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This memorandum presents a summary of the key issues pertaining to the proposed remedial action at the 881 Hillside, the recommendations for resolution of the issues, and the implications for submittal of the final RI/FS reports. The contents of this memorandum were discussed in our meeting with DOE on November 16, 1988. In attendance were Kari Schneider and Greg Underberg representing DOE; Rebecca Weed, Suzanne Paschke, and Mike Anderson representing Weston; Bob James and Tom Greengard representing Rockwell; and Ben Doty.

The ARAR analysis performed for the FS identified a number of inorganic constituents in ground water at the 881 Hillside Area whose concentrations were above chemical specific ARARs, but that cannot be conclusively stated to be above background. (They are, however, above estimated background levels). Table 1, which is based on data in the FS, identifies average concentrations of inorganics in alluvial ground water that are above ARAR. Table 2 indicates that an ARAR non-compliance condition also exists for bedrock ground water with respect to inorganics. Although geometric means were used in the FS report, arithmethic means are used here to be conservative as the arithmetic mean will always be higher than the geometric mean if the data set contains any atypically high values.

As for radionuclides, the FS did not identify an ARAR non-compliance problem in ground water. However, total uranium did appear to be above estimated background levels (<5 pCi/l). Furthermore, total uranium did exceed the ARAR of 40 pCi/l in alluvial ground water at several wells at some point in time (see Table 3). Because the ARAR analysis was based on the average concentration (22.9 pCi/l), uranium was not identified as a constituent exceeding ARARs. The uranium ARAR is a surface water standard established by the State of Colorado (5 CCR 1002-8, Section 3.8.5(3)). The value of 40 pCi/l total uranium is also the proposed National Primary Drinking Water Standard as published in the September 30, 1986 Federal Register. The value is based on a 4 mrem/yr exposure. It should also be noted that the September 24, 1987 Federal Register sets a uranium standard of 30 pCi/l for remedial action at inactive uranium processing sites. EPA, in their comments on the 881 Hillside FS, noted the existence of a health advisory acceptable total uranium concentration of 10 pCi/l. Although this is a more stringent criterion, the health advisory is not a promulgated standard, and the promulgated standard used as ARAR is protective of human health. However, if 10 pCi/l is established as the uranium ARAR, then bedrock as well as alluvial ground water will be in non-compliance with respect to uranium (see Table 4).

The central issue regarding compliance with ARARs is that until background chemistry is characterized, it is not possible to determine if a variance from meeting these ARARs can be justified, i.e., that background chemical conditions do not meet chemical specific ARARs. Until background has been adequately characterized, the implications of proceeding with the FS preferred remedial action are: 1) discharge to the valley fill alluvium of effluent treated only for organics may be unacceptable to the agencies; 2) the proposed remedial action does not address apparent bedrock ground-water contamination; and 3) the french drain may be improperly located for collection of <u>all</u> "contaminated" alluvial ground water. Table 5 presents the alluvial

wells downgradient of the proposed location of the french drain and the inorganic constituent concentrations above ARAR. The wells are also shown on Figure 1.

The obvious solution to this problem is to collect the necessary background data, determine where variances from ARARs are justified, and then revise the RI/FS so that the preferred remedial action is the cost effective remedy for the 881 Hillside that meets or exceeds ARARs as appropriate. However, the RI/FS reports cannot be finalized for submittal to EPA and CDH until mid 1990 given the time constraints of drilling, sampling, laboratory analysis, data validation, data analysis, and reports preparation and review.

Because organic contamination has not migrated away from the 881 Hillside Area, and inorganic "contamination" has not migrated to any appreciable extent, it is unlikely that contamination will become more wide spread and therefore more costly to remediate if remedial action is not taken until the RI/FS report is finalized (i.e., the wastes were disposed at the 881 Hillside more than 20 years ago). However, there may be negative public perception of delaying remedial action until 1990. Should DOE/Rockwell want to avoid potential poor community relations, an interim remedial action could be implemented. As required by CERCLA/SARA, an interim remedial action must be consistent with the final remedy for the site. The implication of this requirement is that discharge of inorganic "contaminated" water to surface water or ground water may exacerbate the environmental problem at the site, and thus not be consistent with the final remedy. Therefore, any interim action must necessarily include treatment for inorganics. The disadvantages of treatment for inorganic removal during interim remediation are potential needless expenditure of additional funds and creation of a community/political climate that would look unfavorably upon ceasing such treatment if it is determined at a later date that background chemical conditions do not comply with ARARs.

