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DIXIE VALLEY REGION GEOCHEMISTRY

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PROJECTS HISTORY

(all include Goff and Counce)

Oct 1996:

1. **Sampling & chemical/isotopic analyses of selected production area fluids for scaling investigation (w/ Bruton, Moore & Nimz)**

Oct 97-May 99 (Project increases in size and scope):

2. **Full field collections of production, power plant, and injection fluids; brine & gas, chemistry and isotopes (4 sampling campaigns) (w/ Janik, Kennedy, and others)**
3. **Regional study of recharge fluids; chemistry and isotopes (w/ Nimz and Janik)**
4. **CO_2 flux study of "dead zone" (w/ Bergfeld and Janik)**
5. **Trace metals study of production fluids & scales (w/ Johnson)**
6. **Radiometric dating of travertine and sinter deposits (w/ Janik & Murrell)**
7. **Tritium study (w/ Stomates & Shevenell)**

Sept 2000: Project terminated at beginning of FY2001

May 2002: Project reinstated for 1 man-month, FY2002

Gold and Mercury

Dixie Valley Scales and Fluids

	Au	Hg
Production Area		
Scales	**<50 – 1970 ppb (n=7)**	**<40 – 178 ppb (n=7)**
Brines	**=0.4 ppb (n=16)**	**0.05 – 107 ppb (n=56)**
Cond	**na**	**0.4 – 103 ppb (n=53)**
IW/PPF	**<2 ppb (n=6)**	**0.08 – 0.4 ppb (n=25)**
Oth Geo	**<0.1 – <2 ppb (n=12)**	**0.1 – 159 ppb (n=24)**
Fum	**<10 ppb (n=6)**	**21 – 180 ppb (n=6)**
Background		
Springs	**<2 ppb (n=13)**	**<0.05 – 1.5 ppb (n=37)**
Wells	**<2 ppb (n=3)**	**0.08 – 0.2 ppb (n=7)**
Crk/Lake	**na**	**<0.05 – 0.4 ppb (n=14)**

Gold ¯ Scales

(Au^{+2} + $2HS^{-}$ ® AuS^{-} + H_2S -)

Mercury ® Vapor;¯ Scales

Preliminary Dates, Dixie Spring Deposits

Sample	$^{230}Th/^{234}U$	$^{231}Pa/^{235}U$
Travertine, Cottonwood Can	180±4 ka	161±15 ka
Sinter, Lower Ranch	54±4 ka	39±2 ka

Picket and Murrell (1997) EPSL, 148, 259-271

Edwards et al. (1997) Science, 276, 782-786

23 additional samples prepared for dating

Conclusions, Dixie CO_2 Flux Study

1. Preproduction mass discharge of Dixie outflow ˜ 5 kg/s (Allis et al., 1999)

2. Production of Dixie reservoir causes drawdown, ground cracking and induces boiling in Stillwater fumaroles and outflow

3. Induced boiling causes "dead zone"

4. CO_2 flux in dead zone reaches max of 7.5 t/d, 4/98; this requires 15 kg/s steam (˜ 80 kg/s boiled brine) or 16 x greater than preproduction mass discharge

5. By 1999 CO_2 flux wanes as outflow is boiled "dry"

6. Preproduction CO_2 flux is ˜ 1 t/d, 15% of 4/98 max

PUBLICATIONS

Reports:

1. Bruton et al., 1997. GRC Transactions
2. Goff et al., 1998. DOE Program Review
3. Bergfeld et al., 1998. GRC Transactions
4. Nimz et al., 1999. GRC Transactions
5. Goff et al., 2002. LAMS Data Rept

Book Chapter:

Goff and Janik, 2000, Geothermal Systems, *in Encyclopedia of Volcanology*. Academic Press

Journal Paper:

Bergfeld, Goff, Janik, 2001, Chemical Geology

Theses:

1. Bergfeld, 2001, Ph.D. thesis, Univ. New Mexico
2. Stamates, 2001, M.S. thesis, Univ. Nevada, Reno

Unfortunate Casualties:

Journal paper on Dixie geothermal system
Journal paper on Dixie recharge
Journal paper on Au/Hg/traces, Dixie geo system
Journal paper on radiometric ages, Dixie deposits