

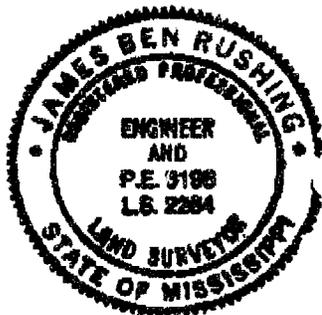
# Hildale Water District, Inc.

## Business Case

for

A New 700 GPM Well to Sparta Aquifer and Modification of  
South Treatment Plant to Blend Existing Water from  
Forest Hill Aquifer with New Sparta Aquifer Water.

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March, 2010



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### ***Hilldale Water District, Inc.***

#### **Business Case**

for

#### **A New 700 GPM Well to Sparta Aquifer and Modification of South Treatment Plant to Blend Existing Water from Forest Hill Aquifer with New Sparta Aquifer Water.**

#### **SUMMARY**

- An innovated approach of blending water from two (2) aquifers is proposed by Hilldale Water District, Inc. (HWD), to conserve water resources, reduce system costs, and reduce disinfection by products (DBP) concentrations.
- DWSIRLF Loan Amount = \$ 588,488.50  
COE 592 Grant Amount = \$1,765,465.50  
  
Total Cost = \$2,353,954.00  
  
Loan Cost = \$ 35,560.00 per year
- Water Savings (Green) Portion of Loan = 100%
- Annual Water Savings = 9.6 mg/year by eliminating EDR Backwash
- Annual Energy Savings = \$18,800.00
- Reduce rate of depletion of Forest Hill Aquifer

#### **BACKGROUND**

The only source of water that HWD currently uses is ground water from the Forest Hill Aquifer. This water has iron that is removed by Aeration, Chlorination and Filtration. After the iron is removed, the water is treated with the Electro Dialysis Reversal (EDR) process to removed dissolved solids. Prior to the installation of the EDR, HWD customers had to frequently replace water heaters and complained about particles in the ice from their ice makers. The problem was due to the low pH. The dissolved solids would participate out when the temperature of the water was changed by either heating or cooling.

A recent study of the Forest Hill Aquifer shows that a drawn down of 165 feet has occurred in the HWD well field, eight wells over the past forty-six (46) years. See attached aquifer study charge Exhibit I. Most of the pumps have been lowered to the top of the well screen or even into the well screen to prevent a suction break.

## **BACKGROUND (continued)**

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The HWD Board of Directors (BOD) determined that the situation has become critical and that a new source of water is required. The aquifer that was selected to provide the new water source is the Sparta. An adjacent water association, Fisher Ferry Water District, Inc. (FFWD) has two (2) Sparta Wells and treats the water for color, temperature and Disinfection by Products (DBP)

## **GROUNDWATER BLEND STUDIES**

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HWD with the cooperation of the FFWD has conducted groundwater blend studies using the HWD's Forest Hill Aquifer Water and FFWD's Sparta Aquifer Water which has been treated by aeration and ozone and disinfected with chlorine

The two (2) blends that were tested are:

1. 25% Forest Hill Aquifer Water and 75% Sparta Aquifer Water
2. 50% Forest Hill Aquifer Water and 50% Sparta Aquifer Water

A complete summary of the chemical analysis of the blends are shown in Exhibit II. Next a test was made using Forest Hill Aquifer Water and Fisher Ferry Treated Water to check for THMMS. The results are shown in Exhibit III.

Highlights of the selected 25% Forest Hill and 75% Sparta are as follows:

1. Temperature after blend and aeration will be approximately 80° F.
2. Color in Sparta Water is reduced from 200 to 150 color units.
3. Iron from Forest Hill Water is reduced to 0.16 ppm.
4. pH in blend is 8.42.
5. Dissolved solids remain at 500 ppm level.
6. DBP are below EPA limit of 80 ppb.
7. Fluoride naturally occurring will be 0.66 ppm.
8. Hardness will be 13.50 ppm

## **PROPOSED TREATMENT PROCESS**

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- Ground water from the Sparta and Forest Hill Wells will be mixed by pumping both sources of water into the same pipe for delivery to the treatment plant. The blend of 25% Forest Hill and 75% Sparta will be controlled by using variable speed motors on the well pumps. This early blending will help cool the water temperature by 10° F

This blended water will be pumped from the wells directly into an elevated aerator / cooling tower to release gases such as CO<sub>2</sub> and H<sub>2</sub>S and to reduce the temperature to about 80° F. The temperature reduction is needed to make the ozone treatment more efficient and cost effective.

