HYDRASleeve

A No-Purge Groundwater Sampler for All Constituents

and Evaluation of its Use on DWR Projects

By Chris Bonds
DWR-Central District

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Stove Pipe Wells, Death Valley
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US Patents 6,481,300 and 6,837,120

HydraSleeve - Background

- Developed in 1999 by Geologist Kent Cordry
- Kent also developed the first direct-push groundwater samplers, the HydroPunch I and II in mid to late 1980's
- Kent is the president of GeoInsight, a company which performs its own R/D and sells direct-push equipment and environmental products in Las Cruces, New Mexico
- GeoInsight has six patents and several pending all related to direct push technology and the HydraSleeve
- I first learned about the HydraSleeve in March 2007 and immediately saw its potential applications and benefits to DWR

HydraSleeve Components

1. Expendable sample sleeve with top loading check valve
2. Reusable weight
3. Suspension tether

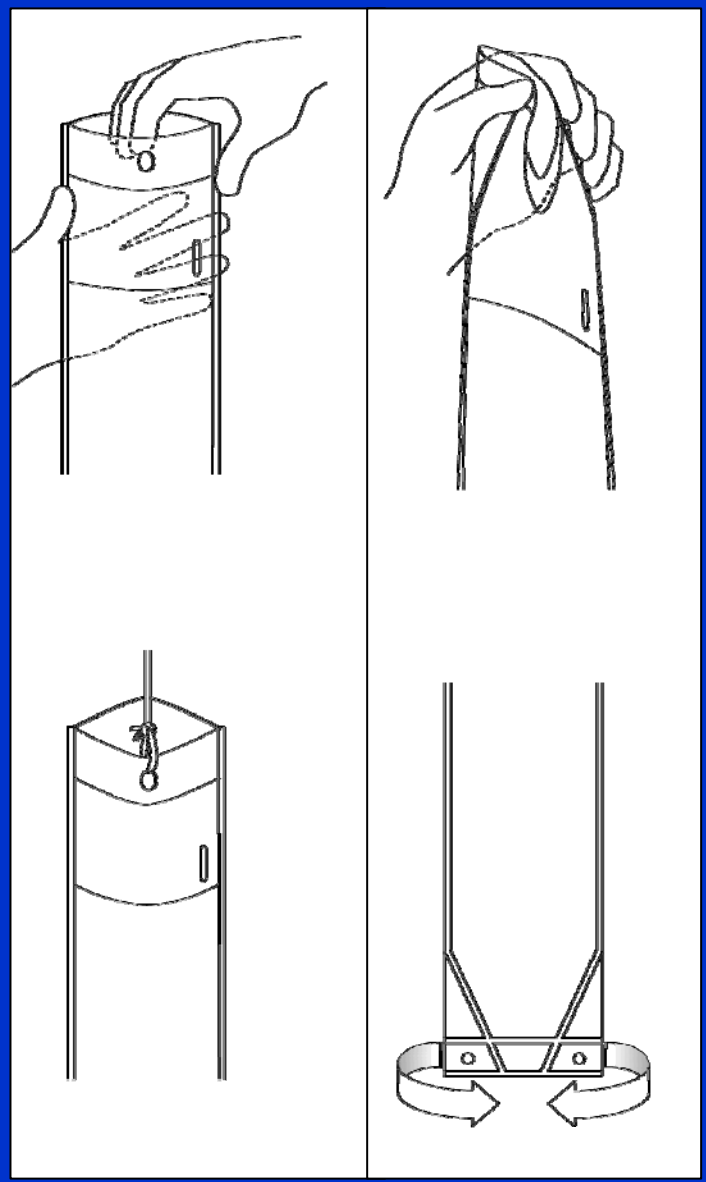
How Does It Work?

- HydraSleeve collects a water core sample from a defined interval within the well screen, then seals itself for recovery