The options for interim remedial action discussed at the November 16, 1988 meeting are variations on the preferred remedial action presented in the FS. The preferred remedial action was to install a french drain at the base of the hillside to collect the alluvial ground water, pump alluvial ground water from the vicinity of well 9-74 (location of highest organic contamination), collect the building 881 footing drain flow, treat these waters for organic contaminant removal using a UV peroxide system, and reinject the effluent into the valley fill alluvium. The options for interim remedial action are listed below.

1) To the FS preferred action, add an ion exchange unit for removal of inorganics as necessary. Ion exchange regenerant would be treated in the Building 374 flash evaporator.

2) Delete from the FS preferred action the french drain and reinjection system. Batch treat ground water collected from well 9-74 vicinity for organics removal, transport the effluent via tanker truck to Building 374 for treatment in the flash evaporator. The footing drain flow would be treated for organics removal and discharged into the South Interceptor Ditch. (Inorganics in the footing drain discharge comply with ARARs).

3) Reinject effluent from the FS preferred action upgradient of the french drain.

4) Discharge effluent from the FS preferred alternative treatment system into the Rocky Flats Plant process waste collection system for eventual treatment at Building 374.

Option 3 was dismissed as not viable because it would be necessary to discharge the base flow either downgradient or offsite once steady state was reached in the hydrogeologic system.

Options 1 and 4 have an advantage over option 2 in that contaminants in alluvial ground water are completely cutoff from further migration by the action of the french drain. Option 4 is less costly in that treatment in the flash evaporator represents a sunk capital cost, and the operational cost would not be assigned to the project. However, there is only 5 gpm residual treatment capacity in the flash evaporator and the effluent discharge flow is predicted to be 5 to 7 gpm. This may render this option infeasible.

Implementation of option 2 will require some modification to the appurtenances of the proposed treatment system. For example it will be necessary to store collected ground water from well 9-74 for subsequent batch treatment, and it will be necessary to store the footing drain flow during batch treatment of the 9-74 ground water. Appropriate piping and valving modifications will also be required. Sizing of the tanks will be dependent on the expected flow of ground water from the vicinity of well 9-74, and the expected time required to remove organics from this highly contaminated water to achieve the effluent standards, i.e., recyle may be required during batch treatment.

In spite of the need for these above mentioned modifications, it was decided at the meeting that option 2 was the most practical and cost effective interim remedial action. First, it resulted in removal of the most contaminated water at the 881 Hillside Area thus mitigating potential contaminant migration downgradient in alluvial ground water and possibly bedrock ground water. Second, it removed organics from the footing drain flow which currently discharges to a surface water pathway. Third, it does not require additional cost for installation and operation of an ion exchange unit which may not be needed depending on the outcome of the background characterization. Lastly, the french drain would not be installed in potentially the wrong location if it is determined inorganics are indeed a contaminant requiring removal. It is noted that a negative aspect of locating the french drain further downgradient of the proposed location is eventual further migration of organics within the alluvium and thus the potential for organic contamination of downgradient subcropping sandstones. However, the risk of extensive downgradient migration of organics during the interim action period is significantly reduced by removal of organic contaminated ground water in the vicinity of well 9-74. In conclusion, it was felt by the group that this alternative provided the most flexibility for incorporating additional treatment processes or ground-water collection systems as deemed necessary, would be consistent with the final remedy, and would require the

least expenditure of funds that may ultimately be determined to have been unnecessary.

Before a final determination is made on the interim remedial action, the following are recommended:

- consult ion exchange vendors to "ball park" capital and operating cost, and as necessary, conduct bench scale treatability studies to determine the most effective resin and unit size;

- determine the expected flow if the french drain were located in the valley fill alluvium near well 65-86 in order to capture the inorganic plume;

- determine the expected flow of bedrock ground water at the 881 Hillside Area if it were necessary to pump and treat for inorganics;

- determine the expected flow and ultimate volume from pumping ground water in the vicinity of well 9-74;

- determine the expected treatment time to treat a batch of highly contaminated ground water from well 9-74;

- if an interim remedial action is pursued, the design should allow for additional space and piping arrangements to accommodate other units for treatment of inorganics and/or increased flows if required at a later date.

