND	ND	ND	ND	ND	ND	2580	8.35	33.3
Hill Ranch 29-15	3.76	11	ND	ND	ND	ND	ND	1146	32.6	<.2	442	ND	1.8	<1	<4	2.63	ND	ND	ND	ND	ND	ND	ND	ND	ND	1639	8.481	22.3
Huber-Andreatta 01-33	15.08	<20	ND	ND	ND	ND	ND	631.1	4.521	ND	254	ND	2.8	<1	<4	2.09	ND	ND	ND	ND	0.059	ND	ND	ND	ND	910	7.882	36.9
Huber-Marshall 03-30	13.52	<20	ND	ND	ND	ND	ND	709.4	61.52	ND	282	ND	2.8	<1	<4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1069	8.965	27.2
Hurtado 13-02	7.96	20	ND	ND	<10	ND	<10	659.3	32.15	<.2	257	ND	23.1	<1	<4	0.15	ND	ND	ND	ND	ND	ND	ND	ND	ND	1000	8.715	27.4
Hyon 23-32	4.00	203	ND	ND	<20	ND	ND	1882	31.53	0.21	836	ND	7.7	<1	4.6	0.25	ND	ND	ND	ND	ND	ND	ND	ND	ND	2970	8.251	20.2
Lance 22-34	7.36	128	ND	ND	ND	ND	ND	736.8	17.88	<.2	362	ND	3.2	<1	5.0	3.40	ND	ND	ND	ND	ND	ND	0.05	ND	ND	1264	8.412	20.7
Llama 32-24	5.72	4254	ND	ND	22	ND	ND	NC	NC	0.99	1924	ND	9.4	15.6	71.6	0.22	ND	3.10	ND	ND	ND	ND	0.18	ND	ND	6307	7.584	22.6
Lonesome 22-10	4.52	89	ND	ND	ND	ND	ND	2229	17.79	<.2	902	ND	1.8	<1	<4	0.52	ND	ND	ND	ND	ND	ND	ND	ND	ND	3245	7.929	35.5
Longhorn 32-01	<2	3110	ND	ND	55	ND	ND	6417	24.8	<20	4160	ND	27.8	45.6	163.6	0.34	ND	15.10	ND	ND	ND	0.33	ND	ND	ND	14020	7.614	22
Lorencito 4-8-34-66	4.64	116	ND	ND	ND	ND	ND	1678	27.0	<.2	712	ND	2.2	<1	<4	5.52	ND	0.97	ND	ND	ND	0.03	ND	ND	ND	2547	8.233	23.7
Louderback 12-27	2.72	1405	ND	ND	<20	ND	ND	210.1	1.554	0.65	966	ND	9.4	5.1	10.7	0.64	ND	1.48	ND	ND	ND	0.02	ND	ND	ND	2613	7.896	30.9
Luis Canyon 5-2	6.00	52	ND	ND	<10	ND	ND	935.2	7.5	<.2	382	ND	19.9	<1	<4	0.53	ND	ND	ND	ND	ND	ND	ND	ND	ND	1403	7.931	37.4
Mauricio Canyon 33-1	5.82	64	ND	ND	<10	ND	ND	1065	11.13	<.2	428	ND	37.1	<1	<4	0.12	ND	ND	ND	ND	ND	ND	N/A	ND	ND	1611	8.046	41.7
Midway 23-10	3.76	139	ND	ND	<10	ND	ND	2014	50.2	<.2	850	ND	1.8	1.2	<4	0.43	ND	ND	ND	ND	ND	ND	ND	ND	ND	3060	8.424	21.6
Oppossum 31-32	<2	7082	ND	ND	41.08	ND	ND	NC	NC	<20	3328	ND	12.1	20.3	71.6	10.00	ND	6.36	ND	ND	ND	ND	ND	ND	ND	10571	7.945	21.4
PCW 33-05	<2	2580	ND	ND	<20	ND	ND	356.4	7.64	0.52	1768	ND	6.8	5.9	21.2	0.22	ND	1.40	ND	ND	ND	ND	ND	ND	ND	4748	8.358	23.3
Piaskoski 33-29	<10	109	ND	ND	ND	ND	ND	1871	25.37	<.2	774	ND	2.8	<1	<4	1.45	ND	0.52	ND	ND	ND	ND	ND	ND	ND	2784	8.159	25.1
Pikes Peak 33-02	5.16	81	ND	ND	ND	ND	ND	2332	39.35	<.1	926	ND	2.0	0.7	7.7	0.53	ND	0.53	ND	ND	ND	ND	ND	ND	ND	3395	8.254	37.4
ROHR 09-10	12.10	49	ND	ND	<10	ND	<10	592.7	29.72	<.2	270	ND	<1	<1	<4	0.90	ND	ND	ND	ND	ND	ND	ND	ND	ND	954	8.727	29.8
Spring 22-02	3.76	302	ND	ND	<20	ND	ND	2334	54.47	0.11	1064	ND	2.9	1.5	9.7	1.84	ND	ND	ND	ND	ND	ND	ND	ND	ND	3774	8.395	26.2
Spring Canyon 21-5	15.22	43	ND	<10	<10	ND	<10	595.1	11.37	<.2	259	ND	19.4	<1	<4	3.26	ND	ND	ND	ND	ND	ND	ND	ND	ND	947	8.308	32.3
State of Colorado 12-16	4.12	60	ND	ND	ND	ND	ND	2593	57.8	<.2	1010	ND	4.6	1.4	4.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3736	8.375	23.1
State 4W	7.98	25	ND	<10	<10	ND	<10	753.5	45.42	<.2	307	ND	5.4	<1	<4	ND	ND	0.97	ND	ND	ND	ND	ND	ND	ND	1145	8.807	26
Taylor 12-08	2.72	802	ND	ND	<20	ND	ND	1612	21.3	<.2	1116	ND	3.5	2.5	7.1	0.19	ND	1.08	ND	ND	ND	ND	ND	ND	ND	3569	8.148	19.9
Thunderbird 32-36	<5	598	ND	ND	<50	ND	ND	1038	20.2	<.2	764	ND	3.5	2.0	7.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2433	8.316	27.5
Vonda D#23-12 *	NA	2620	NA	NA	NA	NA	<5	980.5	9E-08	NA	2000	NA	5.6	9.6	41.0	0.39	NA	NA	NA	NA	NA	NA	NA	NA	NA	5657		
Wharton 33-32	4.60	52	ND	ND	ND	ND	ND	1494	34	<.2	598	ND	2.8	1.4	<4	0.18	ND	ND	ND	ND	ND	ND	ND	ND	ND	2187	8.384	23.1

ND = Not Detected at Reporting
NA = Not Analyzed
* Sample collected later and ana
NC = Not Calculated

	Reported Laboratory Values for Gas Analysis																		
Well_Name	Helium %	Hydrogen %	Argon %	Oxygen %	Carbon Dioxide %	Nitrogen %	Carbon Monoxide %	Methane %	Ethane %	Ethylene %	Propane %	Iso-Butane %	Normal Butane %	Iso-Pentane %	Normal Pentane %	Hexanes Plus %	$\delta^{13}CO_2$ per mil	$\delta^{13}C_1$ per mil	δDC_1 per mil
19 VPR-"C"	0	0	0.047	1.19	0.79	4.71	0.0	93.23	0.027	0	0.0016	0	0	0	0	0	14.89	-44.65	-220.7
35 VPR-"C"	0	0	0.048	1.12	1.40	4.43	0.0	92.98	0.025	0	0	0	0	0	0	0	19.12	-42.37	-210.1
Apache Canyon 02-13	0	0	0.072	1.46	0.44	5.76	0.0	92.26	0.0097	0	0	0	0	0	0	0	5.48	-50.97	-231.5
Apache Canyon 04-07	0	0	0.059	1.45	0.67	5.50	0.0	92.30	0.024	0	0.0014	0	0	0	0	0	18.70	-42.83	-228.8
Apache Canyon 12-14	0	0	0.095	2.09	0.49	9.01	0.0	88.30	0.011	0	0	0	0	0	0	0		-47.76	-225.5
Apache Canyon 17-14	0	0	0.37	8.30	0.07	31.67	0.0	59.59	0.003	0	0	0	0	0	0	0		-59.02	-253.0
BGR 12-11	0.0054	0	0.19	4.64	0.59	17.81	0.0	76.76	0.0085	0	0	0	0	0	0	0	20.19	-38.02	-209.5
BGR 43-3	0.0036	0	0.034	1.13	0.52	2.28	0.0	96.02	0.011	0	0.001	0	0	0	0	0	18.34	-43.53	-214.0
Bones 24-30	0	0	0.038	0.96	0.65	3.69	0.0	94.65	0.013	0	0	0	0	0	0	0	22.28	-42.37	-213.6
Buck 43-03	0	0	0.039	0.99	0.64	3.79	0.0	94.53	0.014	0	0	0	0	0	0	0	20.49	-42.90	-215.2
C. Brown 14-34	0	0	0.047	1.02	0.24	3.82	0.0	94.86	0.01	0	0	0	0	0	0	0	8.93	-46.34	-223.1
Celica 32-26	0	0	0.041	0.81	0.08	3.78	0.0	95.28	0.0065	0	0	0	0	0	0	0		-54.65	-243.3
Charlie 43-11	0	0	0.048	1.21	0.61	4.68	0.0	93.43	0.021	0	0	0	0	0	0	0	16.79	-44.15	-229.3
Chips 43-12	0	0	0.047	1.04	0.34	4.13	0.0	94.43	0.0091	0	0	0	0	0	0	0	15.82	-45.52	-227.3
Earthquake 44-27	0	0	0.044	1.09	0.40	4.16	0.0	94.30	0.01	0	0	0	0	0	0	0	9.97	-46.25	-221.9
Ernestine 12-35	0	0	0.045	1.02	0.45	5.27	0.0	93.17	0.031	0	0.011	0.0028	0.0027	0	0	0	15.09	-43.13	-226.6
Eureka 33-32	0	0	0.033	0.73	0.85	2.87	0.0	95.50	0.015	0	0	0	0	0	0	0	18.74	-43.89	-215.4
Explorer 33-16	0	0	0.036	0.82	0.49	3.48	0.0	95.16	0.012	0	0.0014	0	0	0	0	0	17.98	-43.15	-217.0
Falcon 41-18	0	0	0.039	1.04	0.44	4.26	0.0	94.20	0.017	0	0	0	0	0	0	0	14.98	-43.82	-232.1
Fish Eye 41-21	0	0	0.05	1.15	0.52	4.44	0.0	93.82	0.018	0	0.0011	0	0	0	0	0	20.89	-41.22	-209.6
Ginnie 24-10	0	0	0.04	0.98	0.67	4.08	0.0	94.21	0.021	0	0.0016	0	0	0	0	0	17.75	-44.48	-222.8
Gourdin 24-21	0	0	0.038	0.84	0.58	3.25	0.0	95.25	0.036	0	0.0029	0	0	0	0	0	17.74	-40.88	-209.7
Highlands 41-25	0	0	0.038	0.93	0.50	3.53	0.0	94.99	0.015	0	0	0	0	0	0	0	16.06	-43.25	-224.6
Hill Ranch 29-15	0	0	0.069	1.12	0.13	5.83	0.0	92.84	0.0093	0	0	0	0	0	0	0		-57.62	-250.8
Huber-Andreatta 01-33	0	0	0.05	0.82	0.39	3.89	0.0	94.75	0.092	0	0.0089	0.0016	0.001	0	0	0	-3.20	-47.40	-236.9
Huber-Marshall 03-30	0	0	0.15	2.04	0.03	11.08	0.0	86.69	0.0065	0	0	0	0	0	0	0		-56.66	-248.1
Hurtado 13-02	0.003	0	0.14	1.32	0.10	9.19	0.0	89.24	0.0047	0	0	0	0	0	0	0		-56.51	-244.3
Hyon 23-32	0.36	0	0.11	2.53	0.90	9.51	0.0	86.50	0.074	0	0.012	0.0016	0.0013	0	0	0	19.60	-40.60	-213.9
Lance 22-34	0	0	0.042	0.98	0.57	4.07	0.0	94.31	0.03	0	0.0018	0	0	0	0	0	18.49	-42.12	-225.0
Llama 32-24	0	0	0.042	0.92	0.84	3.55	0.0	94.63	0.015	0	0	0	0	0	0	0	20.08	-42.53	-207.8
Lonesome 22-10	0	0	0.041	0.92	0.57	3.56	0.0	94.89	0.018	0	0	0	0	0	0	0	12.94	-43.69	-218.3
Longhorn 32-01	0	0	0.049	1.21	0.79	4.67	0.0	93.26	0.018	0	0	0	0	0	0	0	19.55	-43.00	-208.8
Lorencito 4-8-34-66	0	0	0.035	0.87	0.20	3.54	0.0	95.34	0.014	0	0	0	0	0	0	0		-46.83	-233.5
Louderback 12-27	0	0	0.042	0.91	1.18	3.80	0.0	94.03	0.038	0	0.0038	0	0	0	0	0	21.13	-40.53	-210.5
Luis Canyon 5-2	0	0	0.073	0.96	0.70	5.30	0.0	92.93	0.033	0	0.0022	0	0	0	0	0.0024	-2.16	-45.35	-239.3
Mauricio Canyon 33-1	0	0.071	0.078	1.57	0.61	6.39	0.0	91.26	0.019	0	0	0	0	0	0	0	5.06	-45.97	-234.4
Midway 23-10	0	0	0.041	0.93	0.32	3.49	0.0	95.21	0.0088	0	0	0	0	0	0	0	13.35	-46.42	-227.3
Oppossum 31-32	0.003	0	0.03	0.96	0.88	1.89	0.0	96.22	0.021	0	0	0	0	0	0	0	19.18	-43.21	-213.1
PCW 33-05	0	0	0.076	1.85	0.50	6.83	0.0	90.73	0.0096	0	0	0	0	0	0	0	18.51	-41.85	-209.7
Piaskoski 33-29	0	0	0.049	1.02	0.44	4.08	0.0	94.39	0.017	0	0	0	0	0	0	0	12.43	-48.66	-237.6
Pikes Peak 33-02	0	0	0.039	0.87	0.81	4.23	0.0	94.03	0.023	0	0.0014	0	0	0	0	0	11.30	-43.82	-223.9
ROHR 09-10	0.0083	0.023	0.11	1.27	3.78	8.85	0.0	85.95	0.0063	0	0	0	0	0	0	0	-35.86	-53.33	-243.7
Spring 22-02	0	0.071	0.064	1.45	0.87	5.52	0.0	92.00	0.021	0	0	0	0	0	0	0	15.81	-43.52	-219.2
Spring Canyon 21-5	0.003	0	0.29	1.61	0.20	21.49	0.0	76.40	0.0056	0	0.0029	0	0	0	0	0		-48.27	-228.7
State of Colorado 12-16	0.15	0	0.057	0.96	0.33	4.25	0.0	94.21	0.024	0	0.01	0.0042	0.0025	0	0	0	12.88	-49.62	-240.4
State 4W	0	0	0.12	1.11	0.16	7.47	0.0	91.13	0.0066	0	0	0	0	0	0	0		-58.47	-254.0
Taylor 12-08	0	0	0.029	0.76	0.97	2.82	0.0	95.40	0.018	0	0	0	0	0	0	0	19.60	-43.67	-215.8
Thunderbird 32-36	0	0	0.043	0.99	0.88	3.70	0.0	94.37	0.02	0	0	0	0	0	0	0	18.48	-43.34	-221.5
Vonda D#23-12 *	0.0056	0	0.02	0.77	0.49	0.79	0.0	97.91	0.012	0	0	0	0	0	0	0	16.90	-44.63	-221.3
Wharton 33-32	0	0	0.052	1.22	0.63	4.84	0.0	93.23	0.028	0	0	0	0	0	0	0	19.13	-42.51	-214.5
ND = Not Detected at Reporting																			
NA = Not Analyzed																			
* Sample collected later and ana																			
NC = Not Calculated																			