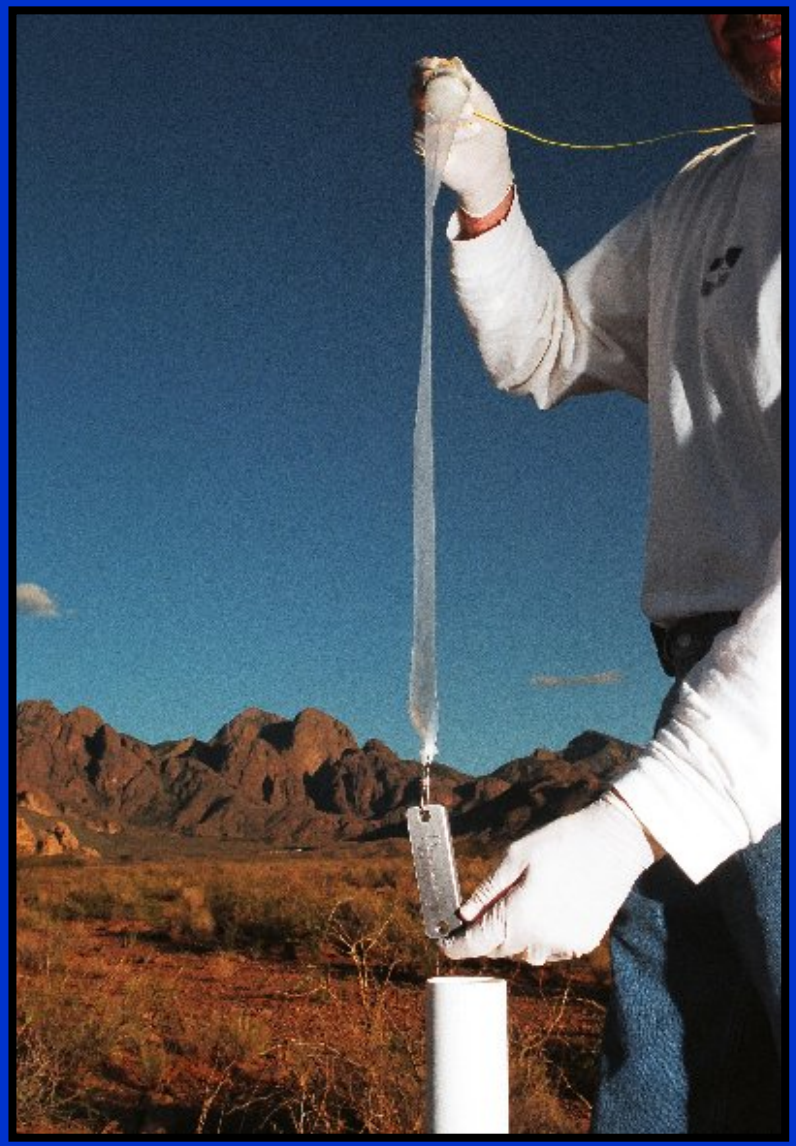
- *In empty and sealed*

- *Out full and sealed*

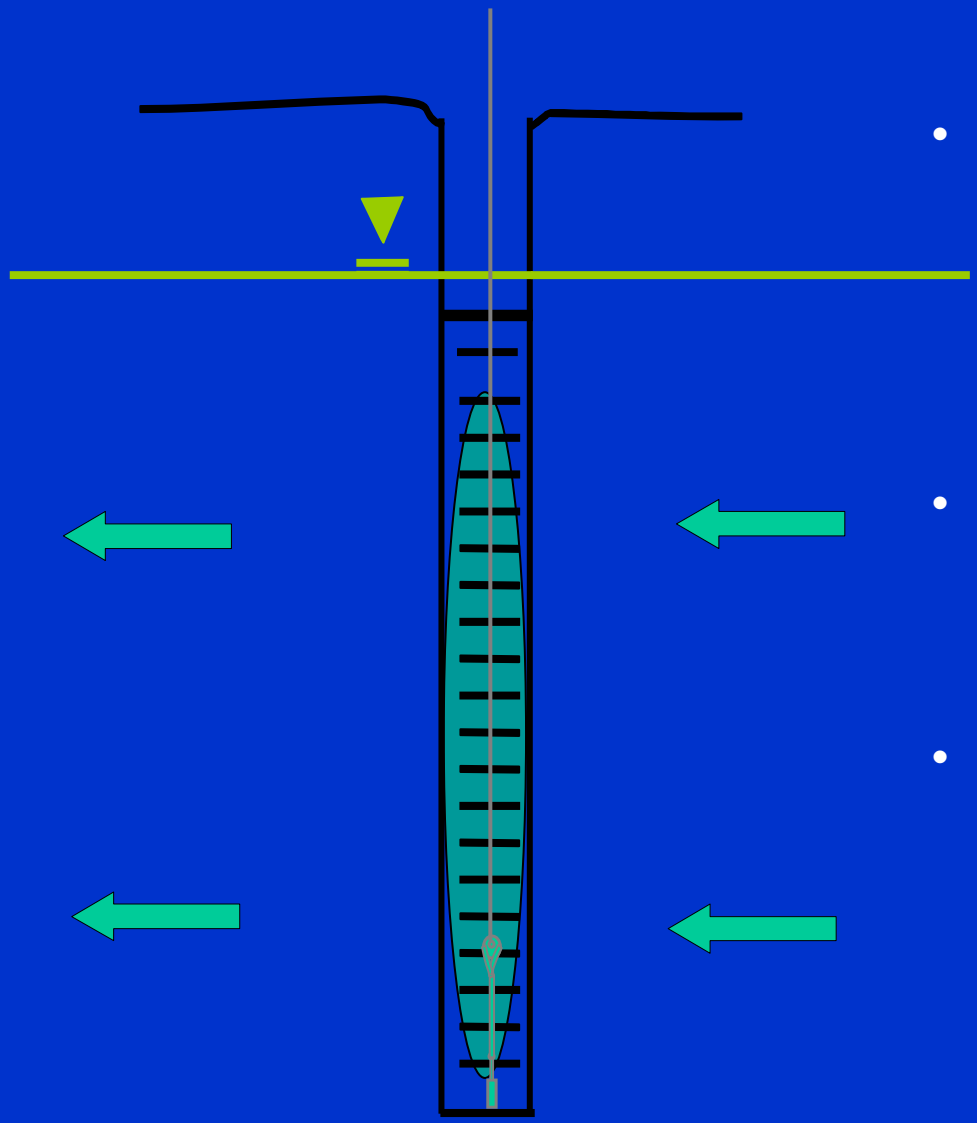
HydraSleeve Assembly



HydraSleeve Placement

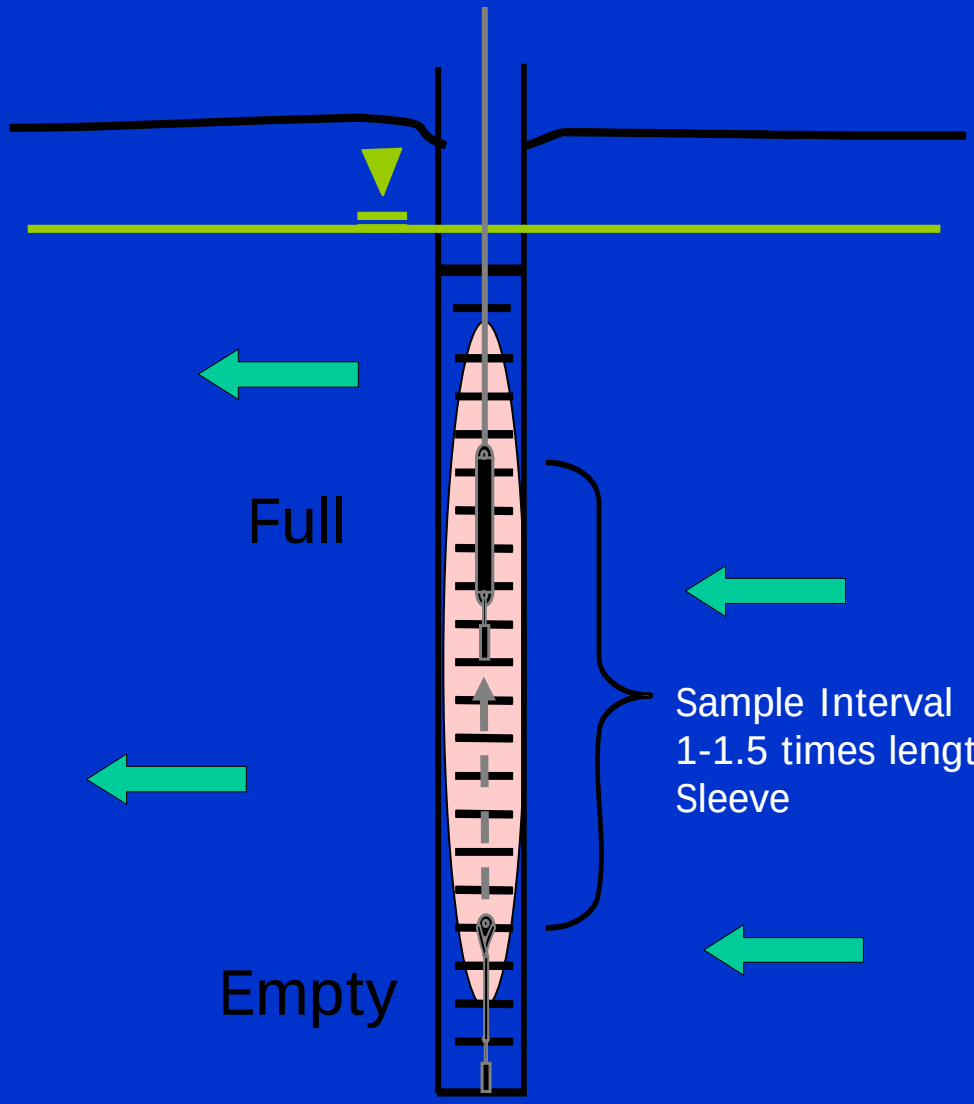


Well Equilibration



- All groundwater samplers or sampling methodologies attempt to collect a sample that is representative of formation-quality water adjacent to the well
- Studies have shown that most wells receive groundwater flow through the screened interval of the well
- This screened interval, considered in equilibrium with the adjacent formation water, can be sampled with passive samplers with little or no well-water agitation

HydraSleeve Sample Collection (continuous pull)