It is further noted that the Plant's NPDES permit may require modification for discharge to the valley fill alluvium or the South Interceptor Ditch. In the former case, interaction between shallow ground water and surface water is likely to trigger a need to comply with the CWA requirements. Additional monitoring parameters will likely include the inorganics identified in Table 1 as well as the Target Compound List (TCL) volatiles (see Table 6). The Target Compound List was formerly known as the Hazardous Substance List (HSL).

Lastly, EPA policy for Superfund sites is to prepare an Engineering Evaluation/Cost Analysis (EE/CA) before non-time-critical removal actions are implemented. The EE/CA serves to 1) satisfy environmental review requirements for removal actions, 2) satisfy administrative record requirements for documentation of removal action selection, and 3) provide a framework for evaluating and selecting alternative technologies. As Rocky Flats Plant is not a Superfund site, an EE/CA is not federally required. However, an EE/CA may be required by the State of Colorado. Such a document may cost on the order of $50,000 to prepare.

TABLE 1

INORGANIC CONSTITUENTS ABOVE CHEMICAL SPECIFIC ARARS IN ALLUVIAL GROUNDWATER AT THE 881 HILLSIDE AREA

Constituent	ARAR (mg/l)	Geometric Mean Concentration (mg/l)
Selenium	0.01	0.03
Strontium	0.46*	1.0
Manganese	0.05	0.07
TDS	400	1053
Sulfate	250	171**

* Based on risk assessment hazard index of 1 for adult drinking water only. The hazard index is the ratio of the computed daily intake of the contaminant to the acceptable daily intake.

** Geometric mean does not indicate exceedence of ARAR, but ARAR is frequently exceeded at wells 9-74, 10-74, 69-86, 4-87, 6-87, 43-87.

TABLE 2

INORGANIC CONSTITUENTS EXCEEDING ARAR

IN BEDROCK GROUNDWATER

	ARAR(mg/l)	Range (mg/l)	Arithmetic Mean (mg/l)
Selenium	0.01	0.005U - 0.23	0.04
Strontium	0.46*	0.21 - 3.14	1.20
Manganese	0.05	0.005U - 0.18	0.05
TDS	400	275 - 1852	790
Sulfate	250	23 - 770	262

* Based on risk assessment hazard index of 1 for adult drinking water only.

TABLE 3. - 881 HILLSIDE ALLUVIAL WELLS

Well Number	Batch Number	Sample Date	U234+U238 Total pCi/L	Well Mean (Running) pCi/L	Grand Mean (Running) pCi/L
0187	0188-881-127	02/11/88	13.9000	13.9000	13.9000
0287	0187-123-015	10/18/87	17.8240	17.8240	
0287	0188-881-128	02/11/88	10.9000	14.3620	
0287	0288-881-049	04/08/88	11.1000	13.2747	
0287	0387-881-008	07/09/87	12.6000	13.1060	
0287	0687-881-011	10/08/87	15.5000	13.5848	
0287	0587-881-002	05/29/87	15.9000	13.9707	13.9353
0487	0188-881-140	02/16/88	34.0000	34.0000	
0487	0288-881-006	04/14/88	40.0000	37.0000	
0487	0387-881-010	07/09/87	44.2000	39.4000	
0487	0687-881-013	10/15/87	28.0000	36.5500	
0487	0587-881-001	05/20/87	36.0000	36.4400	21.4369
0687	0188-881-143	02/19/88	52.0000	52.0000	
0687	0387-881-047	08/04/87	54.6000	53.3000	29.4027
0974	0188-881-156	02/26/88	26.0000	26.0000	
0974	0288-881-010	04/15/88	21.2000	23.6000	
0974	0288-881-011	04/15/88	21.5000	22.9000	
0974	0487-881-010	10/21/87	16.2000	21.2250	
0974	0187-881-004	03/09/87	11.0000	19.1800	
0974	0187-881-049	04/09/87	9.2000	17.5167	
0974	0287-881-001	05/21/87	16.1000	17.3143	
0974	1000-000-241	/ /	19.2000	17.5500	27.0321
1074	0188-881-158	02/26/88	12.4000	12.4000	
1074	0288-881-009	04/15/88	8.5000	10.4500	
1074	0287-881-002	05/21/87	12.4000	11.1000	24.3768
4387	0188-881-155	02/23/88	40.0000	40.0000	
4387	0288-881-002	04/12/88	27.0000	33.5000	
4387	0487-881-017	12/18/87	37.0000	34.6667	25.8468
4487	DRY	11/14/87	0.0000	0.0000	
4487	DRY	02/22/88	0.0000	0.0000	
4487	DRY	04/18/88	0.0000	0.0000	25.8468
4887	0188-881-139	02/16/88	13.8000	13.8000	
4887	INSUFF. SAMP.	11/18/87	0.0000	13.8000	
4887	INSUFF. SAMP.	02/15/88	0.0000	13.8000	
4887	INSUFF. SAMP.	04/13/88	0.0000	13.8000	24.3409