	Gas Composition Data with Air Dilution Component Removed - Normalized														
Well_Name	Normalized Helium %	Normalized Hydrogen %	Normalized Argon %	Normalized Carbon Dioxide %	Normalized Nitrogen %	Normalized Methane %	Normalized Ethane %	Normalized Ethylene %	Normalized Propane %	Normalized Iso-Butane %	Normalized Normal-Butane %	Normalized Iso-Pentane %	Normalized Normal Pentane %	Normalized Hexanes Plus %	Notes
19 VPR-"C"	0.000	0.000	0.000	0.836	0.291	98.843	0.029	0.000	0.002	0.000	0.000	0.000	0.000	0.000	
35 VPR-"C"	0.000	0.000	0.000	1.477	0.270	98.226	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Apache Canyon 02-13	0.000	0.000	0.008	0.471	0.342	99.169	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Apache Canyon 04-07	0.000	0.000	0.000	0.717	0.103	99.152	0.026	0.000	0.002	0.000	0.000	0.000	0.000	0.000	
Apache Canyon 12-14	0.000	0.000	0.002	0.541	1.356	98.089	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Not enough gas for CO2 Isotopes
Apache Canyon 17-14	0.000	0.000	0.003	0.095	1.219	98.679	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Not enough gas for CO2 Isotopes
BGR 12-11	0.007	0.000	0.000	0.748	0.664	98.570	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
BGR 43-3	0.004	0.000	0.000	0.548	-2.041	101.477	0.012	0.000	0.001	0.000	0.000	0.000	0.000	0.000	Resampled in May 2002
Bones 24-30	0.000	0.000	0.000	0.680	0.117	99.189	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Buck 43-03	0.000	0.000	0.000	0.670	0.105	99.210	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
C. Brown 14-34	0.000	0.000	0.002	0.251	0.019	99.718	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Celica 32-26	0.000	0.000	0.005	0.082	0.792	99.114	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Not enough gas for CO2 Isotopes
Charlie 43-11	0.000	0.000	0.000	0.645	0.181	99.152	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Chips 43-12	0.000	0.000	0.001	0.356	0.267	99.366	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Water from Tank, well down
Earthquake 44-27	0.000	0.000	0.000	0.420	0.103	99.466	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Ernestine 12-35	0.000	0.000	0.000	0.471	1.544	97.935	0.033	0.000	0.012	0.003	0.003	0.000	0.000	0.000	Water from pit, well down.
Eureka 33-32	0.000	0.000	0.001	0.880	0.155	98.950	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Explorer 33-16	0.000	0.000	0.000	0.509	0.441	99.036	0.012	0.000	0.001	0.000	0.000	0.000	0.000	0.000	
Falcon 41-18	0.000	0.000	0.000	0.461	0.404	99.117	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Fish Eye 41-21	0.000	0.000	0.000	0.548	0.163	99.269	0.019	0.000	0.001	0.000	0.000	0.000	0.000	0.000	
Ginnie 24-10	0.000	0.000	0.000	0.701	0.449	98.827	0.022	0.000	0.002	0.000	0.000	0.000	0.000	0.000	
Gourdin 24-21	0.000	0.000	0.001	0.603	0.124	99.232	0.038	0.000	0.003	0.000	0.000	0.000	0.000	0.000	
Highlands 41-25	0.000	0.000	0.000	0.522	0.067	99.396	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Hill Ranch 29-15	0.000	0.000	0.020	0.136	1.749	98.085	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Not enough gas for CO2 Isotopes
Huber-Andreatta 01-33	0.000	0.000	0.014	0.405	0.868	98.606	0.096	0.000	0.009	0.002	0.001	0.000	0.000	0.000	
Huber-Marshall 03-30	0.000	0.000	0.066	0.030	3.852	96.045	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Not enough gas for CO2 Isotopes
Hurtado 13-02	0.003	0.000	0.087	0.105	4.558	95.243	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Not enough gas for CO2 Isotopes
Hyon 23-32	0.409	0.000	0.000	1.019	0.092	98.379	0.084	0.000	0.014	0.002	0.001	0.000	0.000	0.000	
Lance 22-34	0.000	0.000	0.000	0.596	0.438	98.932	0.031	0.000	0.002	0.000	0.000	0.000	0.000	0.000	
Llama 32-24	0.000	0.000	0.001	0.877	0.127	98.979	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Lonesome 22-10	0.000	0.000	0.000	0.595	0.137	99.249	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Longhorn 32-01	0.000	0.000	0.000	0.836	0.170	98.974	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Lorencito 4-8-34-66	0.000	0.000	0.000	0.207	0.310	99.468	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Not enough gas for CO2 Isotopes
Louderback 12-27	0.000	0.000	0.002	1.232	0.427	98.296	0.040	0.000	0.004	0.000	0.000	0.000	0.000	0.000	
Luis Canyon 5-2	0.000	0.000	0.032	0.732	1.805	97.392	0.035	0.000	0.002	0.000	0.000	0.000	0.000	0.003	
Mauricio Canyon 33-1	0.000	0.077	0.009	0.657	0.582	98.655	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Midway 23-10	0.000	0.000	0.000	0.333	0.025	99.632	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Oppossum 31-32	0.003	0.000	0.000	0.921	-1.769	100.823	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Resampled in May 2002
PCW 33-05	0.000	0.000	0.000	0.545	-0.071	99.515	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Piaskoski 33-29	0.000	0.000	0.004	0.461	0.293	99.225	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Pikes Peak 33-02	0.000	0.000	0.000	0.844	1.030	98.100	0.024	0.000	0.001	0.000	0.000	0.000	0.000	0.000	
ROHR 09-10	0.009	0.024	0.057	4.022	4.383	91.498	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Spring 22-02	0.000	0.076	0.000	0.932	0.125	98.844	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Spring Canyon 21-5	0.003	0.000	0.237	0.214	16.779	82.758	0.006	0.000	0.003	0.000	0.000	0.000	0.000	0.000	Not enough gas for CO2 Isotopes
State of Colorado 12-16	0.157	0.000	0.015	0.344	0.704	98.736	0.025	0.000	0.010	0.004	0.003	0.000	0.000	0.000	
State 4W	0.000	0.000	0.075	0.167	3.520	96.232	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Not enough gas for CO2 Isotopes
Taylor 12-08	0.000	0.000	0.000	1.005	-0.013	98.989	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Thunderbird 32-36	0.000	0.000	0.000	0.922	0.011	99.046	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Vonda D#23-12 *	0.006	0.000	0.000	0.507		101.633	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Gas sampled in June? 2002
Wharton 33-32	0.000	0.000	0.000	0.667	0.311	98.992	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
ND = Not Detected at Reporting															
NA = Not Analyzed															
* Sample collected later and ana															
NC = Not Calculated															



ESN ENVIRONMENTAL
Rocky Mountain SERVICES NETWORK
130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC
Project #: 1372
Date: January, 2003
Drawn by: MAV

COGCC Raton Basin Project

Phase IV

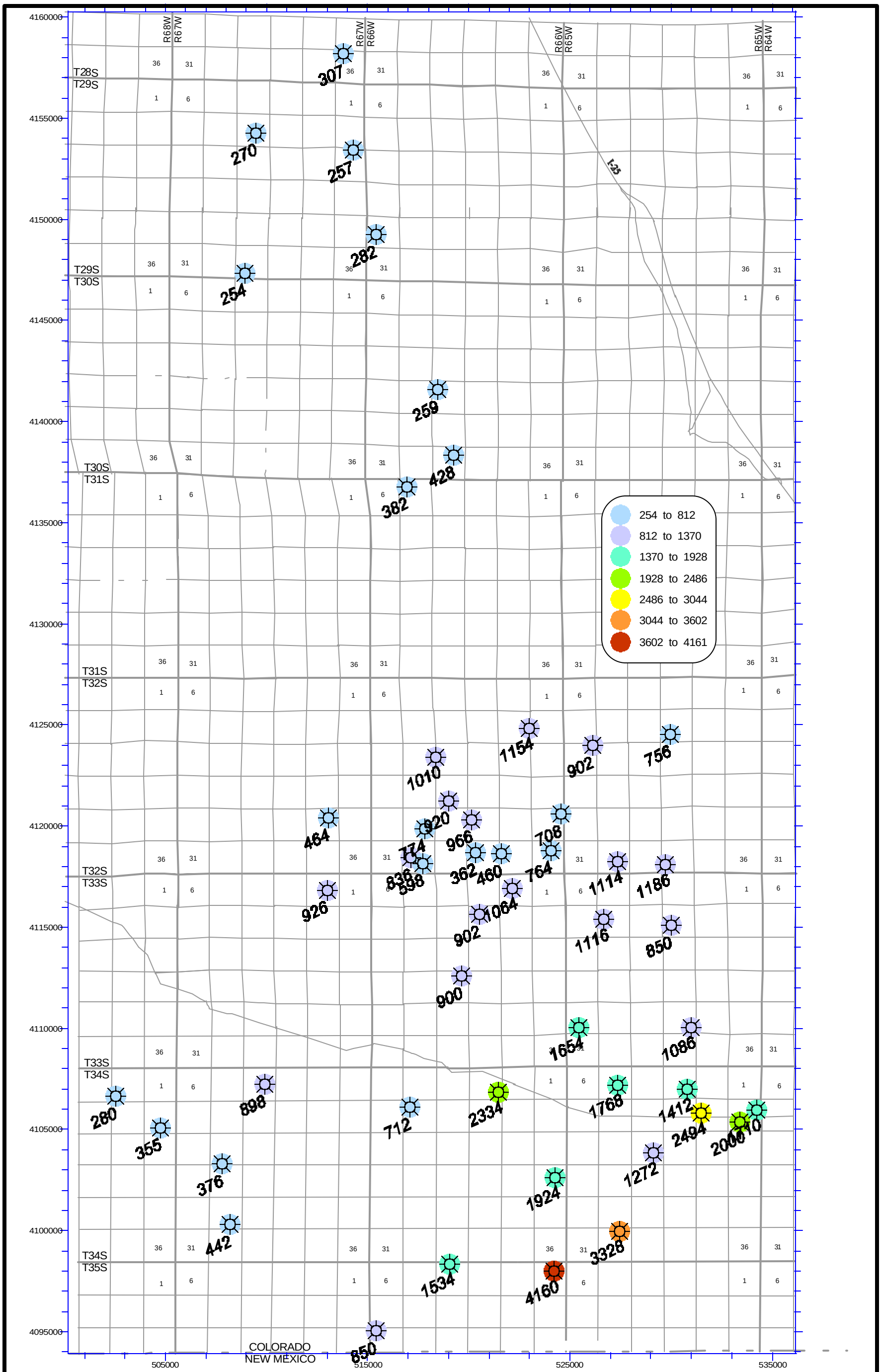
Produced Gas & Water Samples

Barium (mg/L)

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK
130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

Phase IV

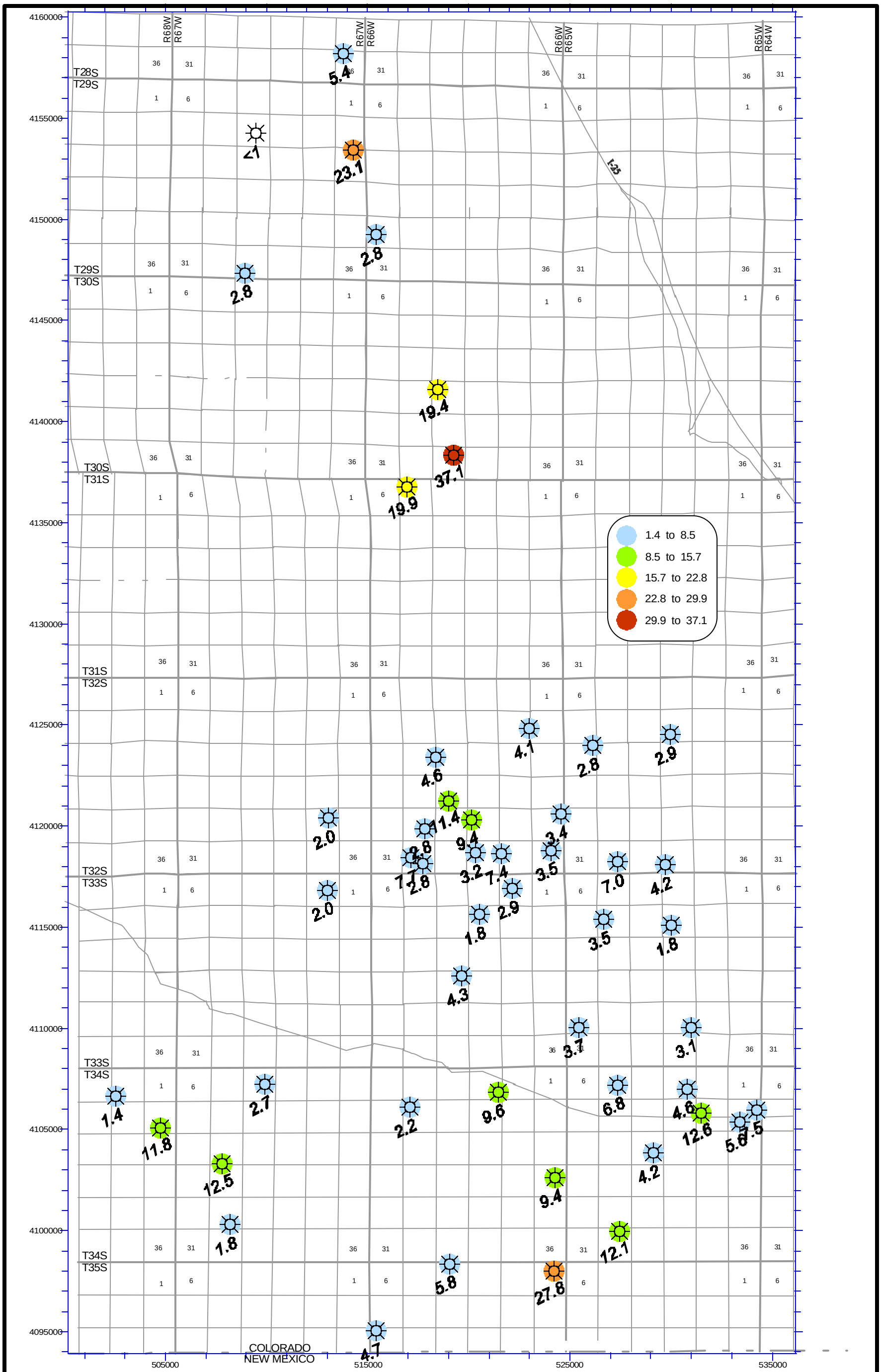
Produced Gas & Water Samples

Sodium (mg/L)

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK

130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303-278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