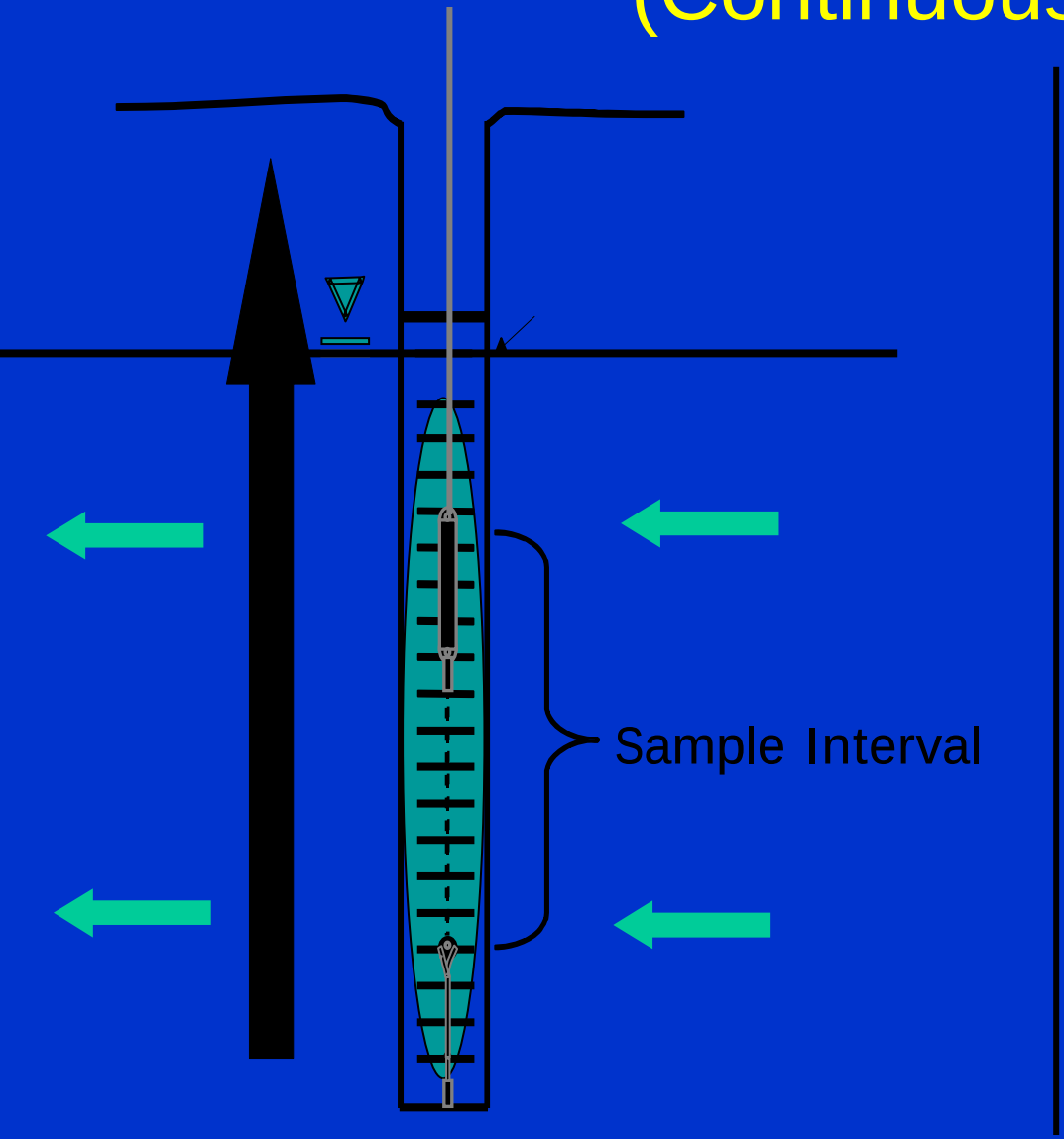


Deploy

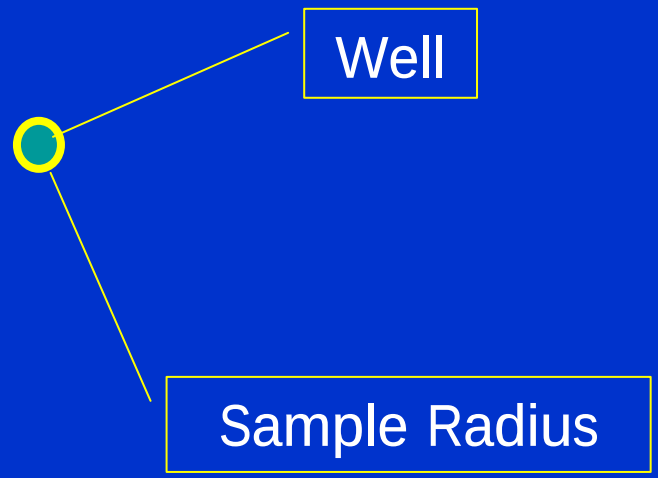
Collect

Recover

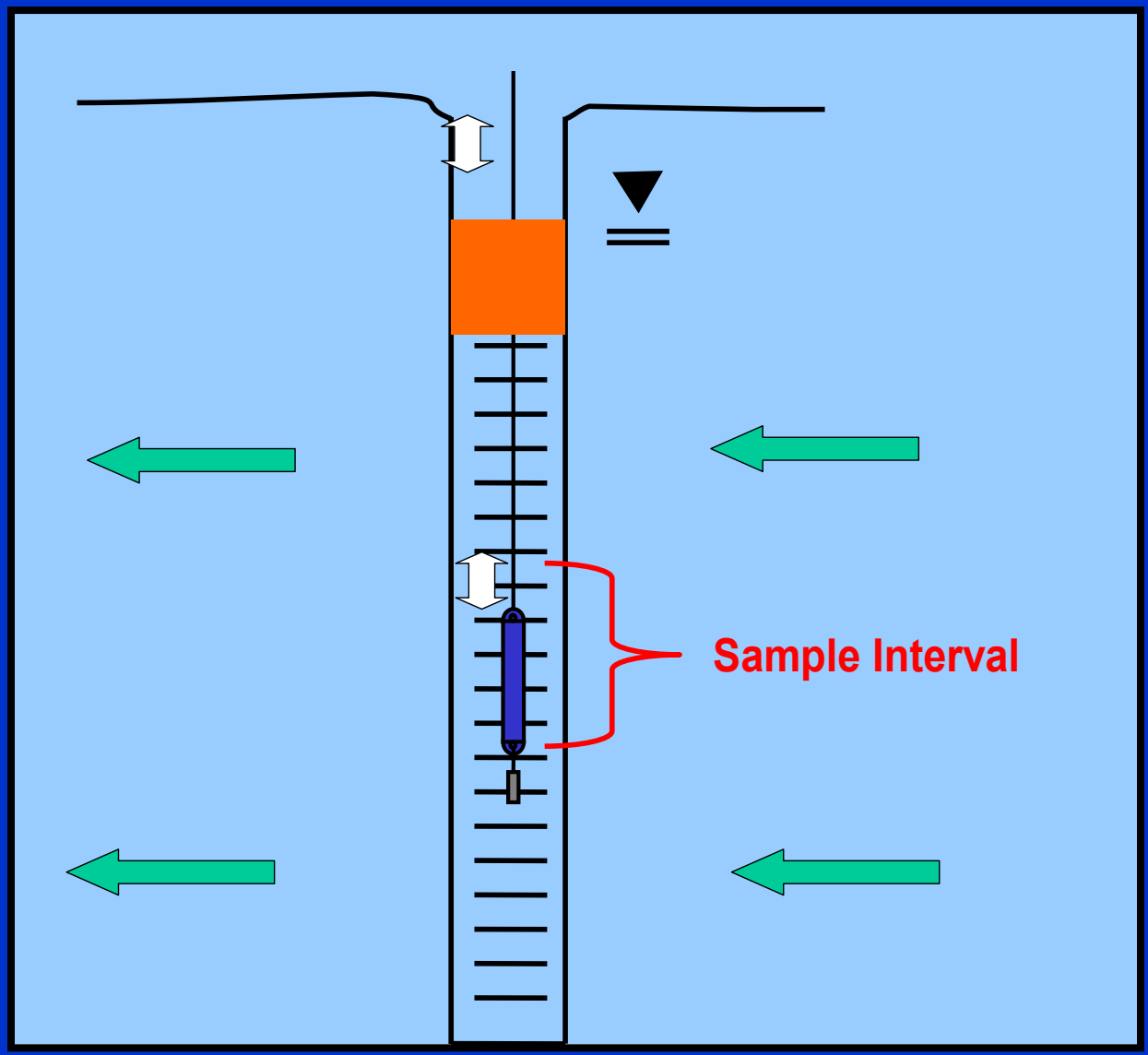
HydraSleeve Sample Collection (Continuous Pull)