TABLE 3. - 881 HILLSIDE ALLUVIAL WELLS

Well Number	Batch Number	Sample Date	U234+U238 Total pCi/L	Well Mean (Running) pCi/L	Grand Mean (Running) pCi/L
5087	INSUFF. SAMP.	11/18/87	0.0000	0.0000	
5087	DRY	02/17/88	0.0000	0.0000	
5087	DRY	04/13/88	0.0000	0.0000	24.3409
5287	0188-881-131	02/13/88	8.7000	8.7000	
5287	0288-881-067	04/19/88	50.0000	29.3500	
5287	0487-881-012	11/24/87	36.0000	31.5667	25.1438
5387	INSUFF. SAMP.	11/18/87	0.0000	0.0000	
5387	DRY	02/10/88	0.0000	0.0000	
5387	INSUFF. SAMP.	04/11/88	0.0000	0.0000	25.1438
5487	INSUFF. SAMP.	11/18/87	0.0000	0.0000	
5487	DRY	02/10/88	0.0000	0.0000	
5487	INSUFF. SAMP.	04/11/88	0.0000	0.0000	25.1438
5587	INSUFF. SAMP.	11/30/87	0.0000	0.0000	
5587	DRY	02/15/88	0.0000	0.0000	
5587	DRY	04/11/88	0.0000	0.0000	25.1438
6386	DRY	10/06/86	0.0000	0.0000	
6386	DRY	07/06/87	0.0000	0.0000	
6386	DRY	10/14/87	0.0000	0.0000	
6386	DRY	02/17/88	0.0000	0.0000	
6386	DRY	04/13/88	0.0000	0.0000	25.1438
6486	0188-881-144	02/18/88	2.9000	2.9000	
6486	0288-881-003	04/12/88	5.5000	4.2000	
6486	0187-881-068	04/29/87	3.8000	4.0667	23.0361
6986	0187-123-014	10/08/87	14.9820	14.9820	
6986	0188-881-129	02/11/88	17.5000	16.2410	
6986	0288-881-004	04/12/88	19.0000	17.1607	
6986	0387-881-110	07/07/87	18.0000	17.3705	
6986	0487-881-008	10/08/87	14.9000	16.8764	
6986	0187-881-066	04/29/87	45.0000	21.5637	
6986	0287-881-008	05/25/87	17.2000	20.9403	
6986	1000-000-309	/ /	25.0000	21.4477	
6986	1000-000-311	/ /	25.0000	21.8424	22.9276

TABLE 4. - 881 HILLSIDE BEDROCK WELLS

Well Number	Batch Number	Sample Date	U234+U238 Total pCi/L	Well Mean (Running) pCi/L	Grand Mean (Running) pCi/L
0387	0587-881-005	06/16/87	22.0000	22.0000	
0387	0387-881-009	07/09/87	0.3000	11.1500	
0387	0687-881-010	10/06/87	2.1300	8.1433	
0387	0188-881-149	02/23/88	2.5000	6.7325	
0387	0288-881-120	04/28/88	1.2100	5.6280	5.6280
0587	0587-881-003	06/12/87	23.1000	23.1000	
0587	0687-881-014	10/13/87	20.0000	21.5500	
0587	0387-881-109	07/07/87	15.3000	19.4667	
0587	0188-881-151	02/23/88	23.0000	20.3500	
0587	0288-881-001	04/12/88	12.8000	18.8400	12.2340
0887	0587-881-004	06/15/87	8.9000	8.9000	
0887	0387-881-012	07/13/87	-0.5000	4.2000	
0887	0188-881-150	02/23/88	6.7000	5.0333	
0887	0288-881-121	04/28/88	6.0000	5.2750	9.9143
4587	0487-881-011	11/24/87	4.1000	4.1000	
4587	0188-881-152	02/26/88	3.9000	4.0000	
4587	0288-881-064	04/19/88	3.0000	3.6667	8.3524
5986	0187-881-046	04/09/87	16.3000	16.3000	
5986	0187-881-071	04/30/87	26.0000	21.1500	
5986	0287-881-010	05/26/87	25.0000	22.4333	
5986	0187-123-016	10/08/87	0.0000	22.4333	
5986	0387-881-112	07/07/87	24.0000	22.8250	
5986	0487-881-024	10/08/87	18.1000	21.8800	11.0579
6286	0187-881-047	04/09/87	2.7000	2.7000	
6286	0187-881-069	04/29/87	8.5000	5.6000	
6286	0287-881-009	05/26/87	6.2000	5.8000	
6286	0188-881-145	02/18/88	1.0300	4.6075	
6286	0288-881-005	04/14/88	7.3000	5.1460	
6286	0387-881-113	07/07/87	7.5000	5.5383	
6286	0487-881-009	10/16/87	7.0000	5.7471	10.1728