The cooled and aerated water will flow by gravity from the elevated aeration / cooling tower through the ozone contact tank and the pressure filters into the existing 50,000 gallon concrete storage tank. The ozone generating equipment will be housed in the existing building that currently houses the EDR Units. Disinfection with chlorine will be immediately prior to the 50,000 gallon concrete storage tank.

## **PROPOSED TREATMENT PROCESS (continued)**

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After required detention time in the concrete storage tank, the water will be pumped into the system. Other than backwash from the pressure filters, there will not be any wastewater.

## **COST OF PROJECT**

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The HWD has applied to the Corps of Engineers for a 75% grant under their 592 program. The grant requested is \$1,765,465.00. The 25% matching funds have been requested through the DWSIRLF Program at a rate of 1.95%.

DWSIRLF Loan Amount = \$ 588,488.50

COE 592 Grant Amount = \$1,765,465.50

Total Cost = \$2,353,954.00

Loan Cost = \$ 35,560.00 per year

## **BENEFITS**

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- Reduce the rate of depletion of the Forest Hill Aquifer.
- Eliminate the wastewater discharge from the EDR of 9.6 mg per year into lakes.
- Reduce by 1/3 the cost of pumping the water during treatment.
- The blended water solves treatment problems unique in both aquifers.
- Eliminates the need for commercial fluoride.
- Insures a long time water supply for HWD.
- Adds hardness to very soft water from the Sparta Aquifer
- Proposed as a 100% "Green" project

## **CONCLUSIONS**

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- The reduced amount of water pumped from the Forest Hill Aquifer will prolong the life of this aquifer. The Forest Hill Aquifer water pumped will provide advantages in the treatment of the blended Sparta Aquifer Water.
- The 25% Forest Hill Aquifer and 75% Sparta Aquifer blend of the waters was chosen over using only Sparta Aquifer water because of the unique blend results i.e. (a) higher pH, (b) cooler water temperature, (c) level of natural occurring fluoride, (d) DBP that meets EPA minimum requirements (e) color reduction and (f) level of hardness.
- The blended water will not require EDR treatment and will eliminate the waste water stream of 9.6 MG per year and the associated cost pumping pre-treatment and disposal of \$13,800.00 per year
- The blended water treatment process will reduce the number of times the water is pumped during treatment from 3 times to 2 times. The estimated cost savings of electrical use will be reduced from \$115,000.00/year to \$110,000.00/year producing a \$5,000.00/year savings at the South Plant Treatment Facility for a total cost savings of \$18,800.00/year.