Top View

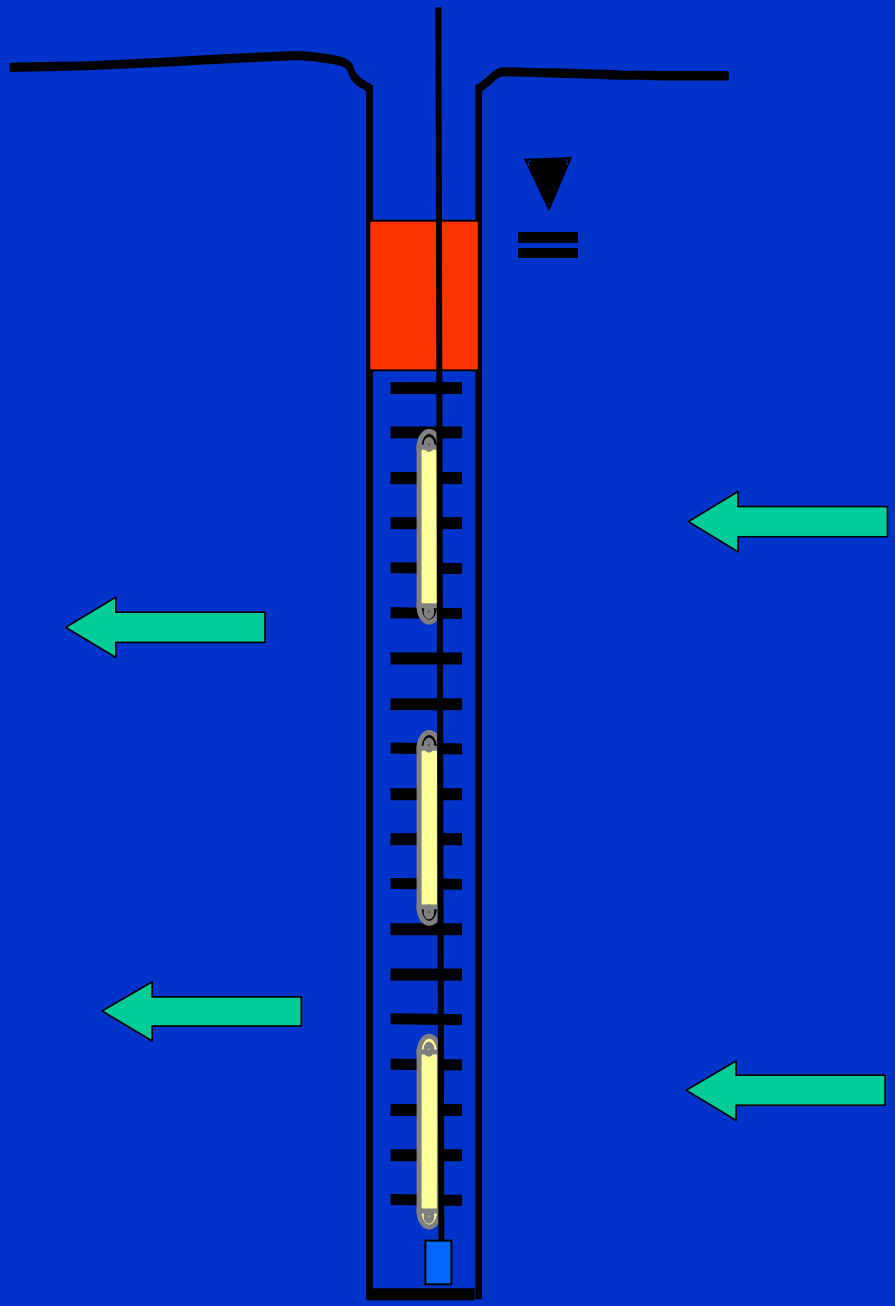


Up-Down Cycle



Recovered HydraSleeve

Sample Discharge



Vertical Profiling-Multiple Samplers

Why use the HydraSleeve?

- Collect a Formation Quality Sample for All Constituents

- Save Time and Money, typically 50-80%

Case Study-New England

- Landfill-Superfund Site
- 30 wells from ~30-200 feet deep
- Annual sampling event
- Original method -EPA Low Flow
- Replacement method -HydraSleeve

Case Study-New England

- Low Flow Sampling - Required 2 weeks with 4 people
- HydraSleeve - Required 4 days with 2 people

HydraSleeve Advantages

- No purge water
- Formation quality sample
- Simple and inexpensive to use

HydraSleeve Limitations

- *Limited sample volume.* One shot sample method

- Samples a defined vertical interval within the well

ITRC Minimum Volume Requirements

Standard

Minimum

Hydrochloric acid	Volatiles	8260	See attached list	140	20	1	If separate 40-mL vials are used for each 20 mL aliquot, inert material is need to occupy the remaining 20 mL. Approved inert material should be used. Alternatively, 20-mL vials can be used.
Unpreserved (SVOCs)	BNAs	8270	See attached list	1000	250	1	Can use 100 mL, but RLs will be higher than AFCEE 3.1 QAPP
	Pesticides	8081	See attached list	1000	100	1	
	PCBs (1016,1221, 1232, 1242, 1248. 1254, & 1260)	8082	0.5 µg/L	1000	100	1	100 mL extracted by separatory funnel (3510) and concentrated to 1.0 mL, 2 µL injection dual column GC/ECD analysis.
	Herbicides	8151	See attached list	1000	100	1	

1 The sample volume in this column assumes that the analytical technique referenced will be employed with little or no modification, that the reporting limit will remain at the standard reporting limit, and that the cost of analysis would be essentially the same as the cost of the method performed using the SW-846 recommended preparation volume. If a modification is necessary to achieve the smaller sample volume, then the modification is of no or minor consequence to the performance of the method and would be "easily accepted" by almost all state and federal regulators that review environmental methods. Sample volumes even lower than those indicated in this column can be achieved through the use of other analytical techniques. However, regulatory approval might be necessary for non-standard technologies and methods and analysis pricing may be higher.

** Are not SW 846 methods and/or not in AFCEE QAPP 3.1, but are commonly requested groundwater tests for long-term monitoring projects.*

*** Stipulated in AFCEE QAPP 3.0 to be run by EPA Method 300.0.*

Other Uses

- *Low-yield wells*
- *Wells with brackish or saline water*
- Vertically define contaminant concentrations in wells
- Sample crooked or damaged wells
- Collect samples from discrete intervals in surface water bodies and tanks

USACOE Demonstration Test

- Sampling completed in Summer of 2004
- Compared 6 no-purge samplers to low-flow and volume purge in the same wells
- Final report issued October 2005

FINAL

Results Report for the Demonstration of
No-Purge Groundwater Sampling Devices
at Former McClellan Air Force Base, California

Prepared For

U.S. Army Corps of Engineers
Omaha District

and

Air Force Center for Environmental Excellence

and

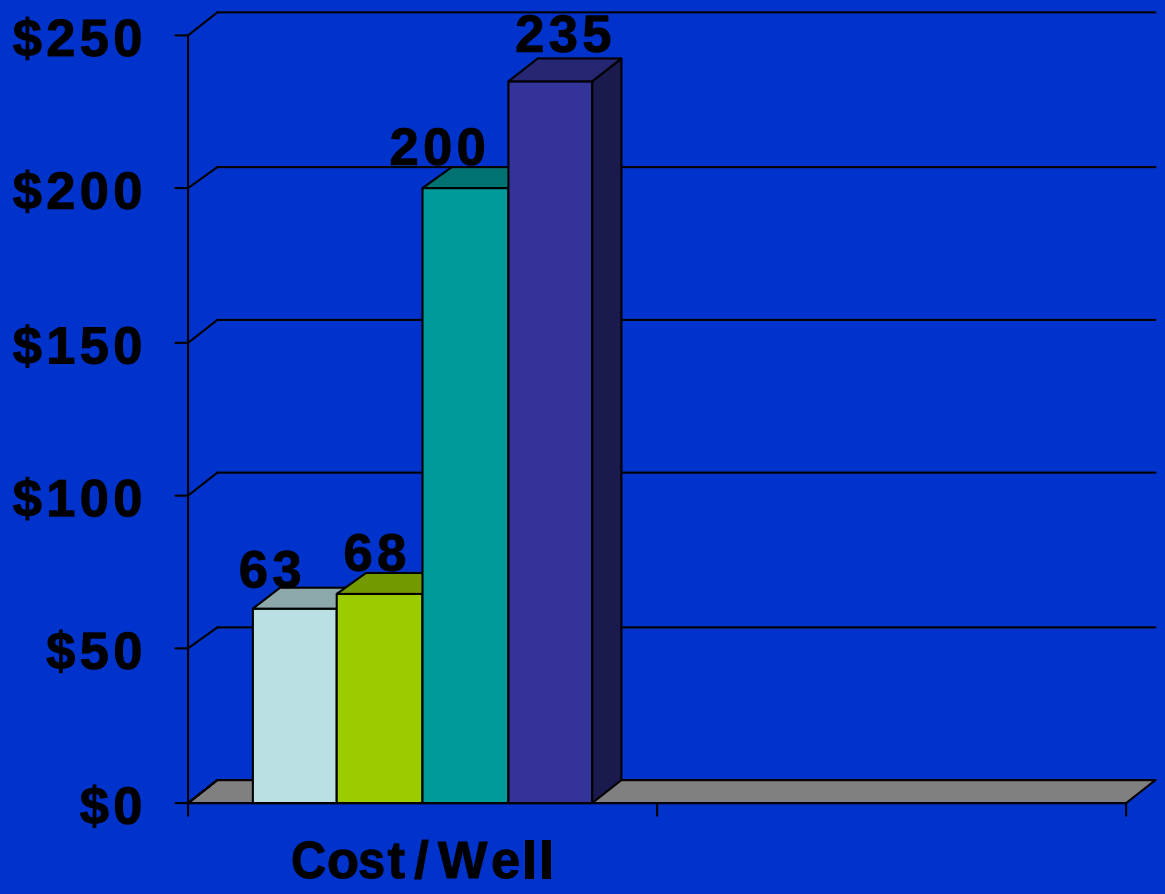
Air Force Real Property Agency

U.S. AIR FORCE

Contract F44650-99-D-0005
Delivery Order DK01

October 2005

Sampling Cost Analysis



- HydraSleeve
- Passive Diffusion
- Low Flow
- 3-Volume Purge

Cost does not include disposal of purge water

Based on 2-person team

USACOE Demonstration Test Conclusions

- From a performance perspective, the report concluded that the HydraSleeve typically produced results most similar to the more conservative (i.e., higher-concentration) results obtained from the conventional and low-flow sampling methods
- HydraSleeve was the least expensive sampler tested and simplest to deploy and retrieve, and it permits a larger volume of water to be collected than do some of the other passive samplers
- HydraSleeve delivered viable samples for all of the analytes tested
- The report concluded that the HydraSleeve appears to be a technically viable method for monitoring all of the compounds included in the demonstration