TABLE 5

ALLUVIAL WELLS DOWNGRADIENT OF FRENCH DRAIN

WITH INORGANIC CONSTITUENTS EXCEEDING ARARS

ARAR Well	Selenium 0.01 mg/l		Strontium 0.46 mg/l		Manganese 0.05 mg/l		TDS 400 mg/l		Sulfate 250 mg/l	
	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
2-87	0.005U	0.005U	0.46-0.61	0.51	0.22-0.44	0.34	525-620	560	66-73*	70*
69-86	.002U-.24	.12	0.90-1.20	1.04	0.005U-.06	0.02*	841-1017	948	53-320	211*
48-87		0.03**		2.9**		0.43**		2081**		838**
47-87 dry										
55-87 dry										
64-86	0.005U-0.009*	0.004*	0.42-0.70	0.53	0.03-0.28	0.12	438-742	597	133-180*	162*
65-86	0.005U-0.009*	0.004*	0.52-0.78	0.61	0.006-0.16	0.06	444-690	549	89-220*	144*

* Does not exceed ARAR

** Only one data point

All units mg/l

TABLE 6

TARGET COMPOUND LIST - VOLATILES

Volatiles	CAS Number	Detection Limits* Low Water[a] ug/L	Low Soil/Sediment[b] ug/Kg
1. Chloromethane	74-87-3	10	10
2. Bromomethane	74-83-9	10	10
3. Vinyl Chloride	75-01-4	10	10
4. Chloroethane	75-00-3	10	10
5. Methylene Chloride	75-09-2	5	5
6. Acetone	67-64-1	10	10
7. Carbon Disulfide	75-15-0	5	5
8. 1,1-Dichloroethene	75-35-4	5	5
9. 1,1-Dichloroethane	75-35-3	5	5
10. trans-1,2-Dichloroethene	156-60-5	5	5
11. Chloroform	67-66-3	5	5
12. 1,2-Dichloroethane	107-06-2	5	5
13. 2-Butanone	78-93-3	10	10
14. 1,1,1-Trichloroethane	71-55-6	5	5
15. Carbon Tetrachloride	56-23-5	5	5
16. Vinyl Acetate	108-05-4	10	10
17. Bromodichloromethane	75-27-4	5	5
18. 1,1,2,2-Tetrachloroethane	79-34-5	5	5
19. 1,2-Dichloropropane	78-87-5	5	5
20. trans-1,3-Dichloropropene	10061-02-6	5	5
21. Trichloroethene	79-01-6	5	5
22. Dibromochloromethane	124-48-1	5	5
23. 1,1,2-Trichloroethane	79-00-5	5	5
24. Benzene	71-43-2	5	5
25. cis-1,3-Dichloropropene	10061-01-5	5	5

(continued)

TABLE 6

TARGET COMPOUND LIST - VOLATILES (CONTINUED)

Volatiles	CAS Number	Detection Limits* Low Water[a] ug/L	Low Soil/Sediment[b] ug/Kg
26. 2-Chloroethyl Vinyl Ether	110-75-8	10	10
27. Bromoform	75-25-2	5	5
28. 2-Hexanone	591-78-6	10	10
29. 4-Methyl-2-pentanone	108-10-1	10	10
30. Tetrachloroethene	127-18-4	5	5
31. Toluene	108-88-3	5	5
32. Chlorobenzene	108-90-7	5	5
33. Ethyl Benzene	100-41-4	5	5
34. Styrene	100-42-5	5	5
35. Total Xylenes		5	5

[a]Medium Water Contract Required Detection Limits (CRDL) for Volatile HSL Compounds are 100 times the individual Low Water CRDL.