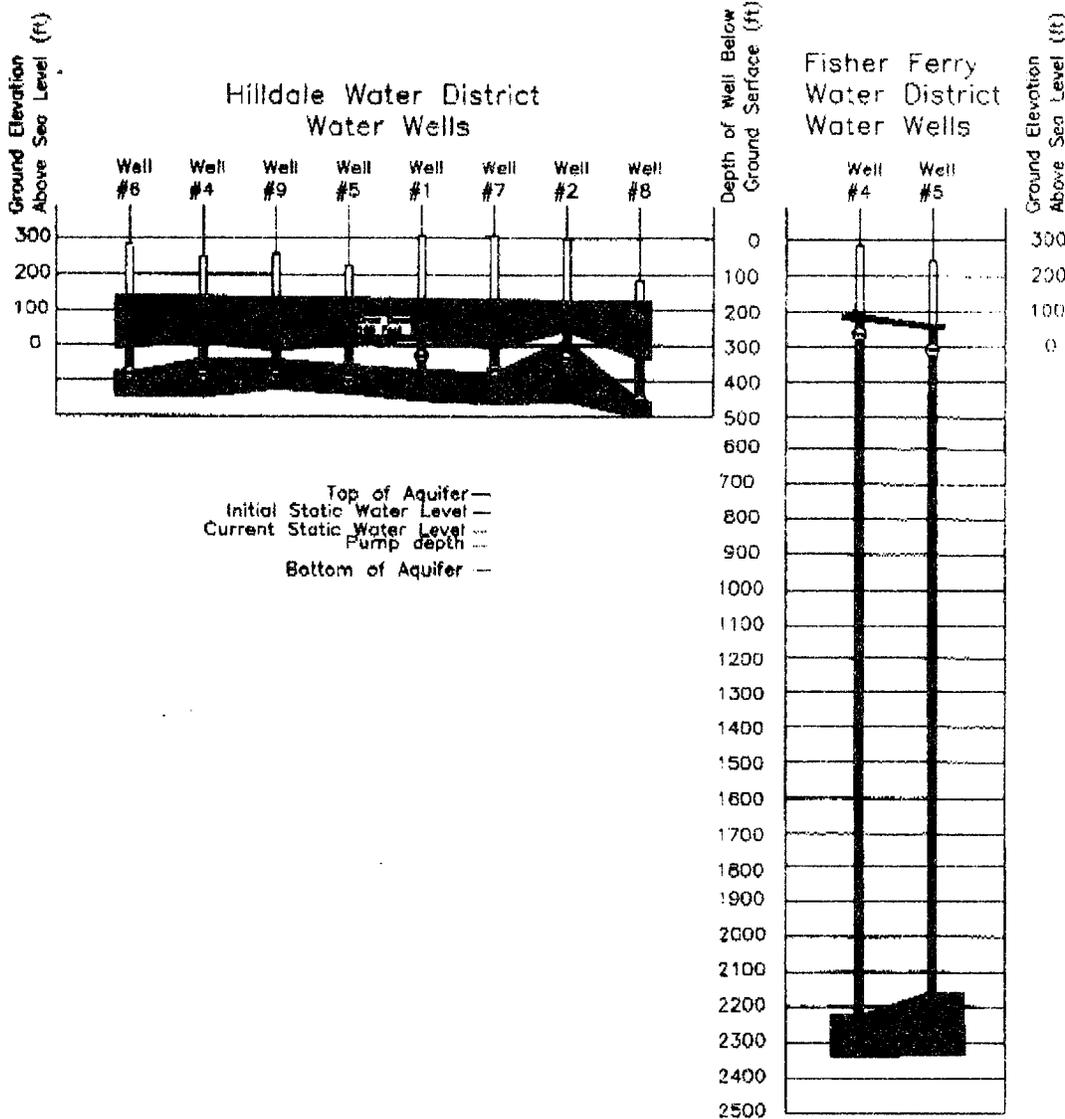


Project No. 1000  
Client: Hilldale Water District  
Date: 5/15/94  
Location: Hilldale, Ohio

Hilldale Fisher Ferry Aquifer Study  
Exhibit I



### Hilldale Fisher Ferry Aquifer Study Exhibit I



**Hilldale Water Mix Analysis**  
**Using Hilldale Well #7 and Fisher Ferry Well #4 and Fisher Ferry Ozone Chlorinated Treated Water**