Phase IV

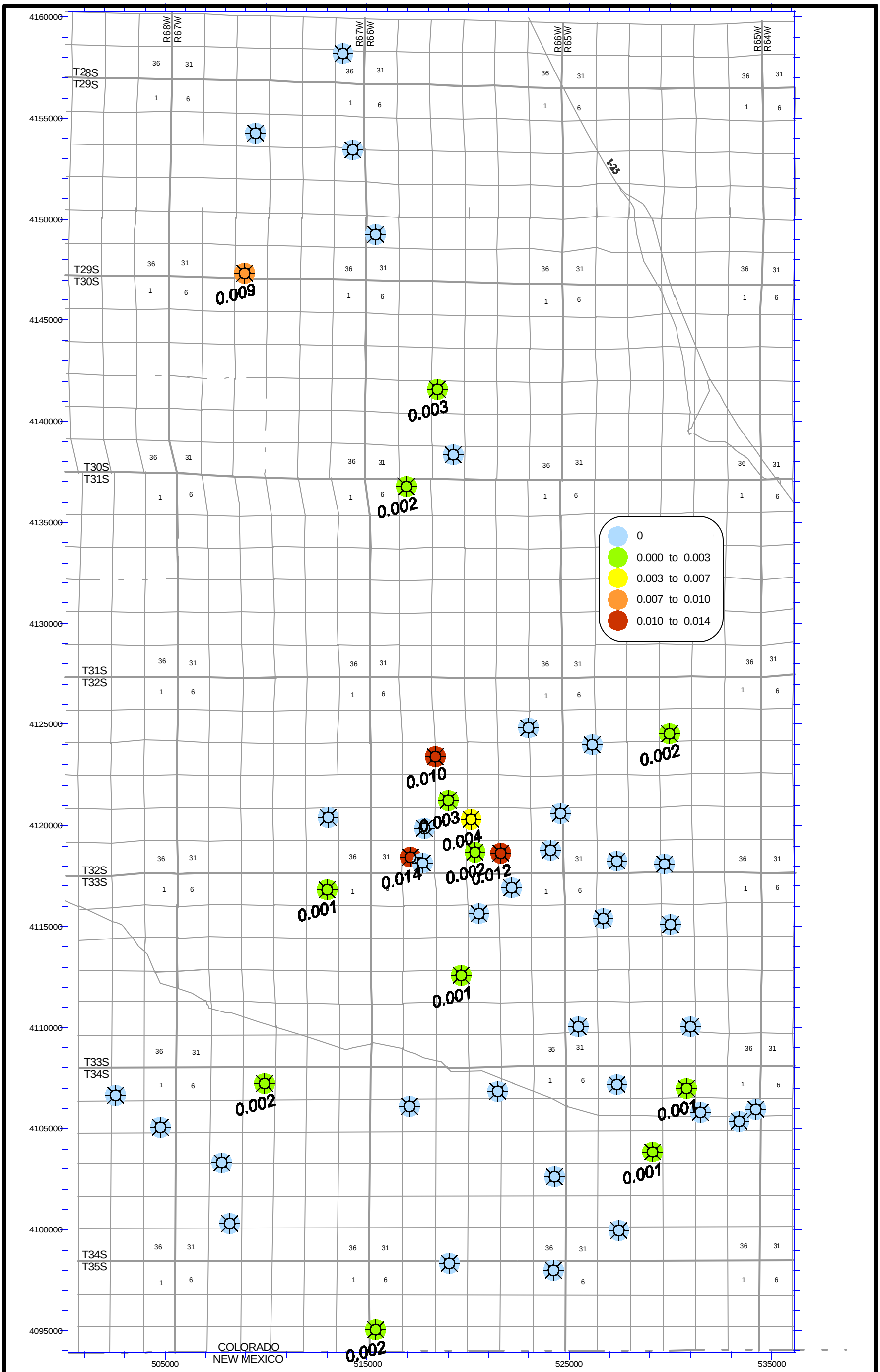
Produced Gas & Water Samples

Potassium (mg/L)

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK
130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

Phase IV

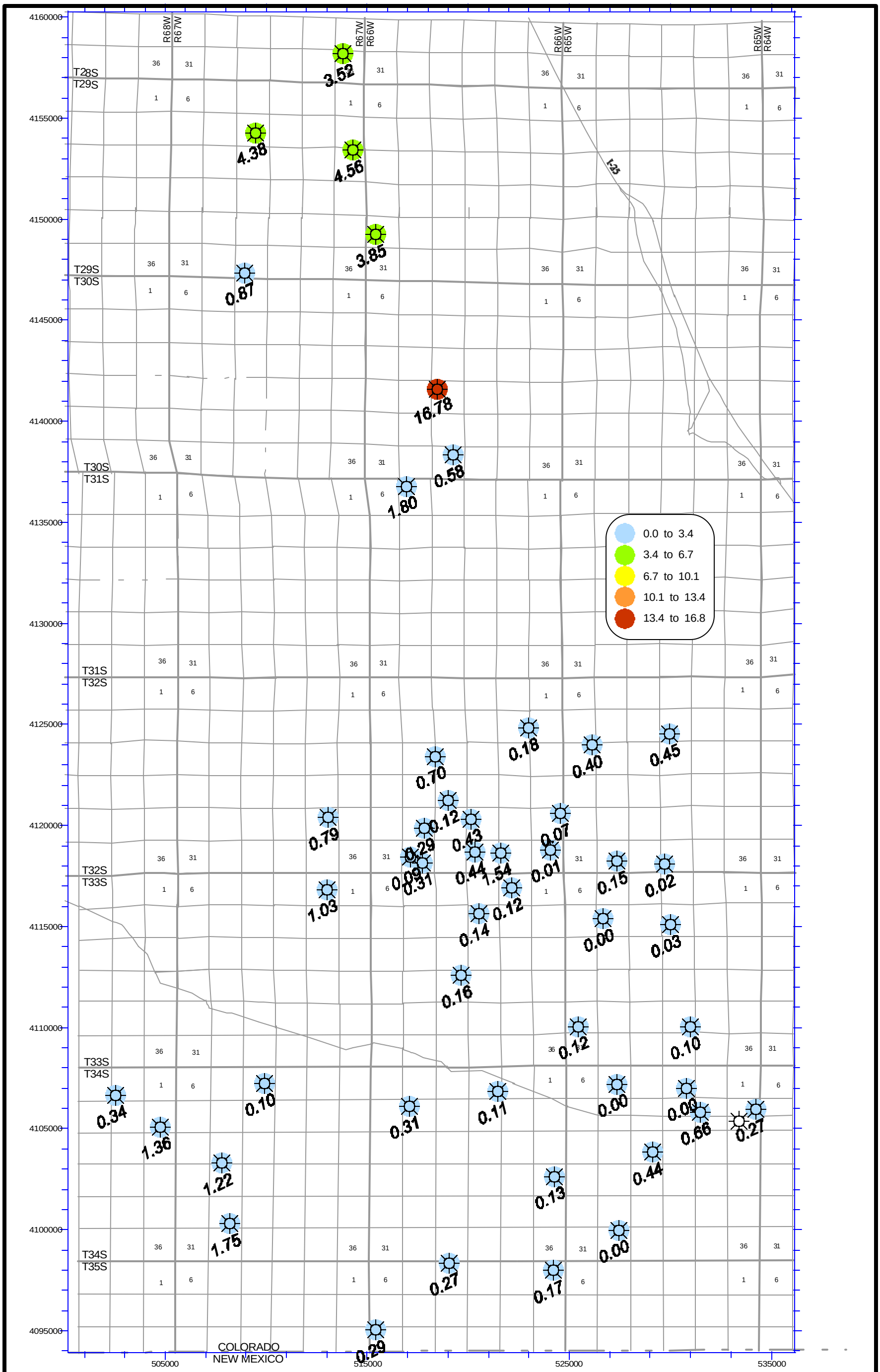
Produced Gas & Water Samples

Normalized Propane (%)

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK

130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

Phase IV

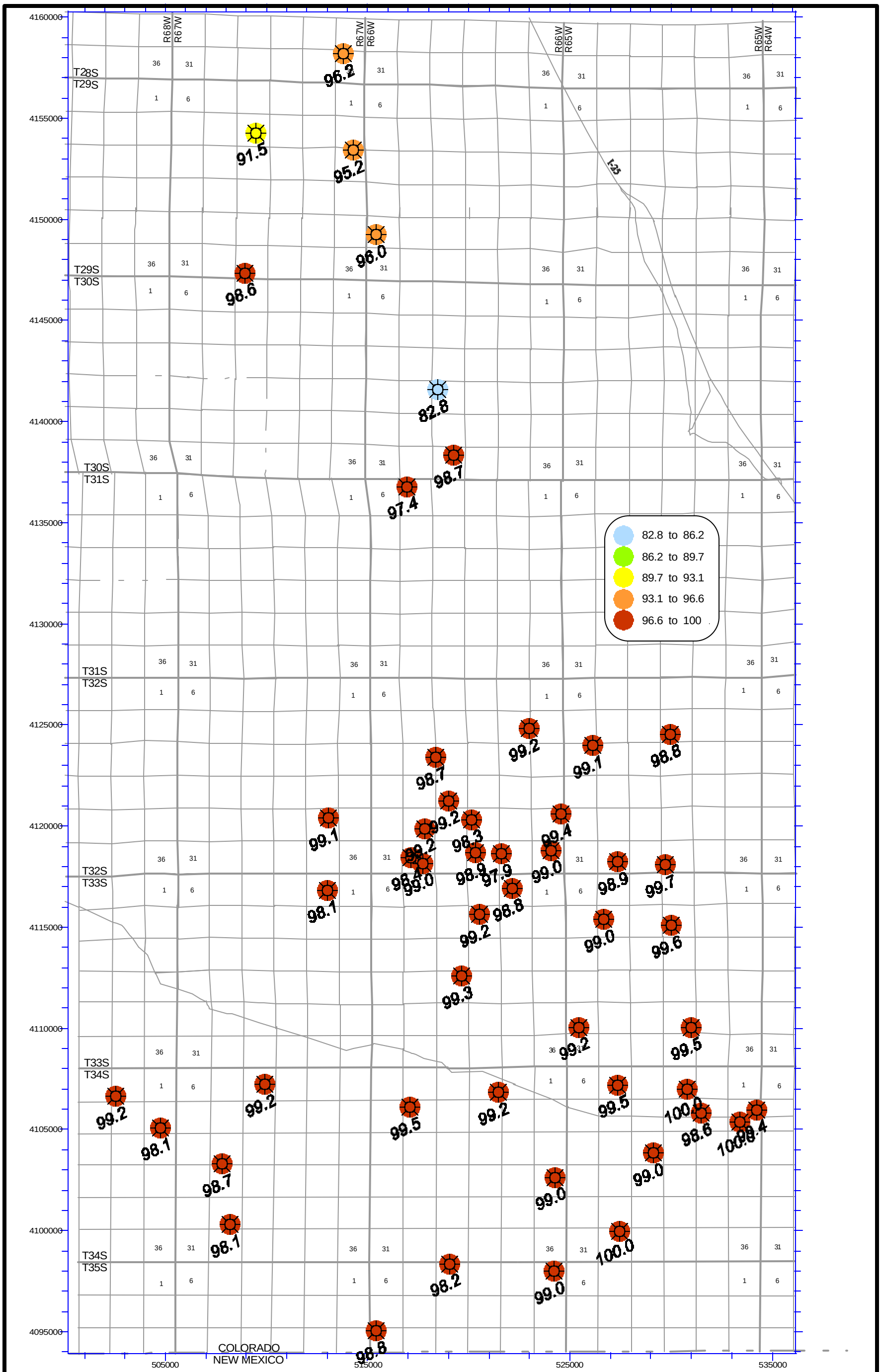
Produced Gas & Water Samples

Normalized Nitrogen (%)

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK

130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

Phase IV

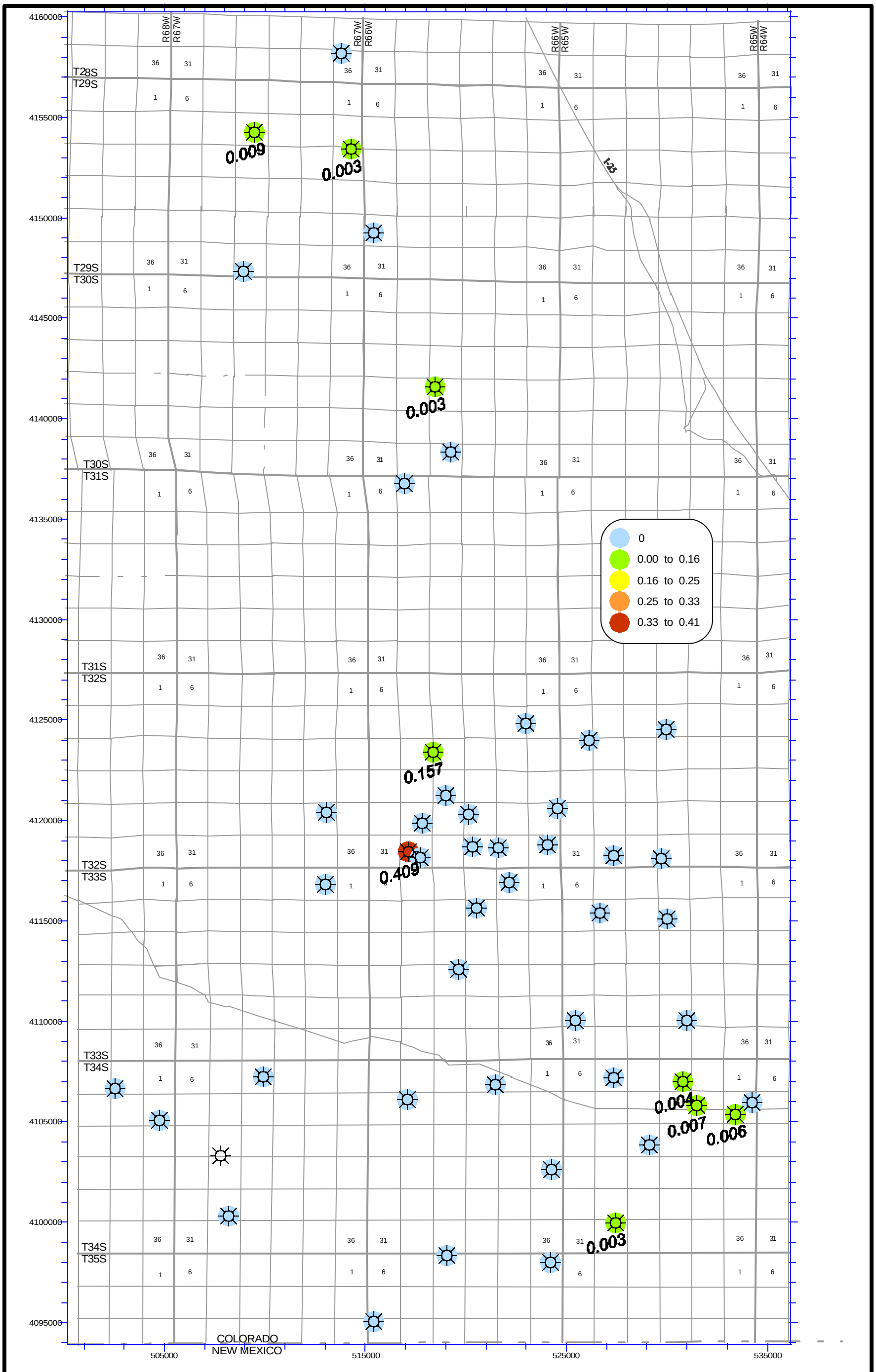
Produced Gas & Water Samples

Normalized Methane (%)

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN ENVIRONMENTAL
Rocky Mountain SERVICES NETWORK
130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC
Project #: 1372
Date: January, 2003
Drawn by: MAV