Evaluation of the Use of the HydraSleeve on DWR Projects

Field Evaluation of HydraSleeve

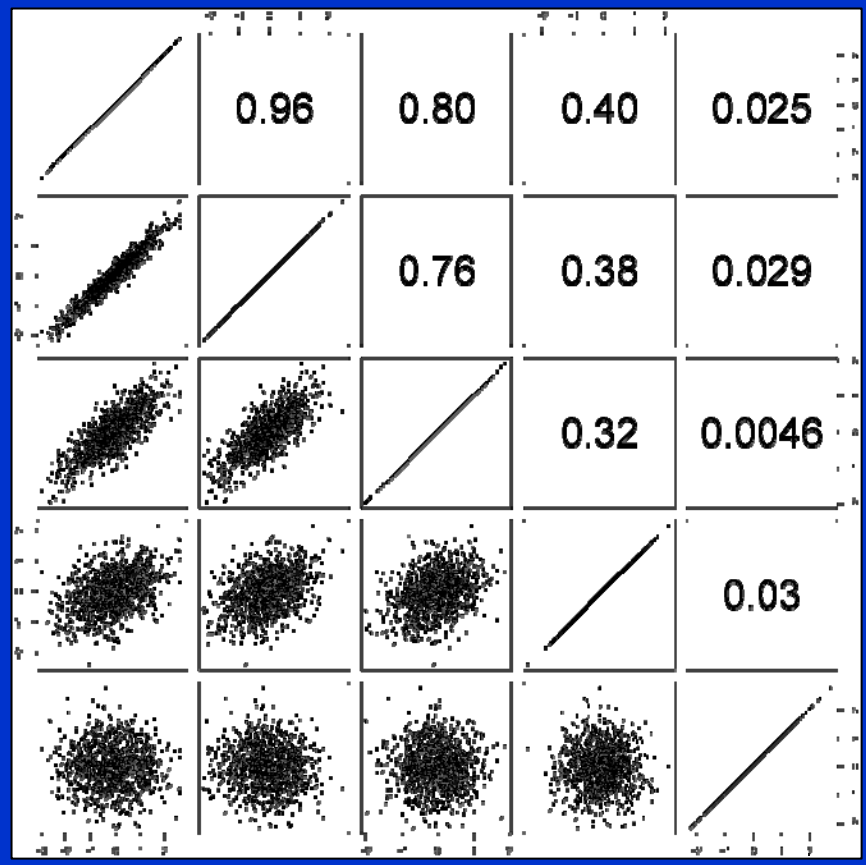
- Eleven wells at four DWR multi-level well sites in the Sacramento Valley were sampled between June and October 2007
- Well depths ranged from 47 to 554 feet bgs
- Samples were analyzed at Bryte Lab for Major Ions, Minor Ions, Trace Ions, and Physical Parameters and Zymax Forensics for Stable Isotopes of O and H

Field Evaluation of HydraSleeve

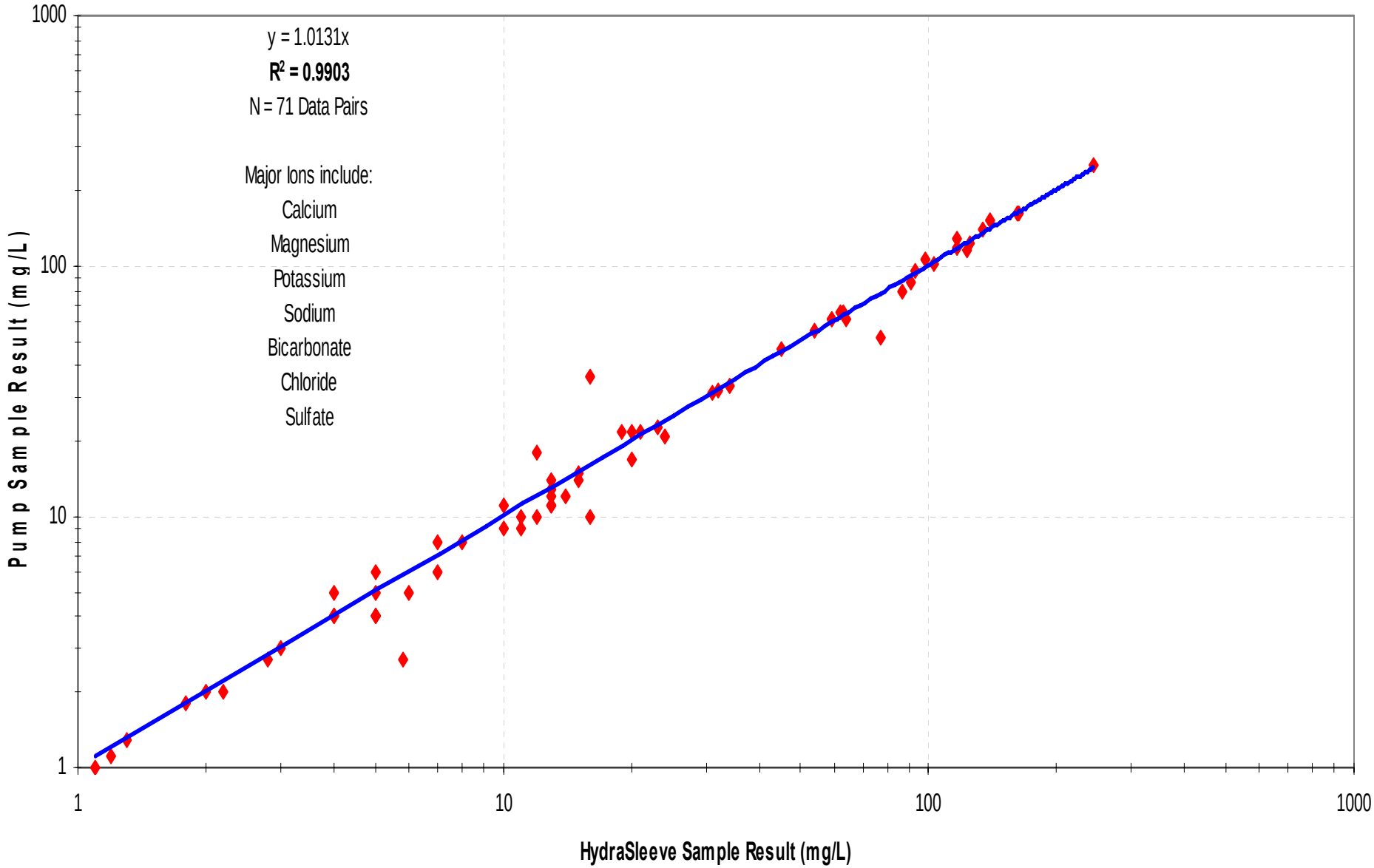
- HS results were compared to results of samples collected through 3-5 casing volume purge methods using a submersible pump (Industry Standard)
- One well was sampled twice (one month apart) using the HS to evaluate data reproducibility and sampler precision
- Ion data pairs were graphed using X-Y scatterplots and correlation was evaluated using linear regression