**Exhibit II**

	Existing Data		EPA		Year 2009		Argus		Analytical		Results	
	Hilldale Well #7	Fisher Ferry Well #4	GOAL MCLG	Max. MCL	Hilldale Well #7	Fisher Ferry Well #4	Hilldale Well #7	Fisher Ferry Well #4	Blend 25% Well #7 75% FF Treated	Blend 50% Well #7 50% FF Treated		
<b>Physical Characteristics</b>												
Turbidity		2.22	n/a	n/a	1.52	1.41			0.74		0.88	
Field Temperature	70.0 F	104.0 F			72.6 F	100.6 F			96.0 F		89.6 F	
Color		160.00		15 color units	10.00	200.00			150.00		100.00	
Specific Conductance		1000.00			766.00	927.00			868.00		846.00	
Odor		ND		3 odor no.	NO	YES			NO		NO	
Free Chlorine(Field)			4.00	4.00	NO TEST	NO TEST			2.10		2.10	
pH (Field)	7.00	8.52			7.16	8.72			8.40		7.87	
pH (Lab)	7.80			6.6 to 8.5	7.28	8.75			8.42		8.18	
Alkalinity (P) as CaCO3					ND	0.60			0.30		ND	
Alkalinity (T) as CaCO3	420.50				ND	17.30			12.80		6.25	
Aluminum as Al		ND		0.05 to 0.2	ND	ND			NO TEST		NO TEST	
Chloride	6.00	25.10	250.00	250.00	6.15	22.50			22.10		19.00	
Sulfate	3.70	ND		250.00	ND	ND			NO TEST		NO TEST	
Fluoride	0.10	1.00		2.00	0.14	0.87			0.66		0.54	
Nitrite (as N)			1.00	1.00	ND	ND			NO TEST		NO TEST	
Free Carbon Dioxide (CO2)	15.00				38.40	2.43			3.14		5.80	
Iron (Field)	0.50			0.30	NO TEST	NO TEST			NO TEST		NO TEST	
Iron (Lab)	0.35	0.14		0.30	0.48	0.04			0.16		0.26	
Magnesium	4.10	0.21	0.05		4.59	0.16			1.31		2.52	
Manganese	0.02	ND		0.05	ND	ND			NO TEST		NO TEST	
Calcium	11.00	0.86			10.60	0.70			3.14		5.75	
Sodium	166.40	222.00			182.00	250.00			235.00		220.00	
Potassium	3.60	1.33			6.35	1.83			3.12		3.90	
Silica		14.60			24.00	16.40			15.80		18.00	
Total Dissolved Residue	448.00	578.00		500.00	462.00	576.00			542.00		522.00	
Ca+Mg Hardness as CaCO3	44.40	2.99			45.40	2.41			13.50		24.70	
Zinc as Zn		ND		5.00	ND	ND			NO TEST		NO TEST	
Alkalinity (B)		464.00			411.00	473.00			463.00		439.00	
Alkalinity (M)					412.00	490.00			476.00		445.00	
Alkalinity (Total)		484.00			412.00	490.00			476.00		445.00	
Arsenic		ND	zero	0.01	ND	ND			NO TEST		NO TEST	
Barium			2.00	2.00	0.07	0.01			0.03		0.04	
Bromate			zero	0.10	ND	ND			NO TEST		NO TEST	
Bromide		ND			0.94	1.89			1.40		1.15	
Copper		ND		1.00	ND	ND			NO TEST		NO TEST	
Gross Alpha Particle			zero	15.00	2.30	1.90			3.60		1.30	
Gross Beta					2.20	6.60			4.20		5.90	
Hardness ( Total)		21.00			47.00	2.00			12.50		23.00	
Hardness (as carbonate)		21.00			47.00	2.00			12.50		23.00	
Hardness (as non-carbonate)		ND			ND	ND			NO TEST		NO TEST	
Hydrogen Sulfide( H2S gas)					NO TEST	NO TEST			NO TEST		NO TEST	
Lead			zero	0.02	0.002	0.002			0.002		0.001	
Mercury			0.002	0.002	ND	ND			NO TEST		NO TEST	
Alkalinity,Phenolphthalein		0.95			ND	0.60			0.30		ND	
Radium-226			zero	5 pCi/L	0.64	0.57			0.33		0.46	
Radium-228					0.62	0.87			0.46		0.65	
Combined Radium					1.26	1.44			0.79		1.11	
Radon-222		118.12			-857(35)	-1090(17.5)			-438(23)		-673(20.2)	
Silver		ND		0.10	ND	ND			NO TEST		NO TEST	
Strontium					0.16	0.04			0.07		0.10	
Sulfide		ND			ND	0.20			ND		ND	
Total Organic Carbon		6.30			0.97	5.40			4.90		3.20	
Total Phosphorus					0.13	0.63			0.50		0.41	

Hilldale Water Mix Analysis

Tests for THMM's

Water Blend using Hilldale Well #7 Raw Water and Fisher Ferry Ozone and Chlorinated Treated Water

Exhibit III

Argus	Analytical	Results							
		Blend 25% Well 7		Blend 50% Well#7		Blend 50% FF Treated			
		Day 1	Day 2	Day 5	Day 6	Day 1	Day 2	Day 5	Day 6
Physical Characteristics									
Field Temperature	73.6 F					73.60			
Ammonia	0.45		0.30	0.33	0.33	0.30	0.54	0.44	0.44
Specific Conductance	813.00					866.00			
Free Chlorine(Field)	2.10					2.10			
Free Chlorine(Lab)	0.09		0.05	0.02	0.02	0.06	0.09	0.04	0.02
Iron (Lab)	0.28		0.15	0.17	0.13	0.16	0.27	0.30	0.25
Magnesium	2.71		1.32	1.40	1.25	1.37	2.50	2.59	2.47
Residue,filterable(TDS)	530.00		562.00	562.00	572.00	580.00	524.00	528.00	514.00
Residue,filterable(TSS)	ND		2.00	1.00	1.00	ND	1.00	ND	
THMM (Total)									
Bromodichloromethane	43.60		74.00	70.80	60.60	63.20	39.70	38.60	33.50
Bromoform	10.10		15.40	11.00	9.30	14.70	8.80	6.30	6.90
Chloroform	ND		ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	33.50		58.60	57.50	49.30	48.50	30.90	32.30	26.60
	ND		ND	2.30	2.00	2.80	ND	ND	ND