COGCC Raton Basin Project

Phase IV

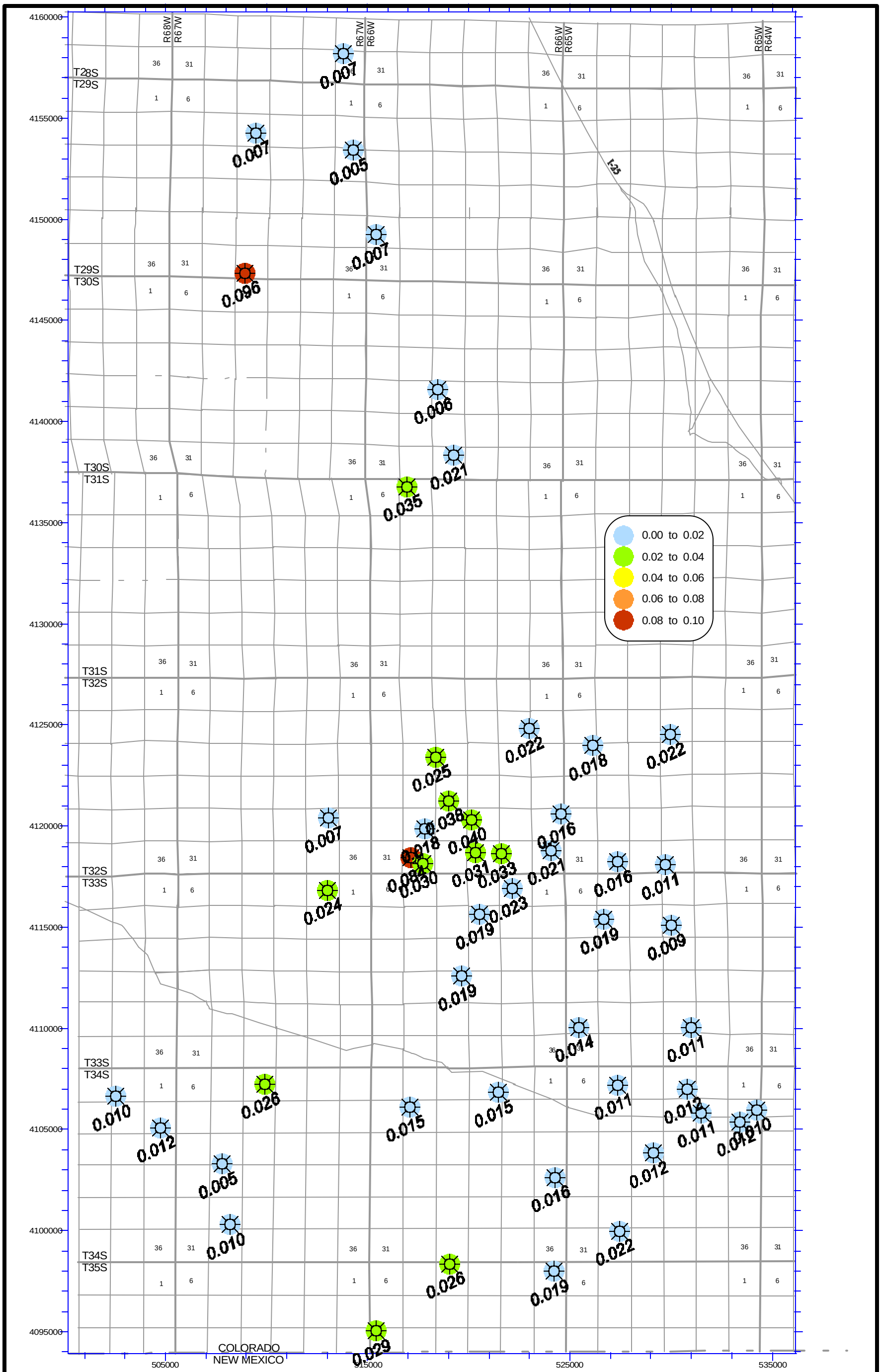
Produced Gas & Water Samples

Normalized Helium (%)

Wells Sampled August, 2001

N

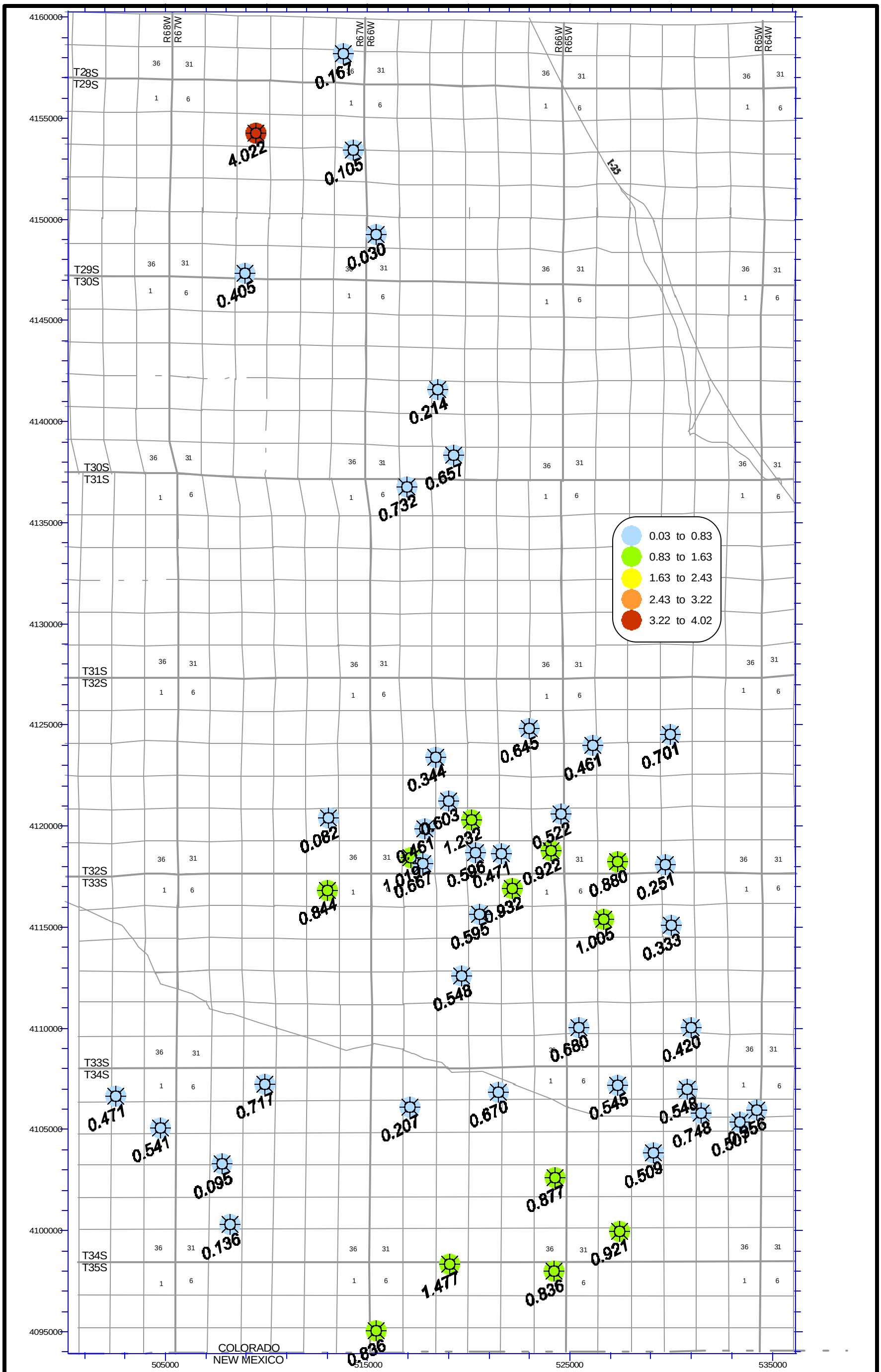
Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK 130 Capital Drive, Suite C Golden, CO 80401-5654 Phone: 303 -278-1911 FAX: 303-278-0104 E-Mail: Info@ESN-RM.com	Client: COGCC Project #: 1372 Date: January, 2003 Drawn by: MAV	**COGCC Raton Basin Project** **Phase IV** **Produced Gas & Water Samples** **Normalized Ethane (%)** Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK

130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

Phase IV

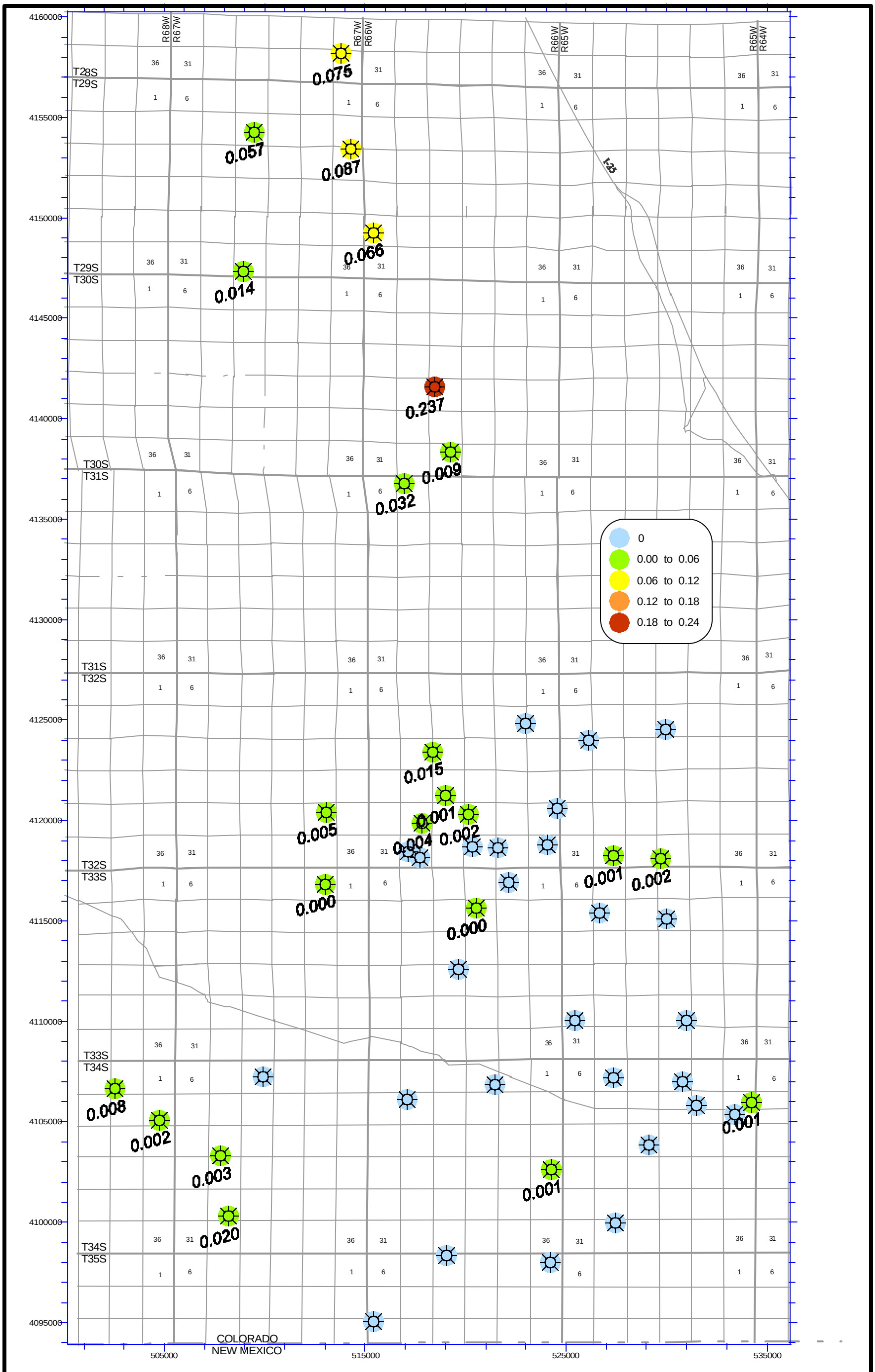
Produced Gas & Water Samples

Normalized Carbon Dioxide (%)

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN ENVIRONMENTAL
Rocky Mountain SERVICES NETWORK
130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC
Project #: 1372
Date: January, 2003
Drawn by: MAV

COGCC Raton Basin Project

Phase IV

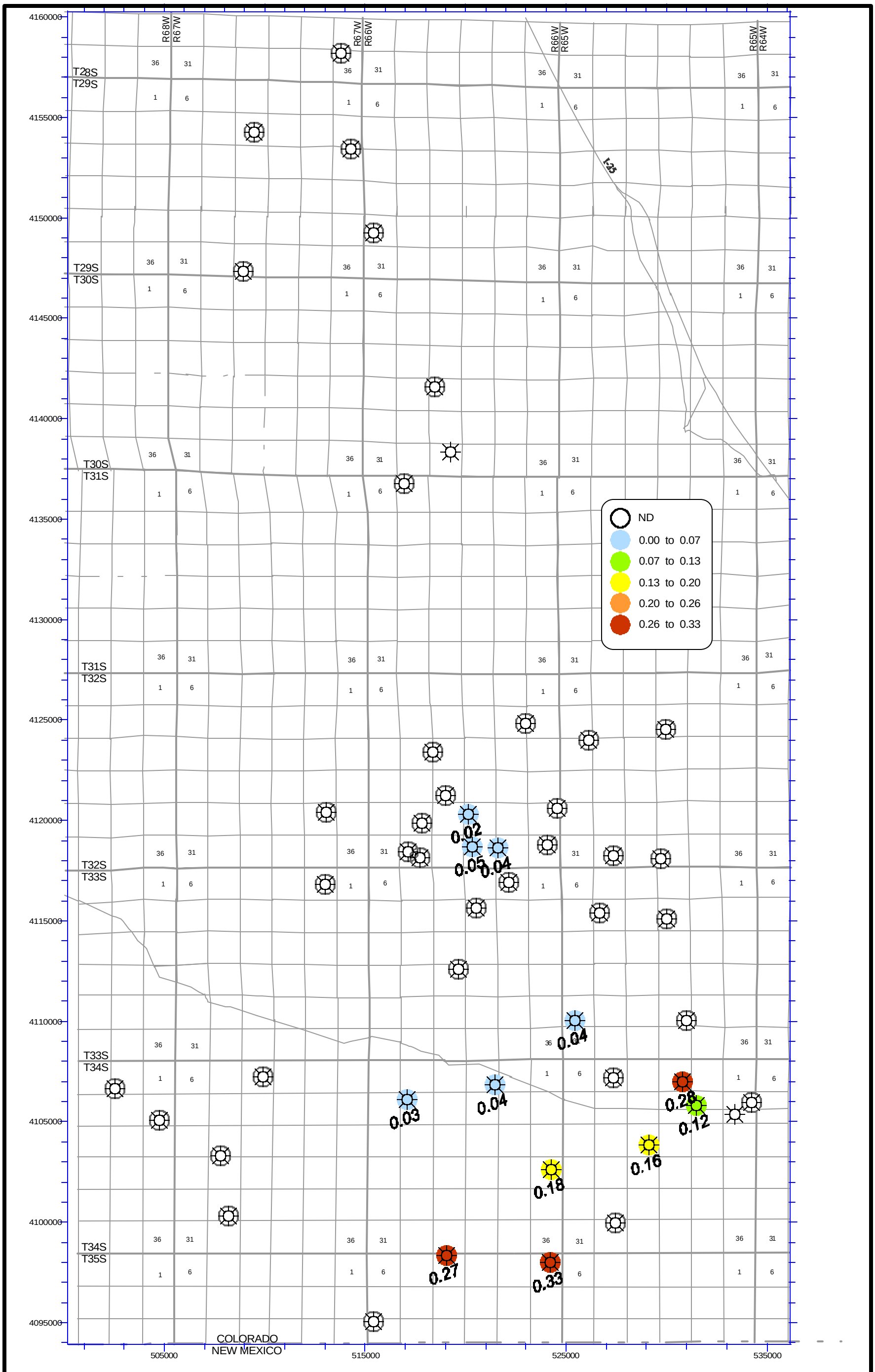
Produced Gas & Water Samples

Normalized Argon (%)

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN ENVIRONMENTAL
Rocky Mountain SERVICES NETWORK
130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC
Project #: 1372
Date: January, 2003
Drawn by: MAV