[b]Medium Soil/Sediment Contract Required Detection Limits (CRDL) for Volatile HSL Compounds are 100 times the individual Low Soil/Sediment CRDL.

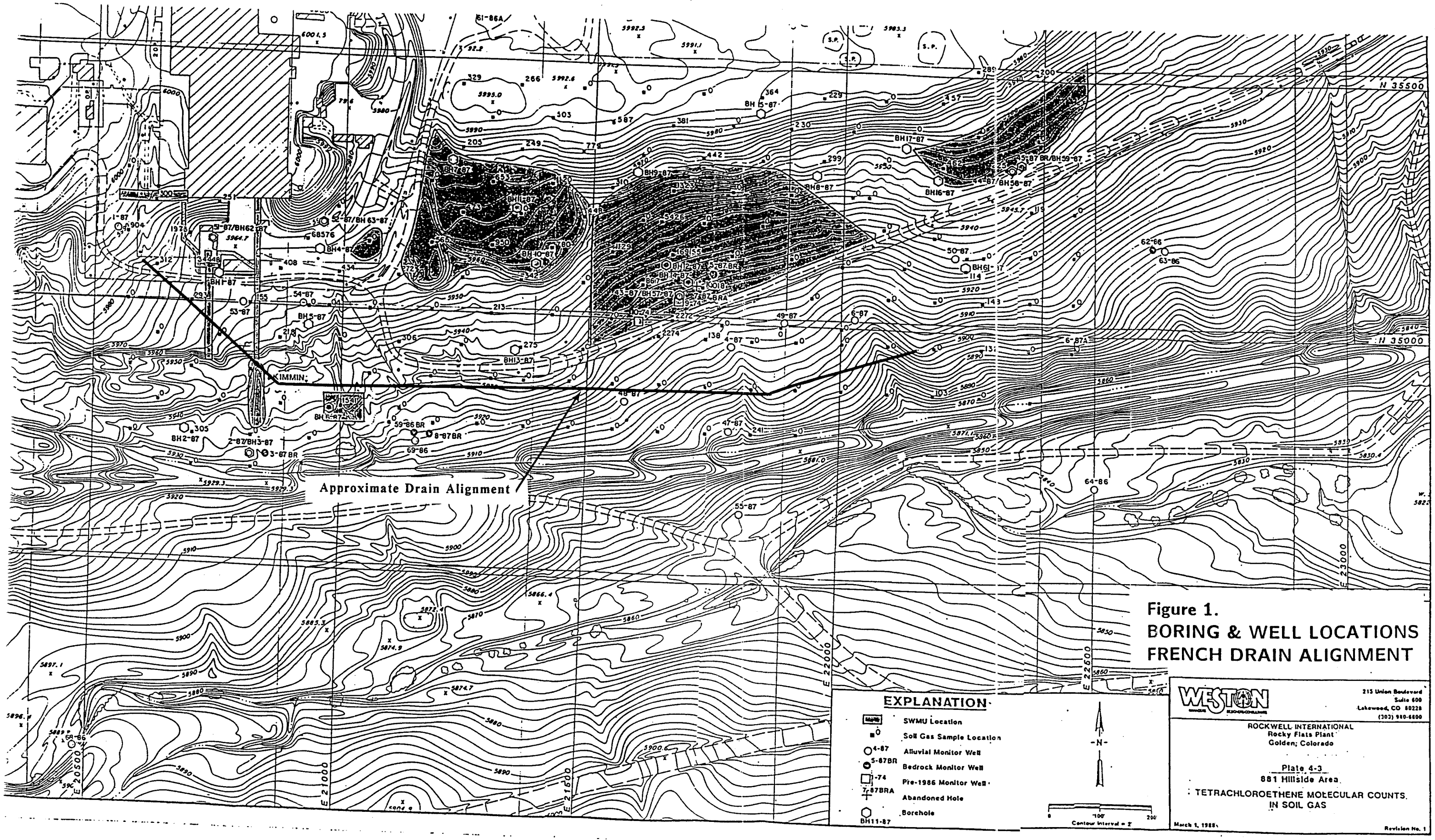

Figure 1.
BORING & WELL LOCATIONS
FRENCH DRAIN ALIGNMENT