HydraSleeve Data Evaluation

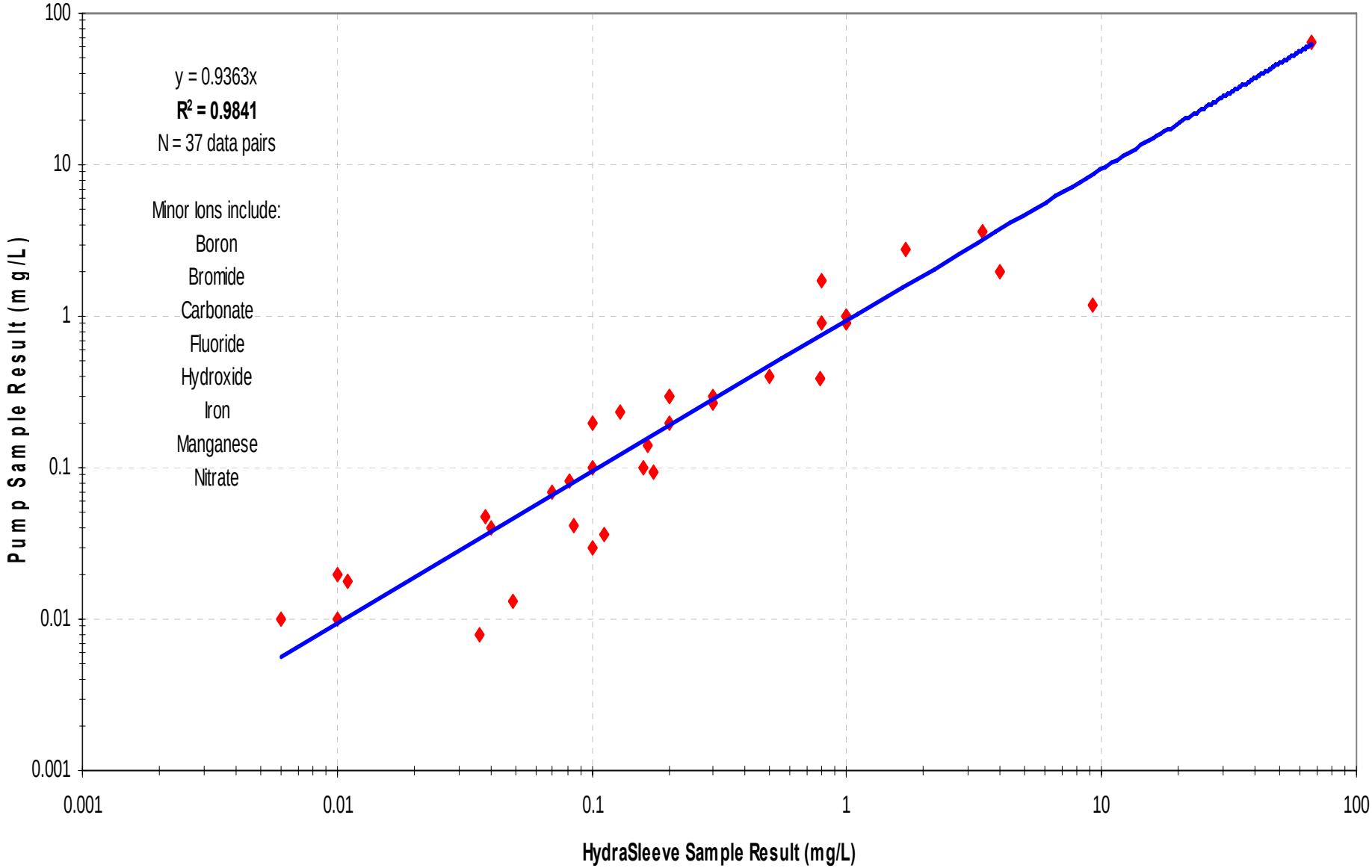
- The Coefficient of Determination commonly referred to as R^2 is a statistic that will give some information about the goodness of fit of a model to a dataset
- In regression, the R^2 value is a statistical measure of how well the regression line approximates the real data points
- An R^2 of 1.0 indicates that the regression line perfectly fits the data