COGCC Raton Basin Project

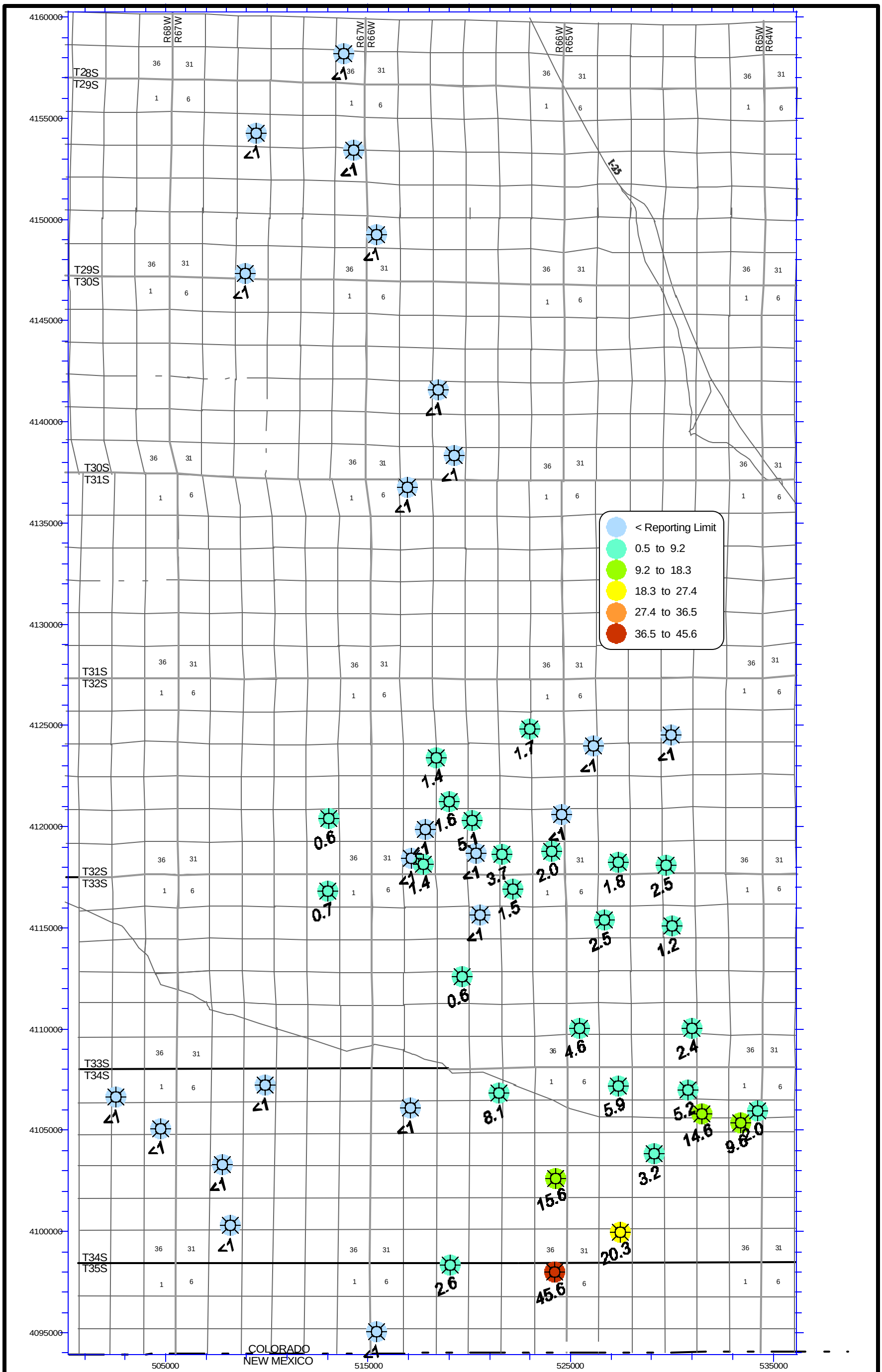
Phase IV

Produced Gas & Water Samples

Manganese (mg/L)

Wells Sampled August, 2001

Projection: UTM Zone 13S; Datum: NAD 27



ESN ENVIRONMENTAL SERVICES NETWORK
Rocky Mountain
130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

Phase IV

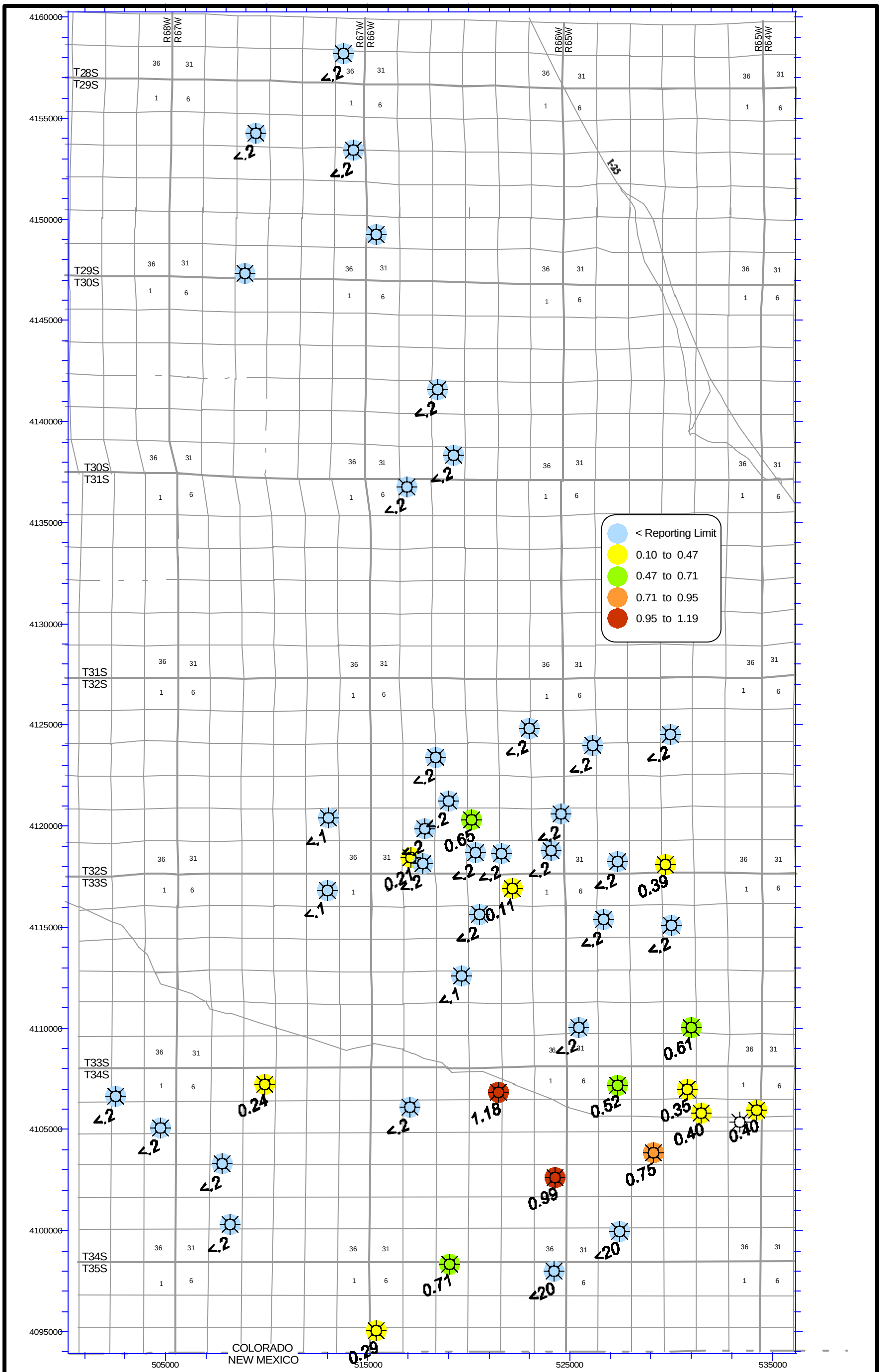
Produced Gas & Water Samples

Magnesium (mg/L)

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK
130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

Phase IV

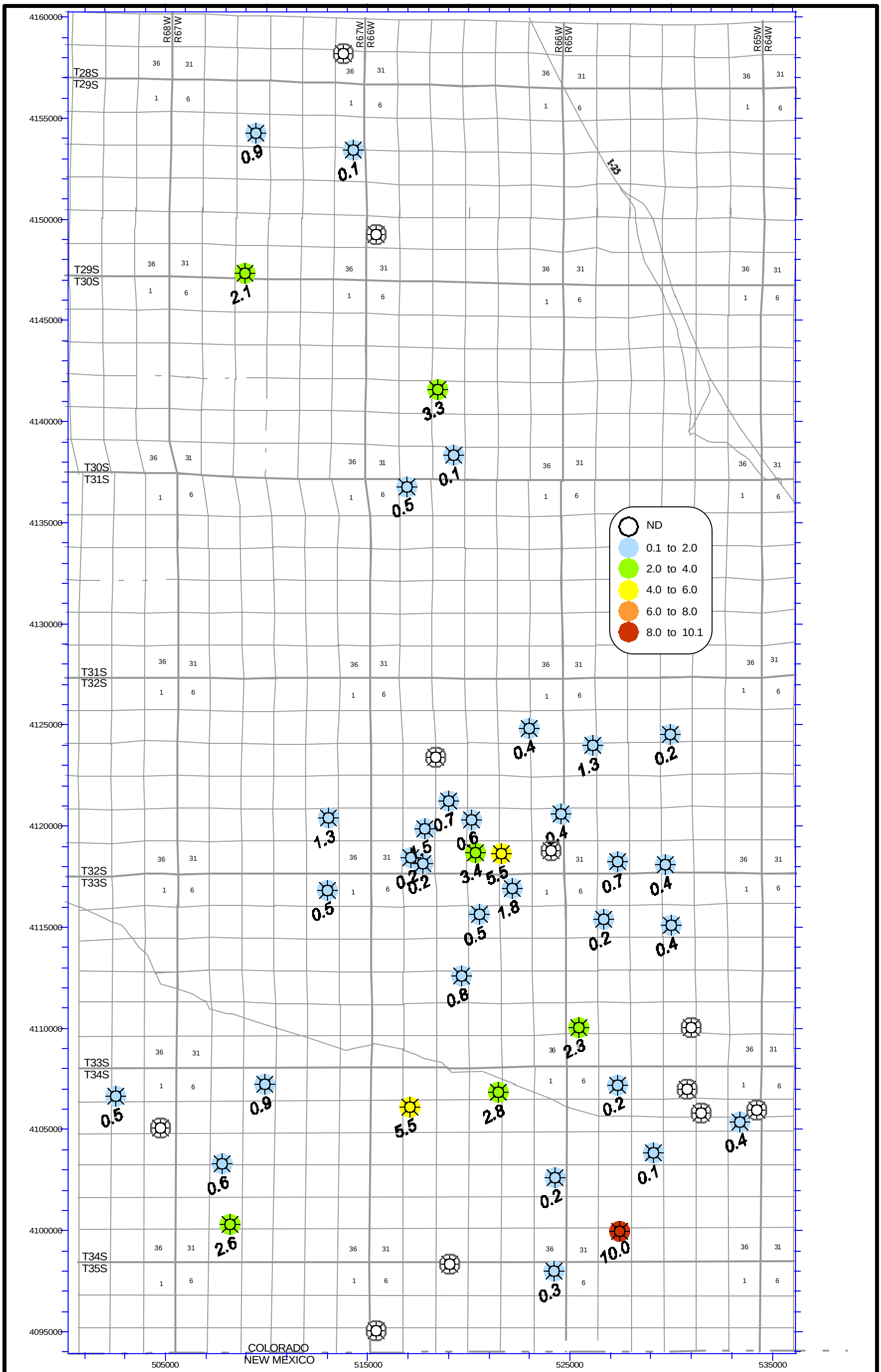
Produced Gas & Water Samples

Lithium (mg/L)

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK

130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

Phase IV

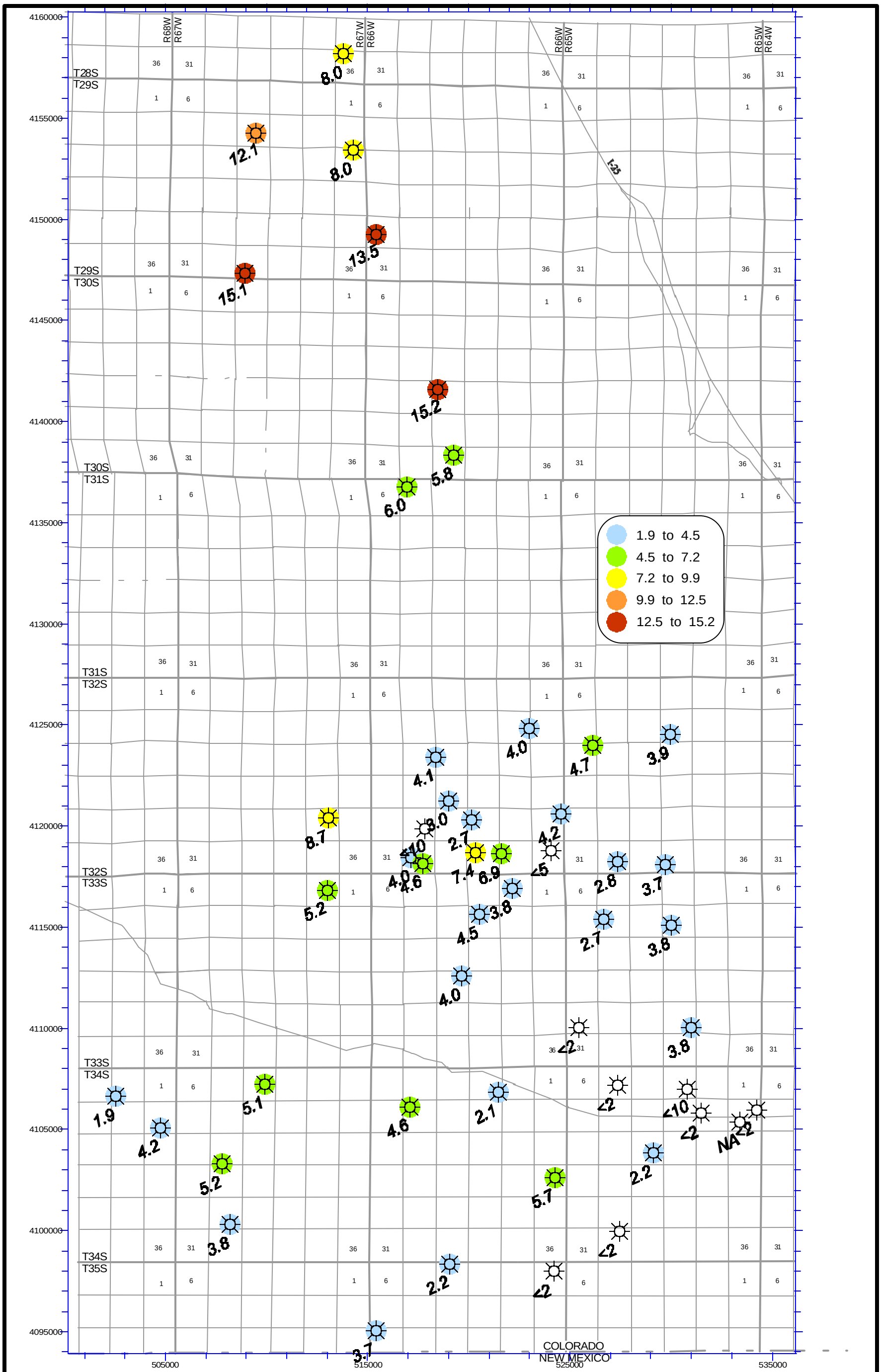
Produced Gas & Water Samples

Iron (mg/L)

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK

130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

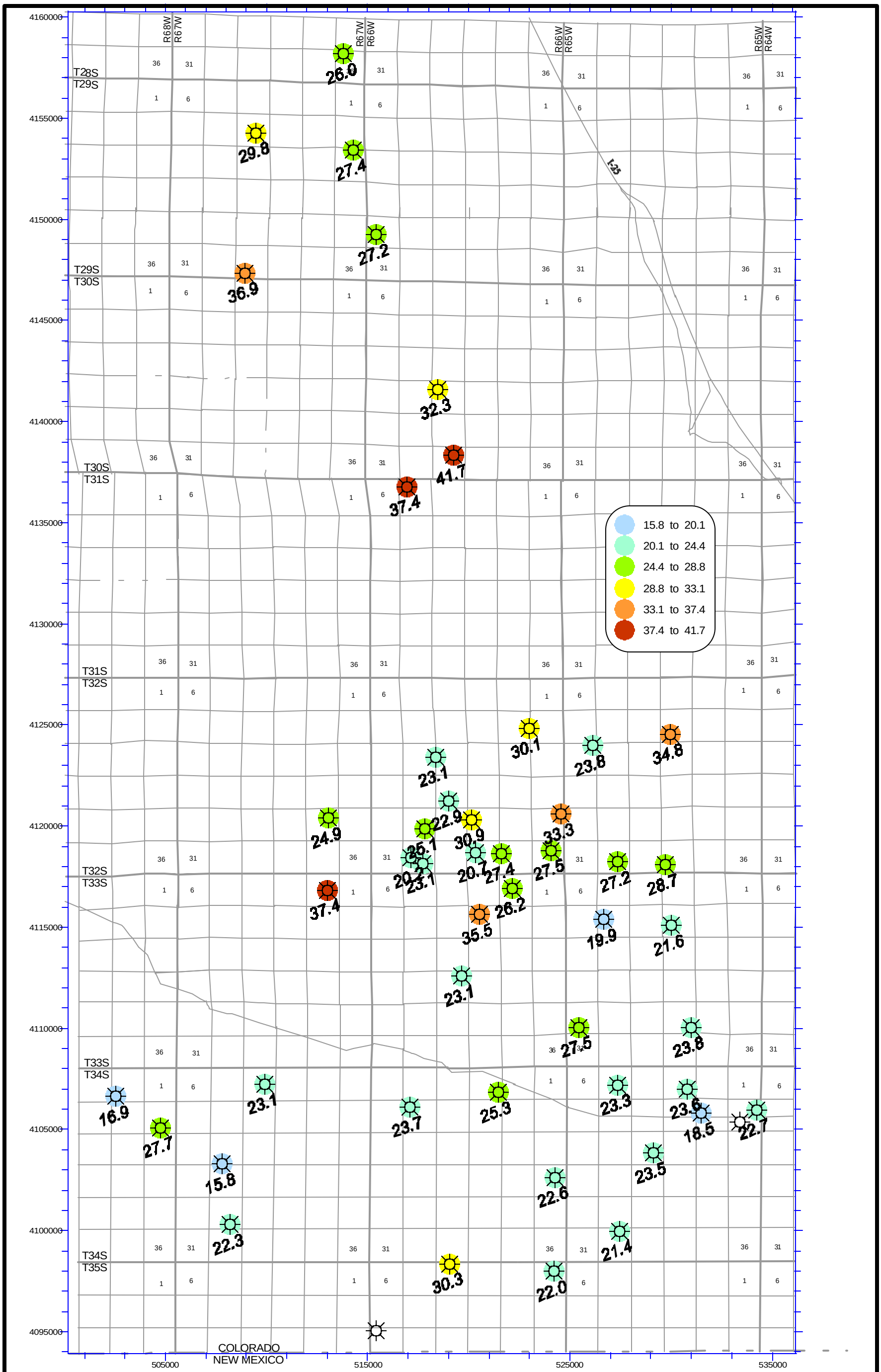
Phase IV

Produced Gas & Water Samples

Fluoride (mg/L)

Wells Sampled August, 2001

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK

130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

Phase IV

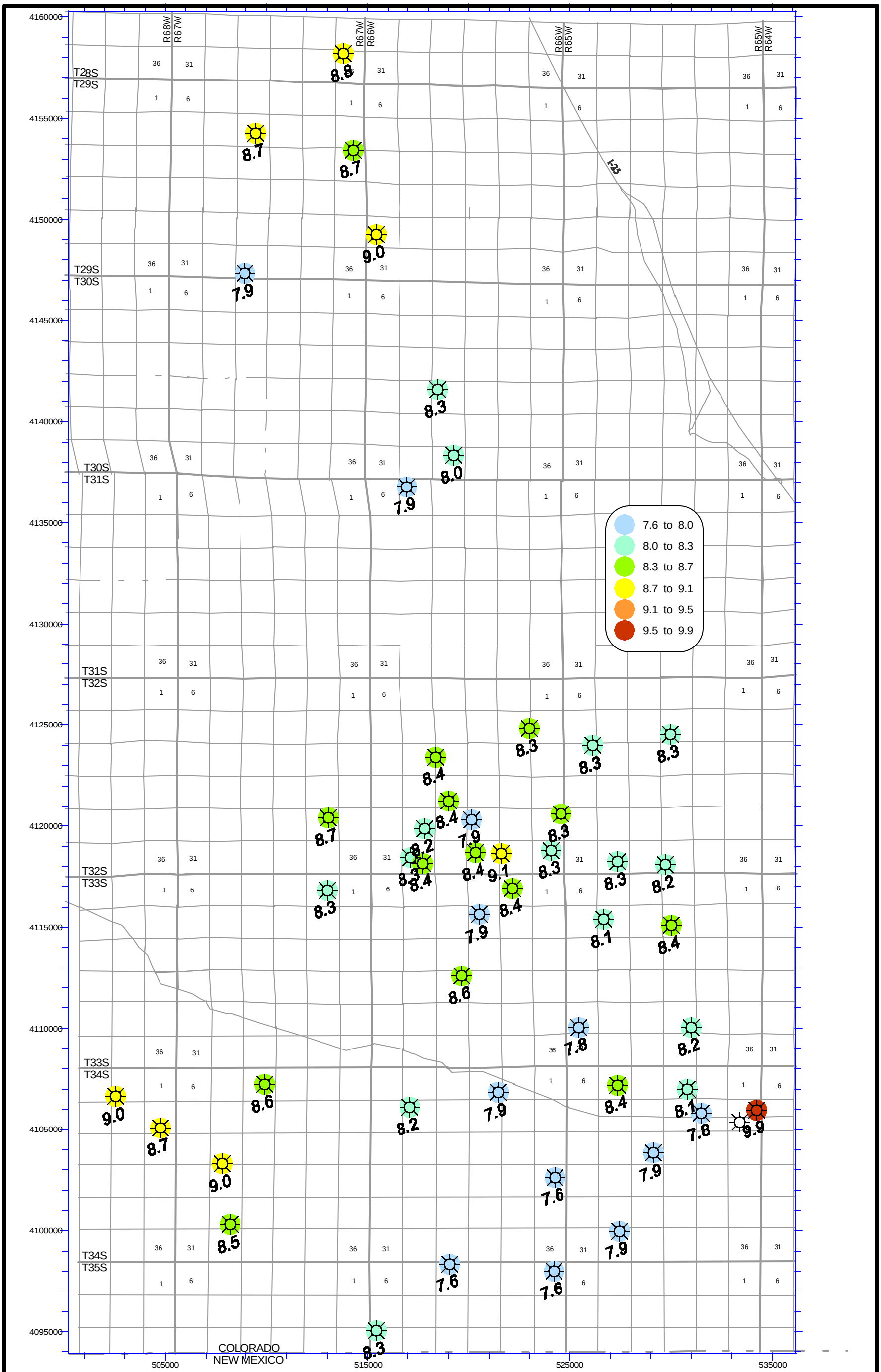
Produced Gas & Water Samples

Field Temperature (°C)

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK
130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