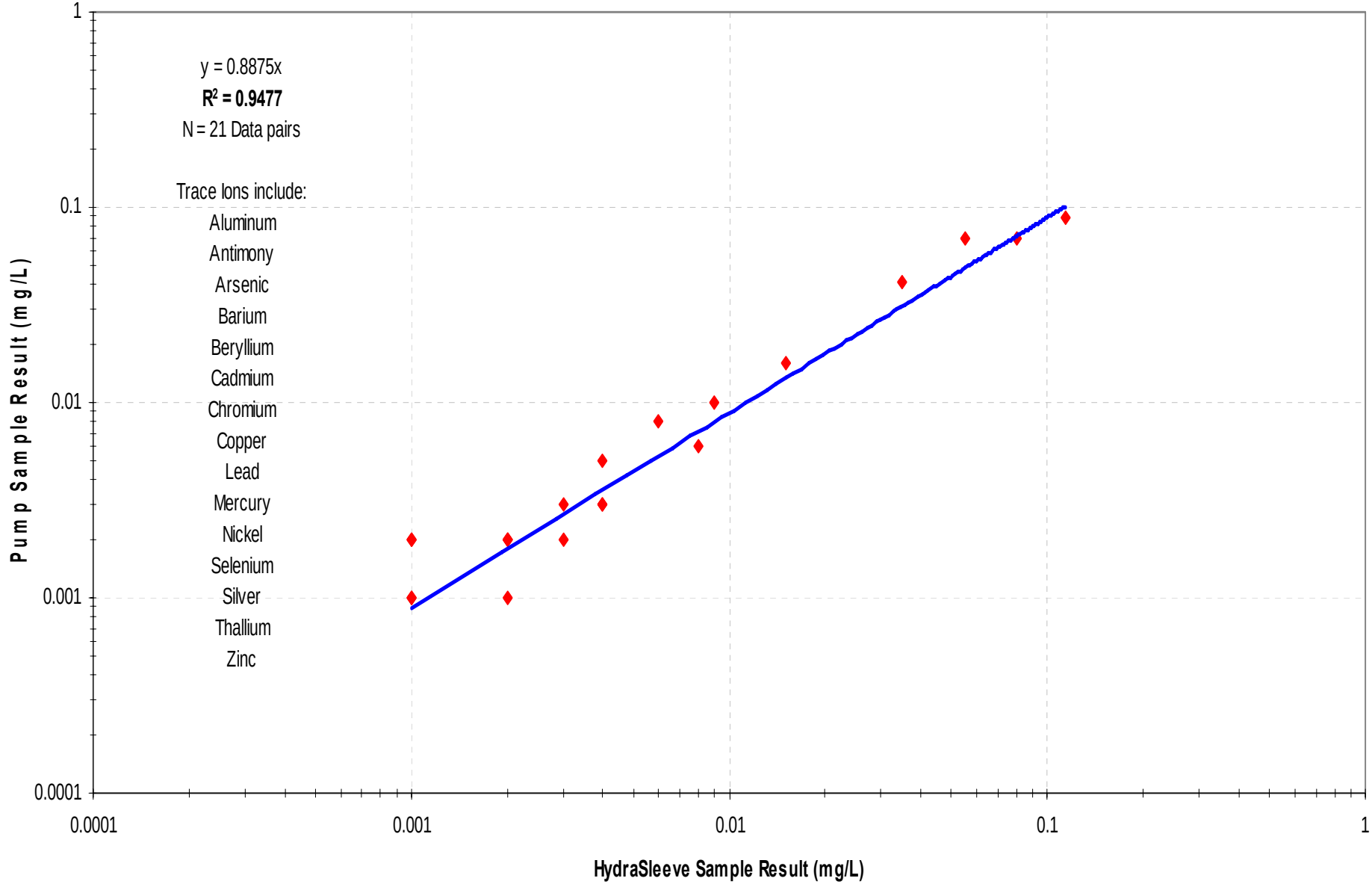
Major Ion Data Scatterplot



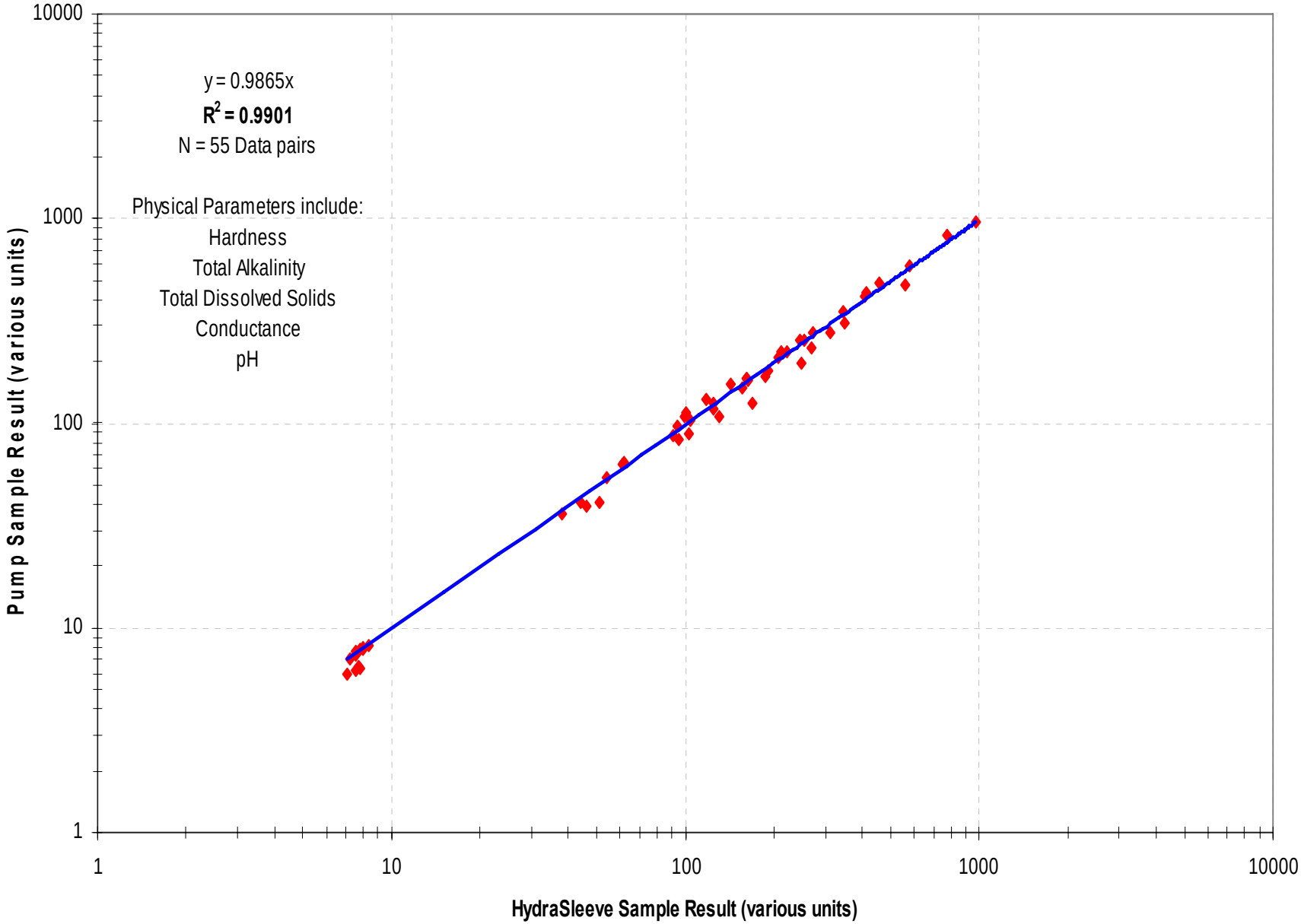
Minor Ion Data Scatterplot



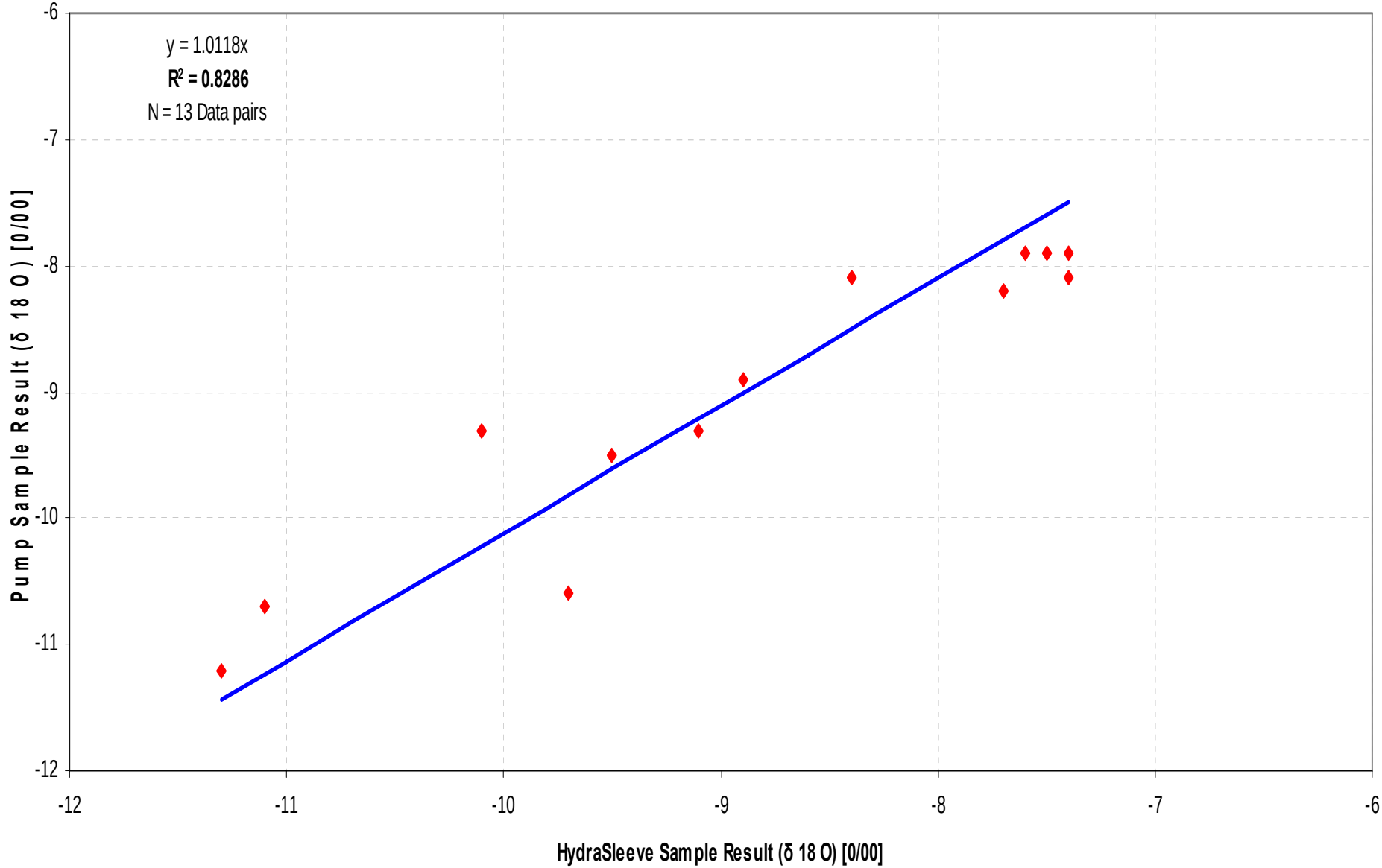
Trace Ion Data Scatterplot



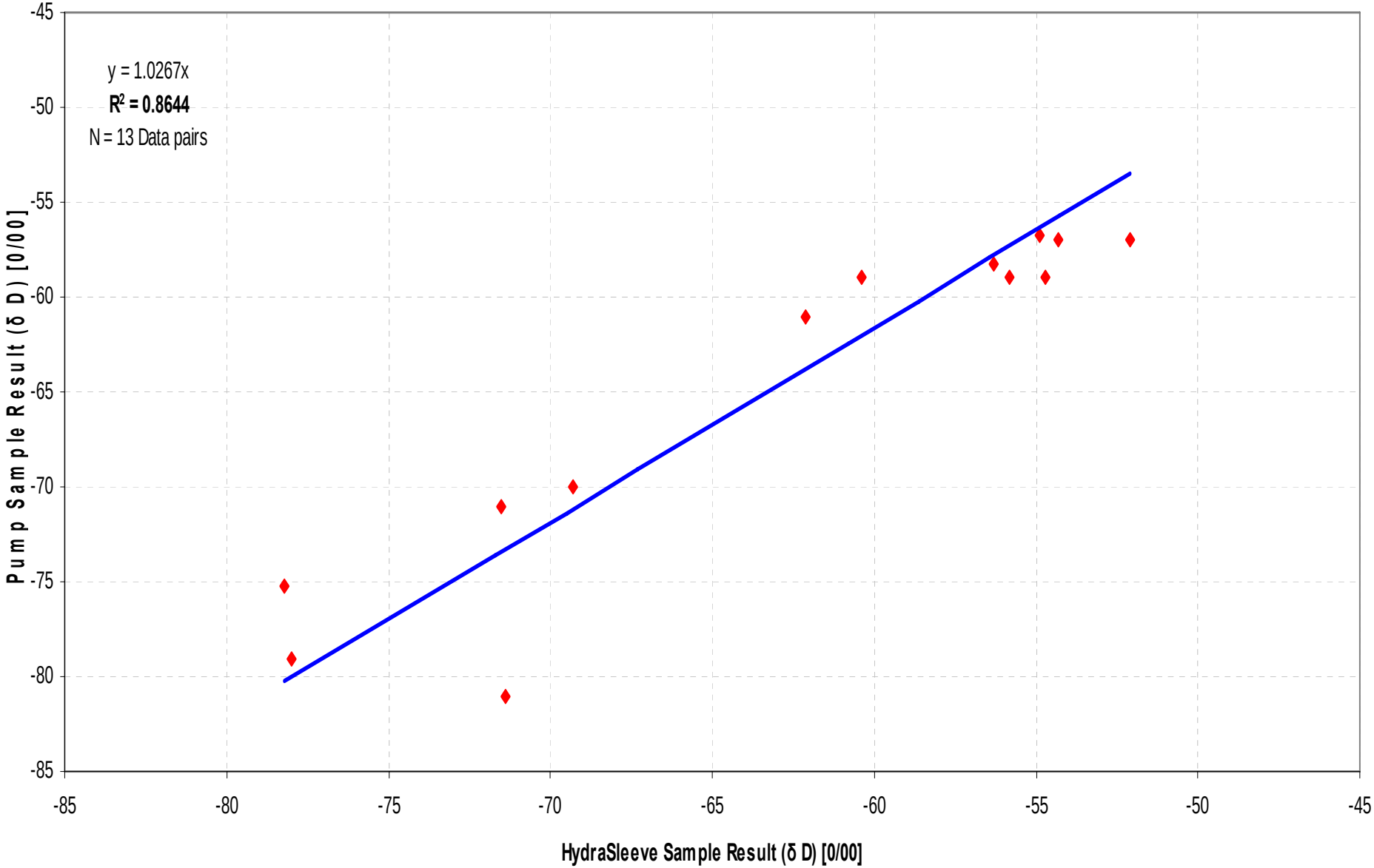
Physical Parameter Data Scatterplot



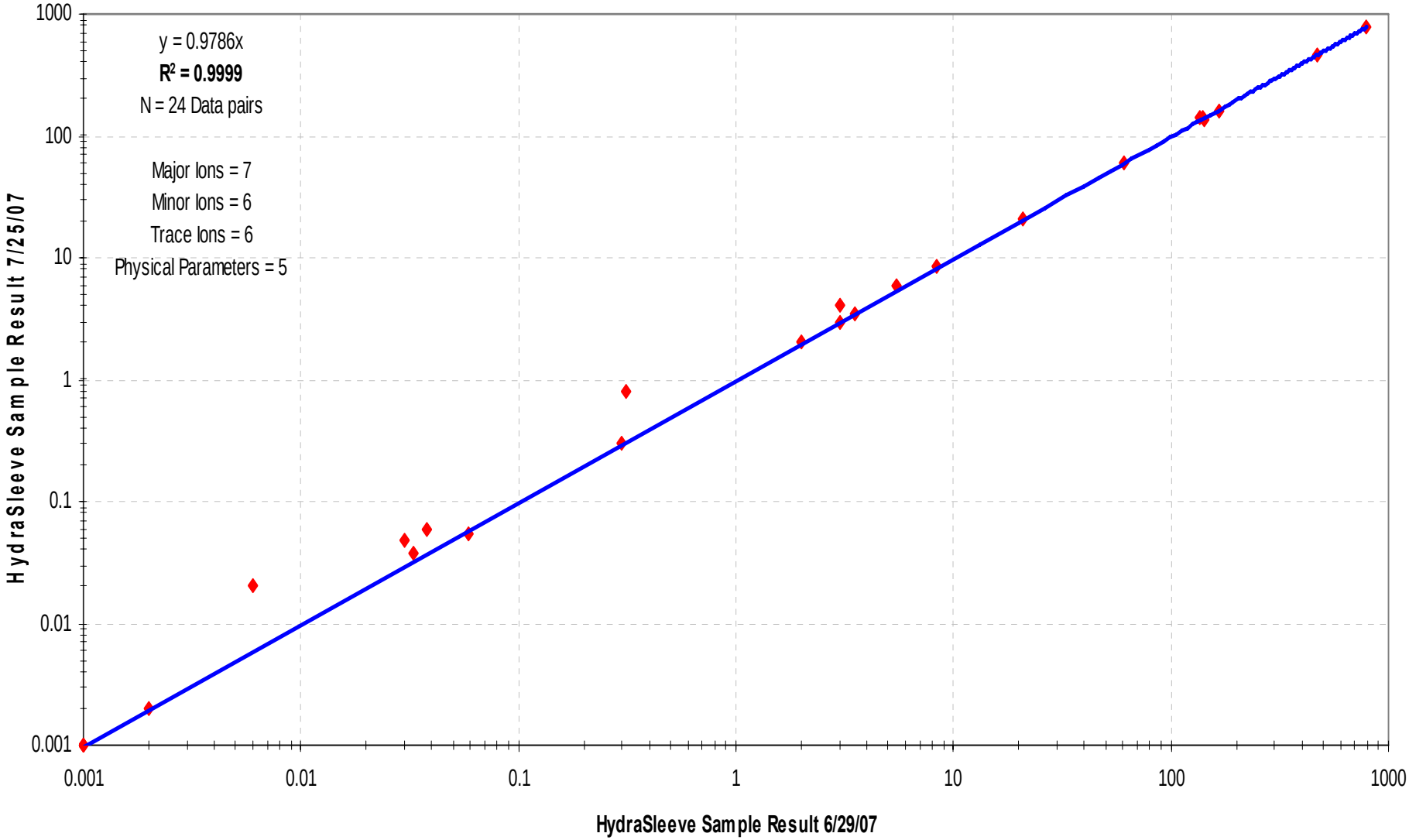
Oxygen 18 Data Scatterplot



Deuterium Data Scatterplot



HydraSleeve Sample Data Reproducibility (Well HC-1)



DWR Conclusions

- The HydraSleeve produced sample results that correlated well to industry standard 3-5 volume pump sample results indicating high accuracy
- The HydraSleeve had excellent data reproducibility indicating high precision
- The results of our evaluation are consistent with those obtained by USACOE in a trial of passive sampling devices at the former McClellan AFB

DWR Conclusions

- The HydraSleeve requires minimal equipment and personnel
- The HydraSleeve is inexpensive and disposable
- The HydraSleeve is very quick and easy to use and generates no purge water

DWR Conclusions

- The use of the HydraSleeve following a standard procedure should produce highly accurate and reproducible data at both clean and contaminated water sites
- Use of the HydraSleeve will save DWR time and money
- The HydraSleeve should be seriously considered for use by DWR and our contractors on all future groundwater sampling projects where appropriate

Acknowledgements

- Kent Cordry of GeoInsight

  Guidance during the course of our field evaluation

  Use of numerous Powerpoint slides

- Bill Brewster for assistance with sampling, lab coordination, and data processing

Online HydraSleeve References

- http://www.geoinsightonline.com
- http://www.hydrasleeve.com
- http://www.itrcweb.org

Questions???