Phase IV

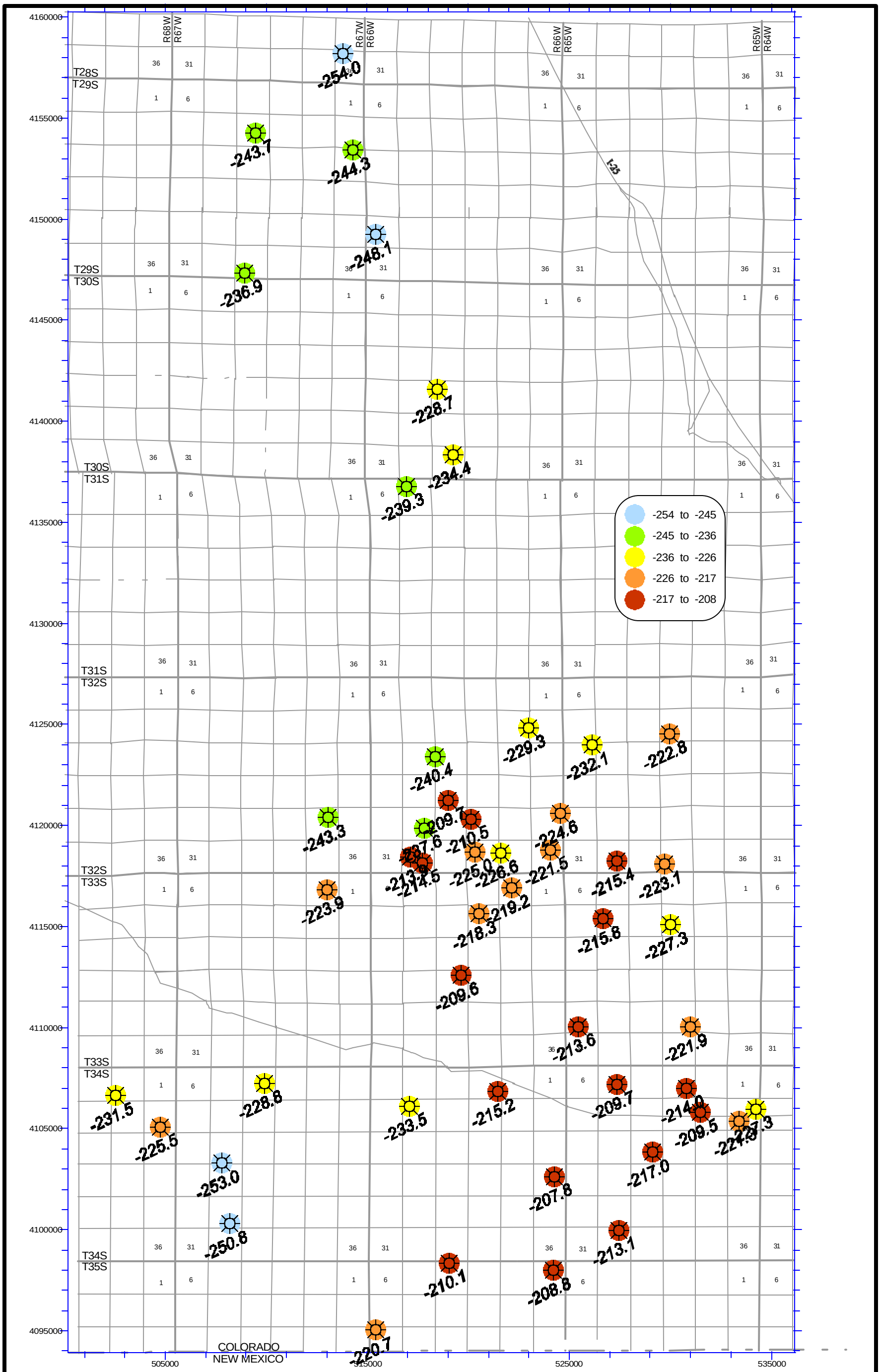
Produced Gas & Water Samples

Field pH

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK

130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

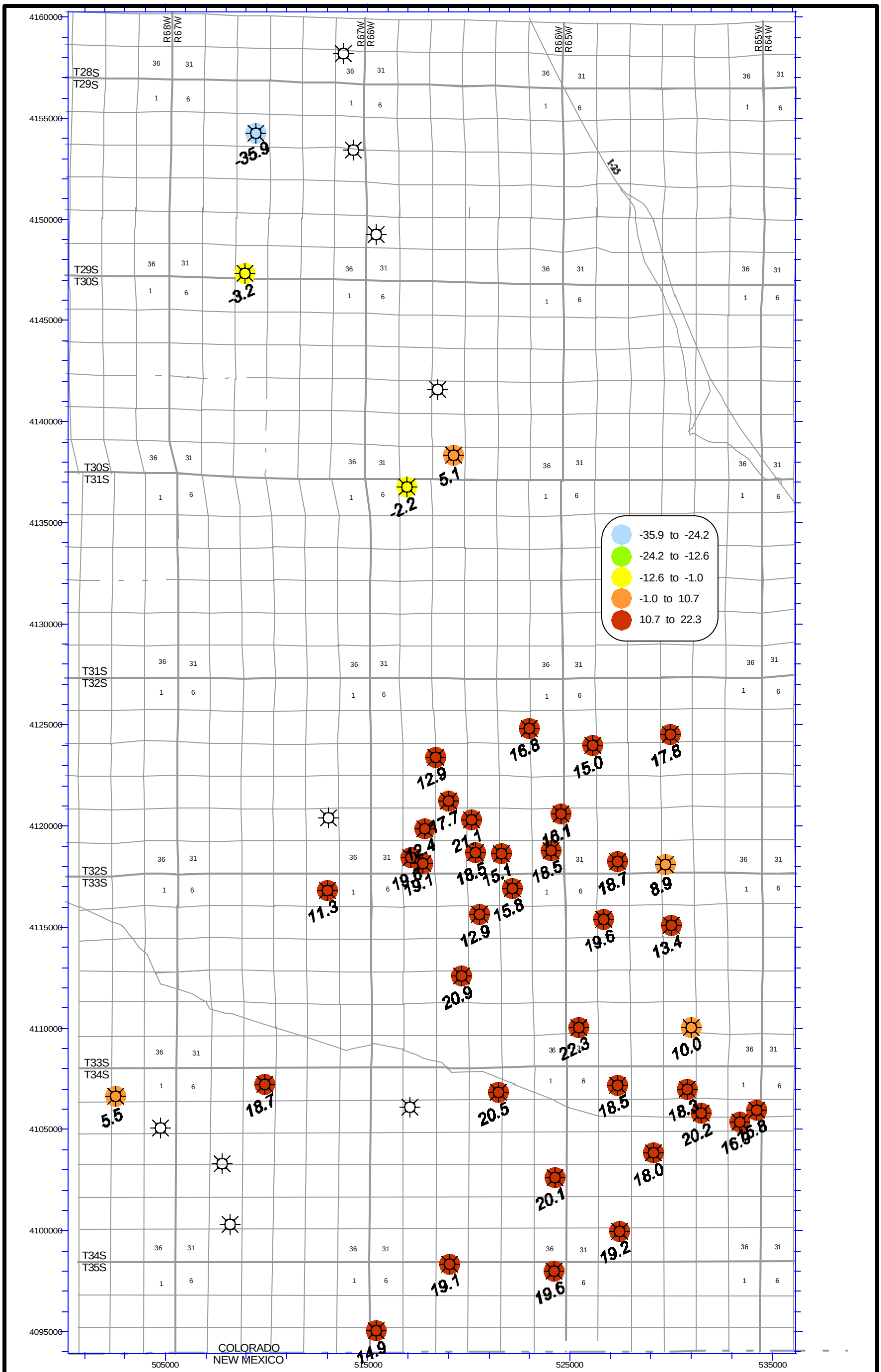
Phase IV

Produced Gas & Water Samples

δDC_1 per mil

Wells Sampled August, 2001

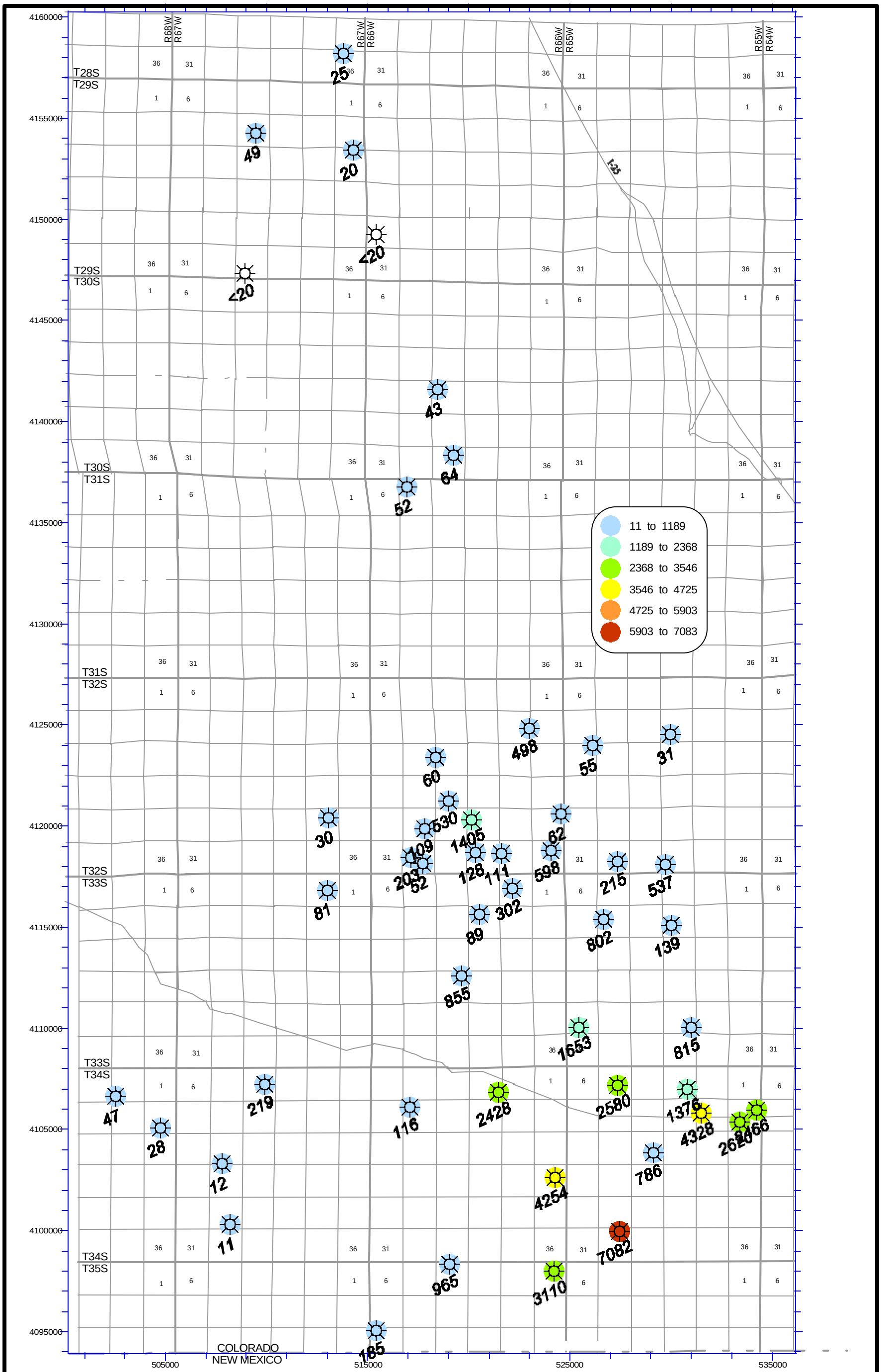
Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK 130 Capital Drive, Suite C Golden, CO 80401-5654 Phone: 303 -278-1911 FAX: 303-278-0104 E-Mail: Info@ESN-RM.com	Client: COGCC Project #: 1372 Date: January, 2003 Drawn by: MAV	**COGCC Raton Basin Project** **Phase IV** **Produced Gas & Water Samples** **$\delta^{13}CO_2$ per mil** Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK

130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

Phase IV

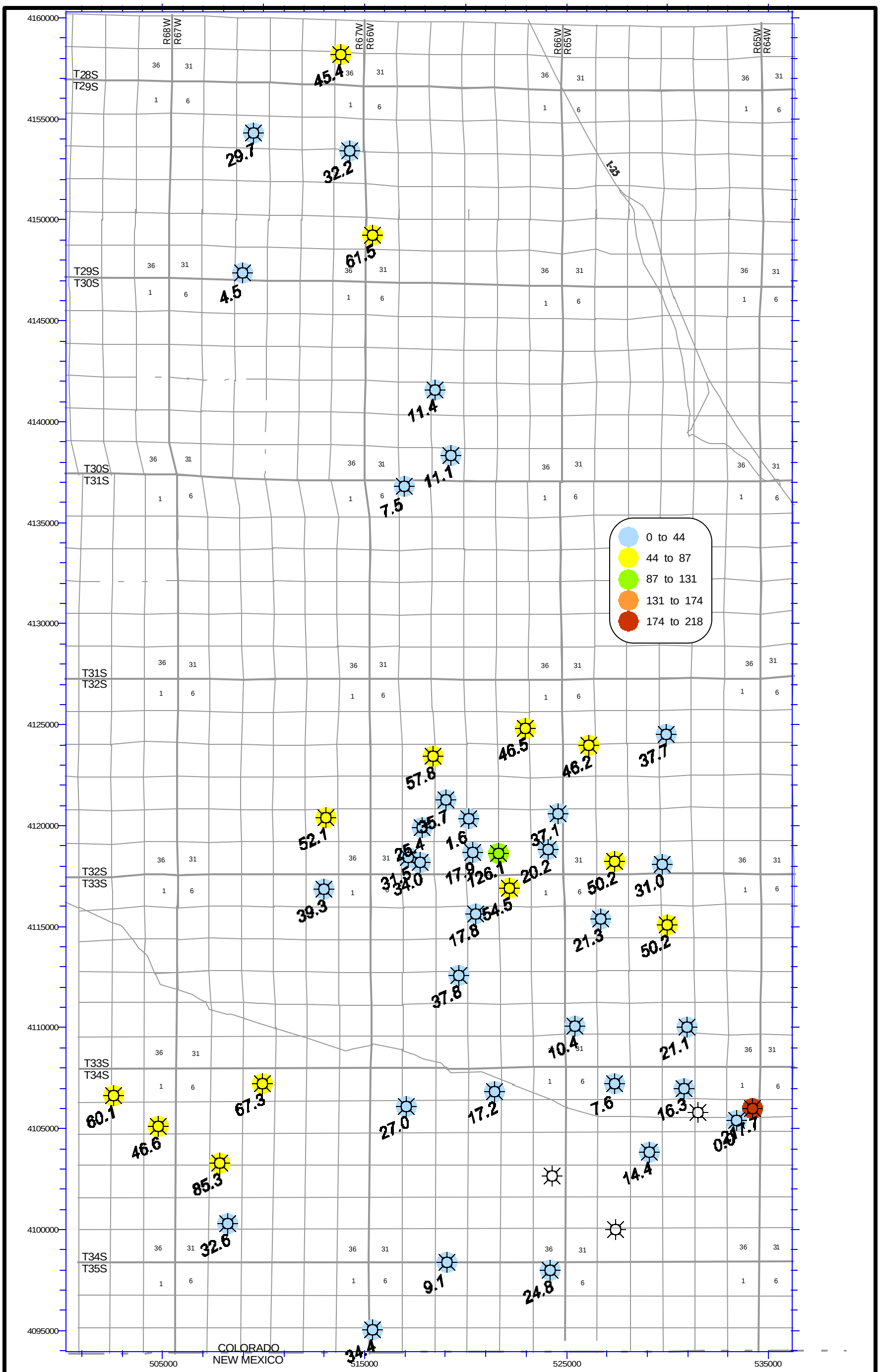
Produced Gas & Water Samples

Chloride (mg/L)

Wells Sampled August, 2001

N

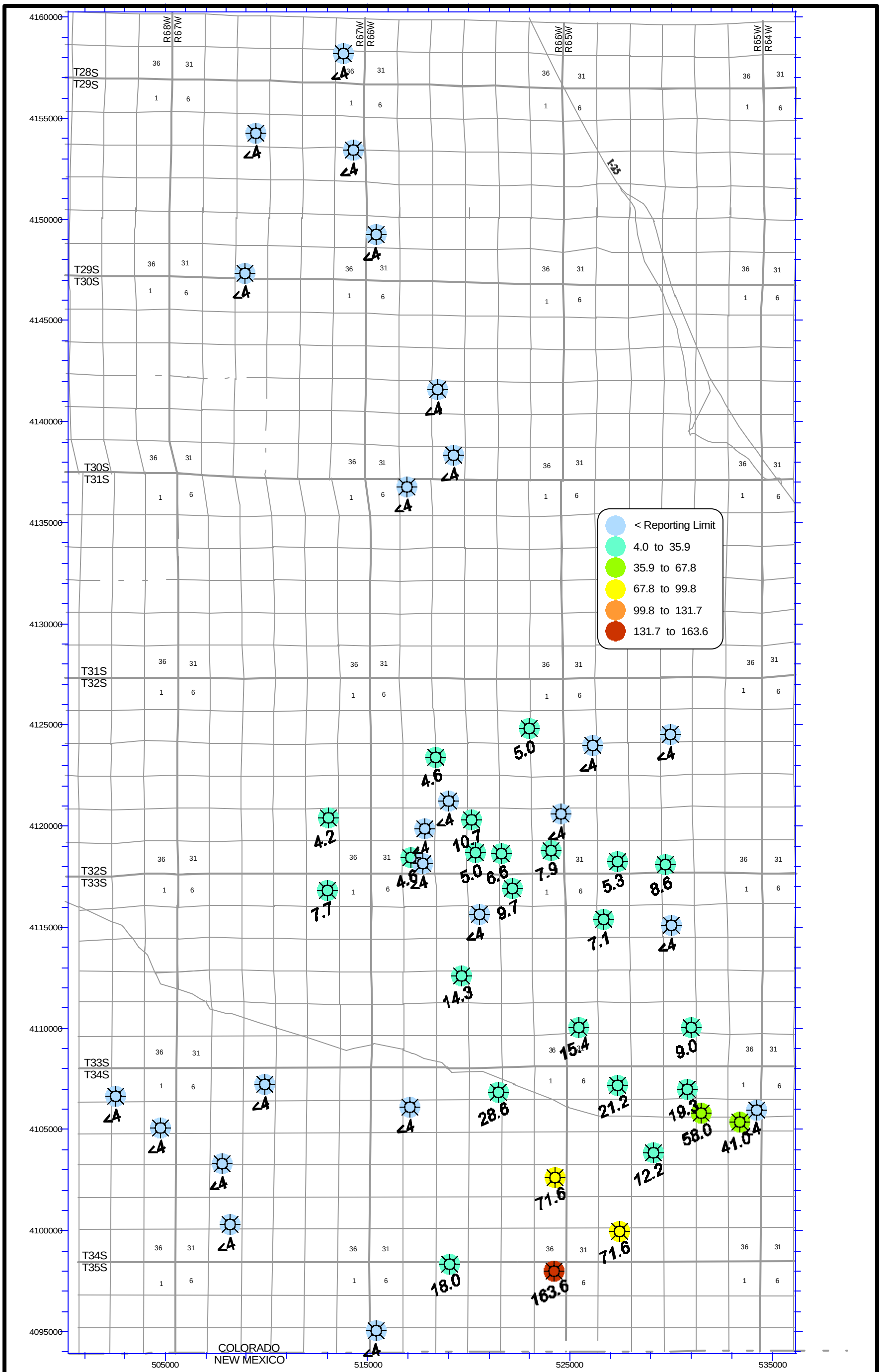
Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK 130 Capital Drive, Suite C Golden, CO 80401-5654 Phone: 303 -278-1911 FAX: 303-278-0104 E-Mail: Info@ESN-RM.com	Client: COGCC Project #: 1372 Date: January, 2003 Drawn by: MAV	**COGCC Raton Basin Project** **Phase IV** **Produced Gas & Water Samples** **Carbonate (mg/L)** Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK

130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

Phase IV

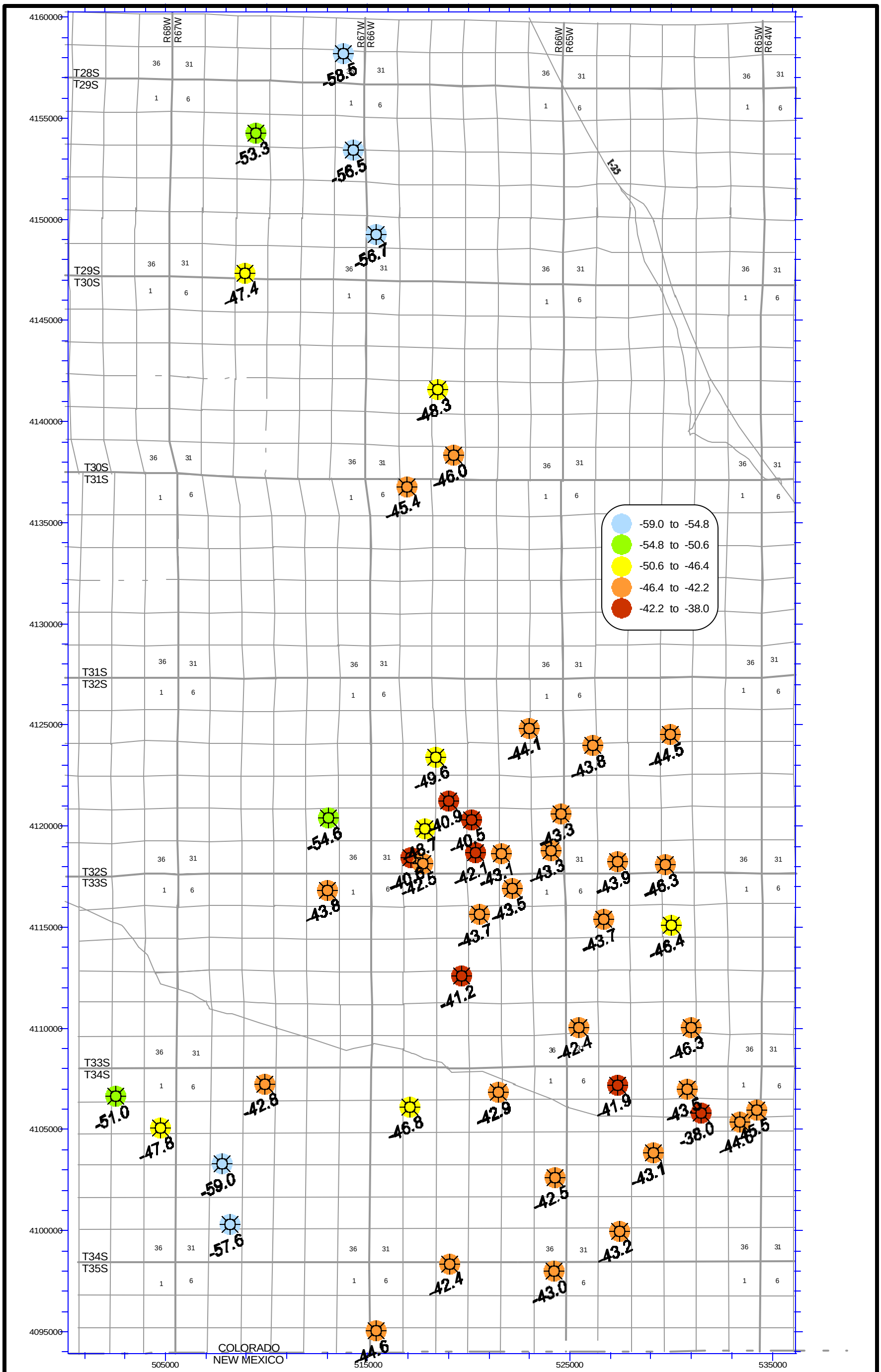
Produced Gas & Water Samples

Calcium (mg/L)

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK

130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303-278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

Phase IV

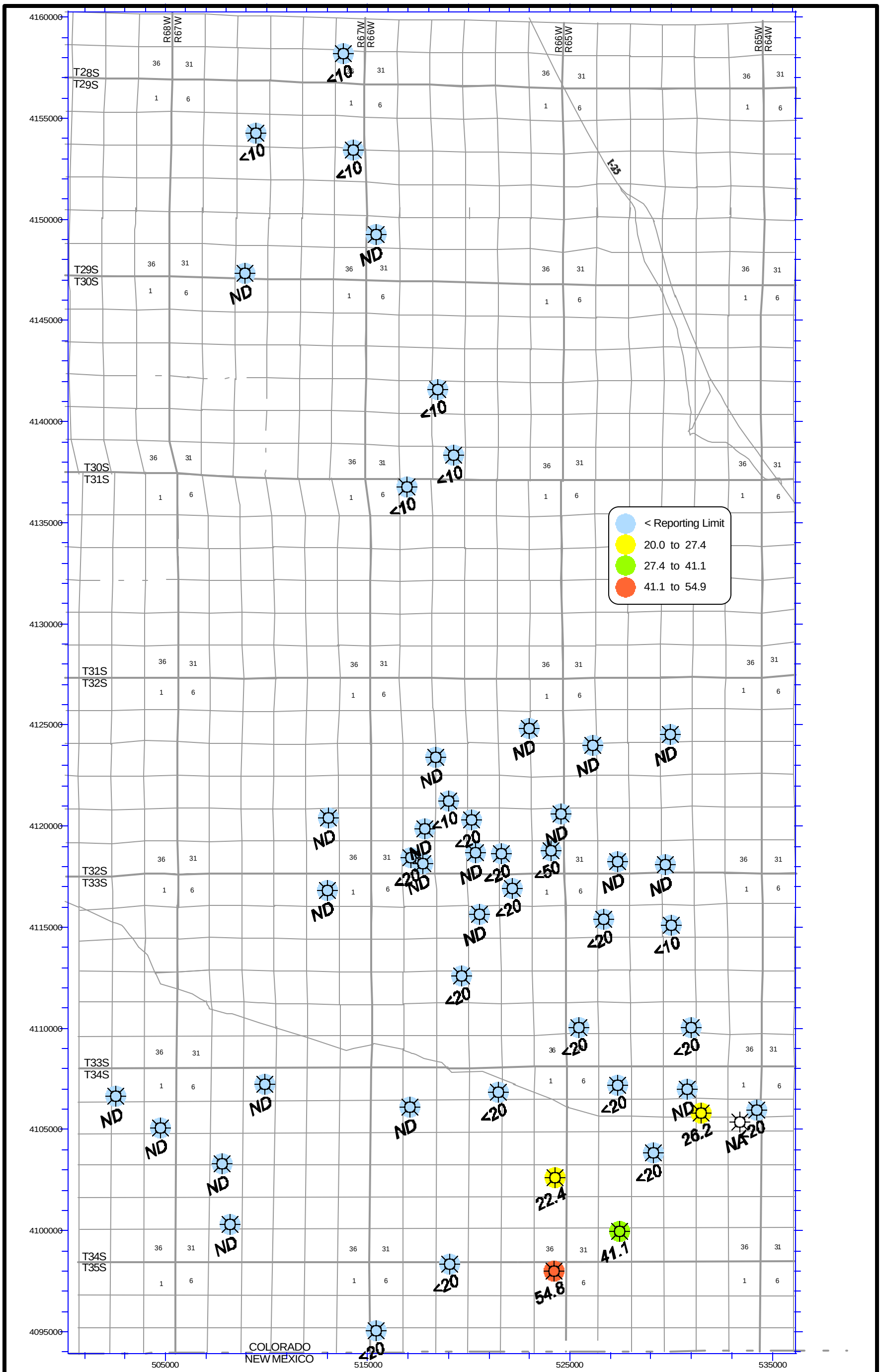
Produced Gas & Water Samples

$\delta^{13}C_1$ per mil

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK
130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC
Project #: 1372
Date: January, 2003
Drawn by: MAV

COGCC Raton Basin Project

Phase IV

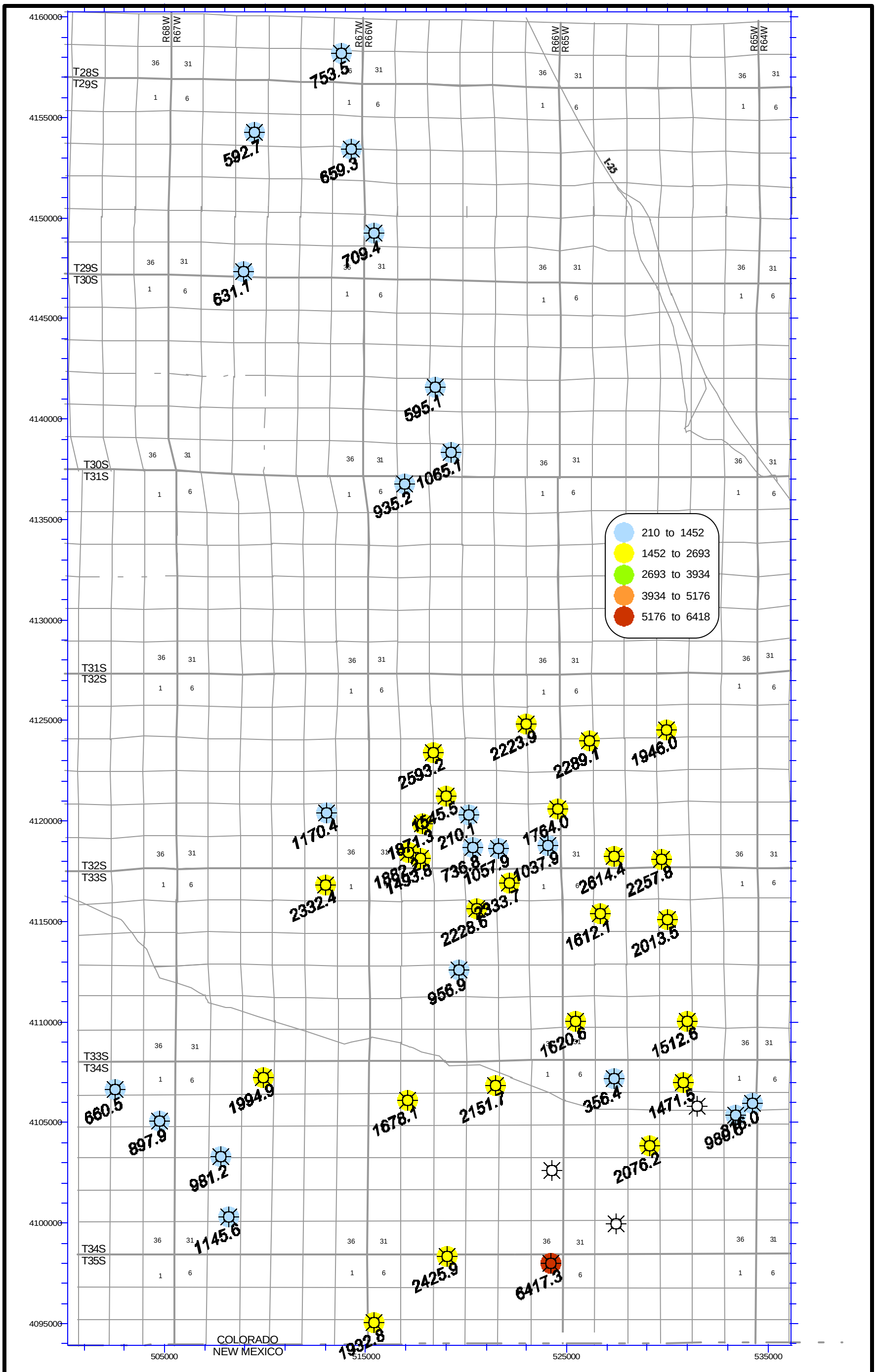
Produced Gas & Water Samples

Bromide (mg/L)

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK

130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303 -278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

Phase IV

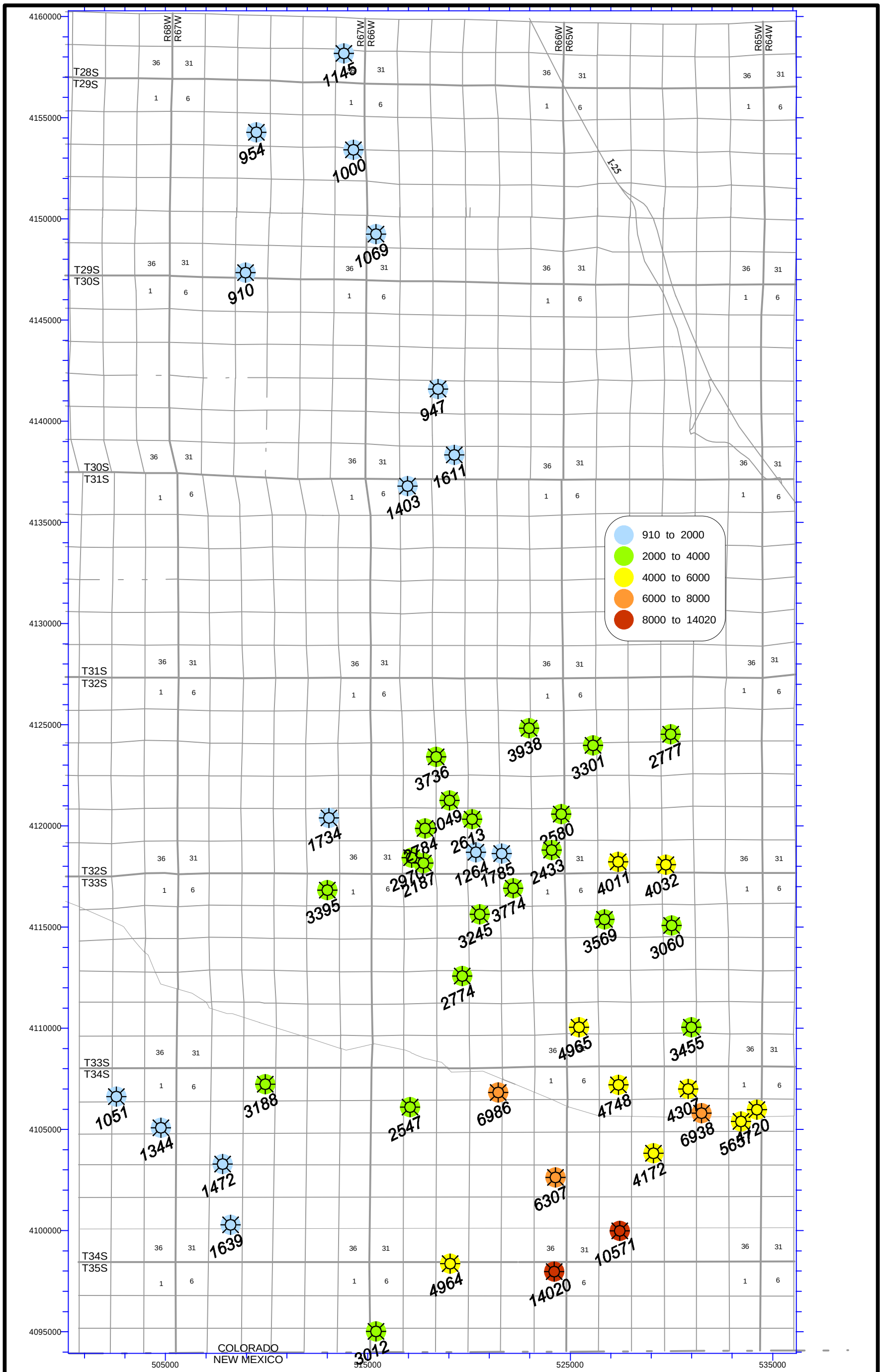
Produced Gas & Water Samples

Bicarbonate (mg/L)

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK

130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303-278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC

Project #: 1372

Date: January, 2003

Drawn by: MAV

COGCC Raton Basin Project

Phase IV

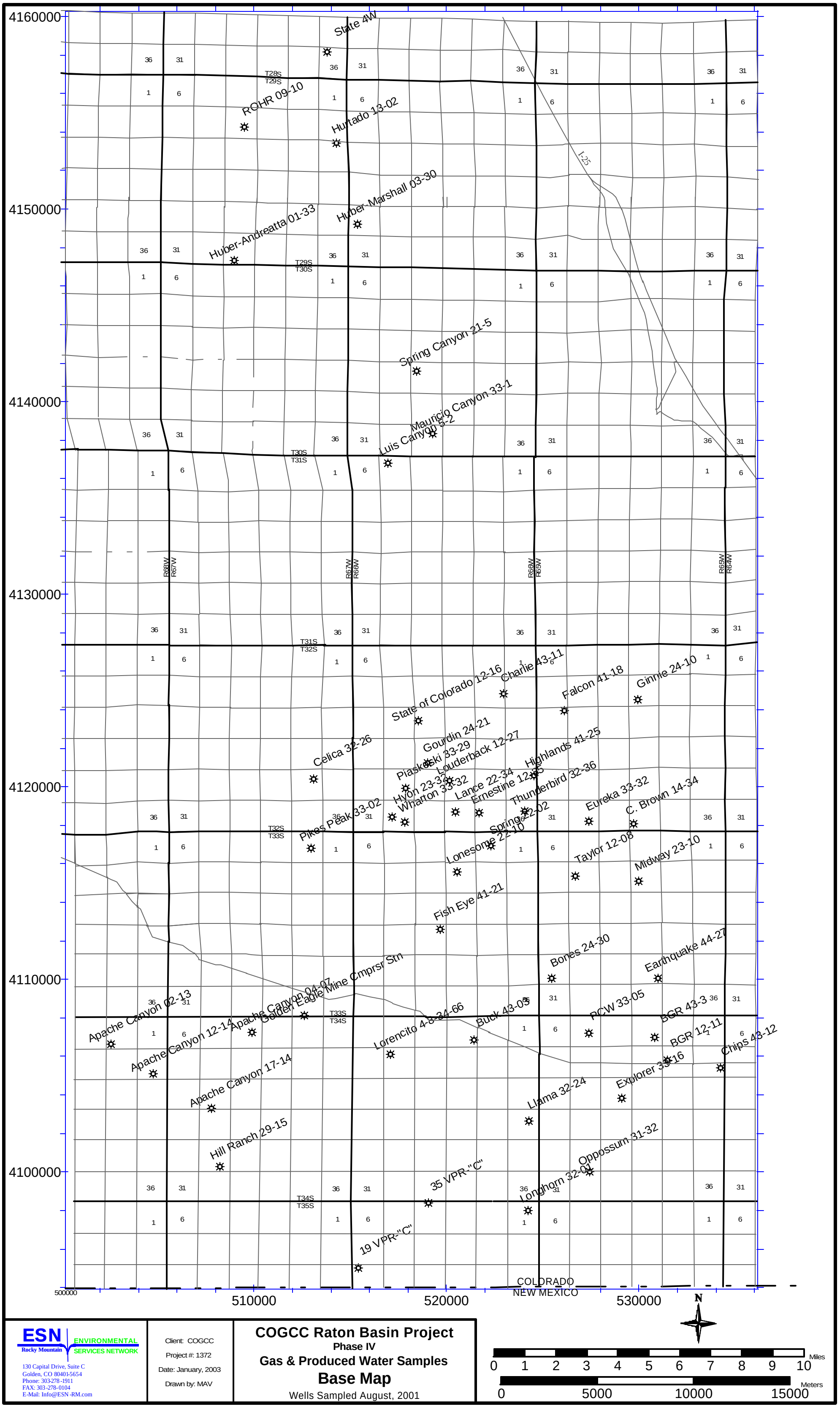
Produced Gas & Water Samples

Total Dissolved Solids (mg/L)

Wells Sampled August, 2001

N

Projection: UTM Zone 13S; Datum: NAD 27



ESN Rocky Mountain ENVIRONMENTAL SERVICES NETWORK

130 Capital Drive, Suite C
Golden, CO 80401-5654
Phone: 303-278-1911
FAX: 303-278-0104
E-Mail: Info@ESN-RM.com

Client: COGCC
Project #: 1372
Date: January, 2003
Drawn by: MAV

COGCC Raton Basin Project

Phase IV

Gas & Produced Water Samples

Base Map

Wells Sampled August, 2001