



Accelerated Bioremediation &
Natural Attenuation by
iSOC™
Groundwater Remediation System
Case Study – Chiefland, Florida

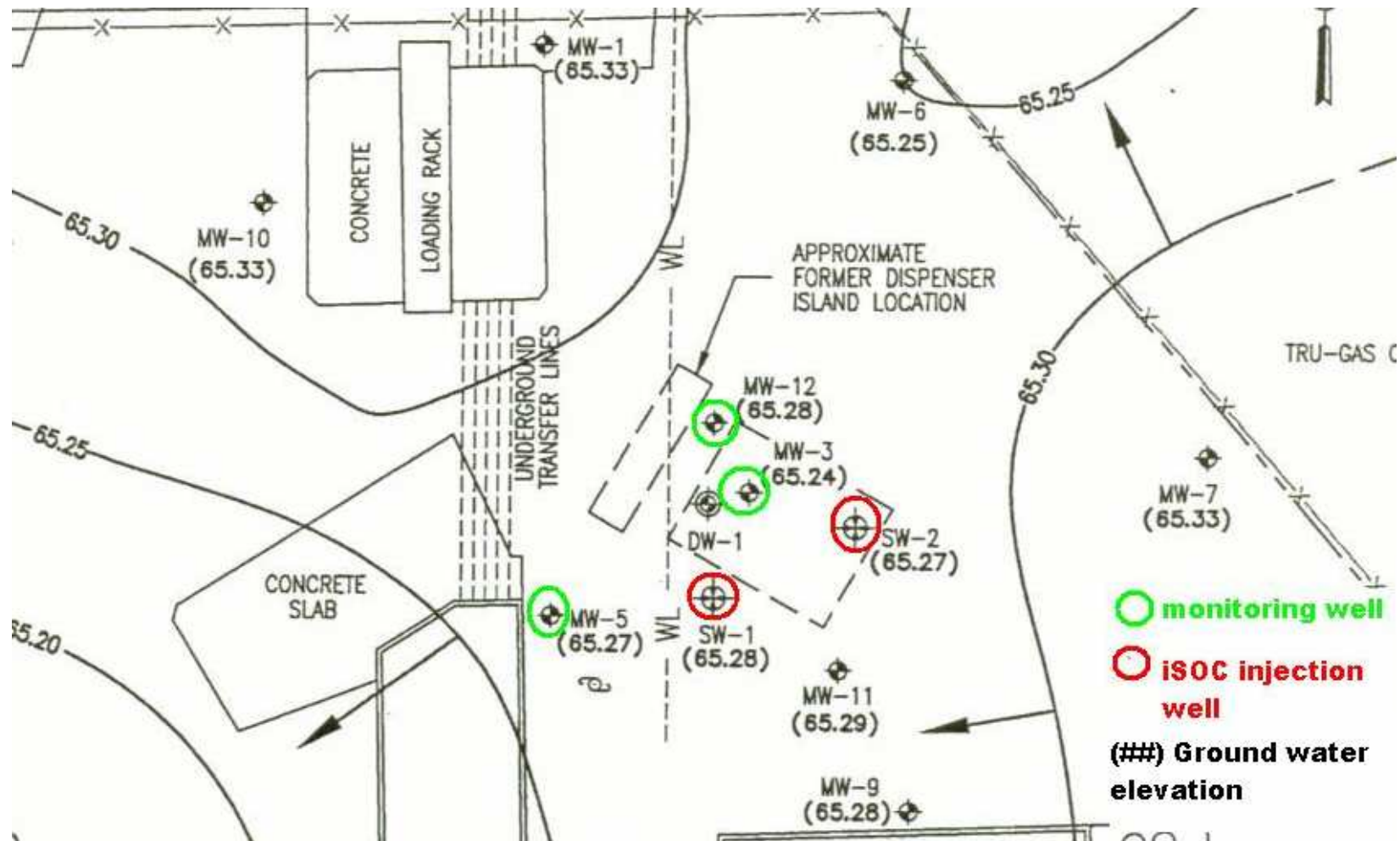
Case Site Characteristics

- Site underlain by 2.5 to 6 metres of interbedded sand and sandy clay; below the unconsolidated deposits, the bedrock is a friable weathered limestone.
- Water table is located in limestone at a depth of 8.5 metres.
- City of Chiefland has two water supply wells approximately 0.4 km southwest of site.
- Ground water flow at bulk facility appears to be affected by the pumping of the municipal wells

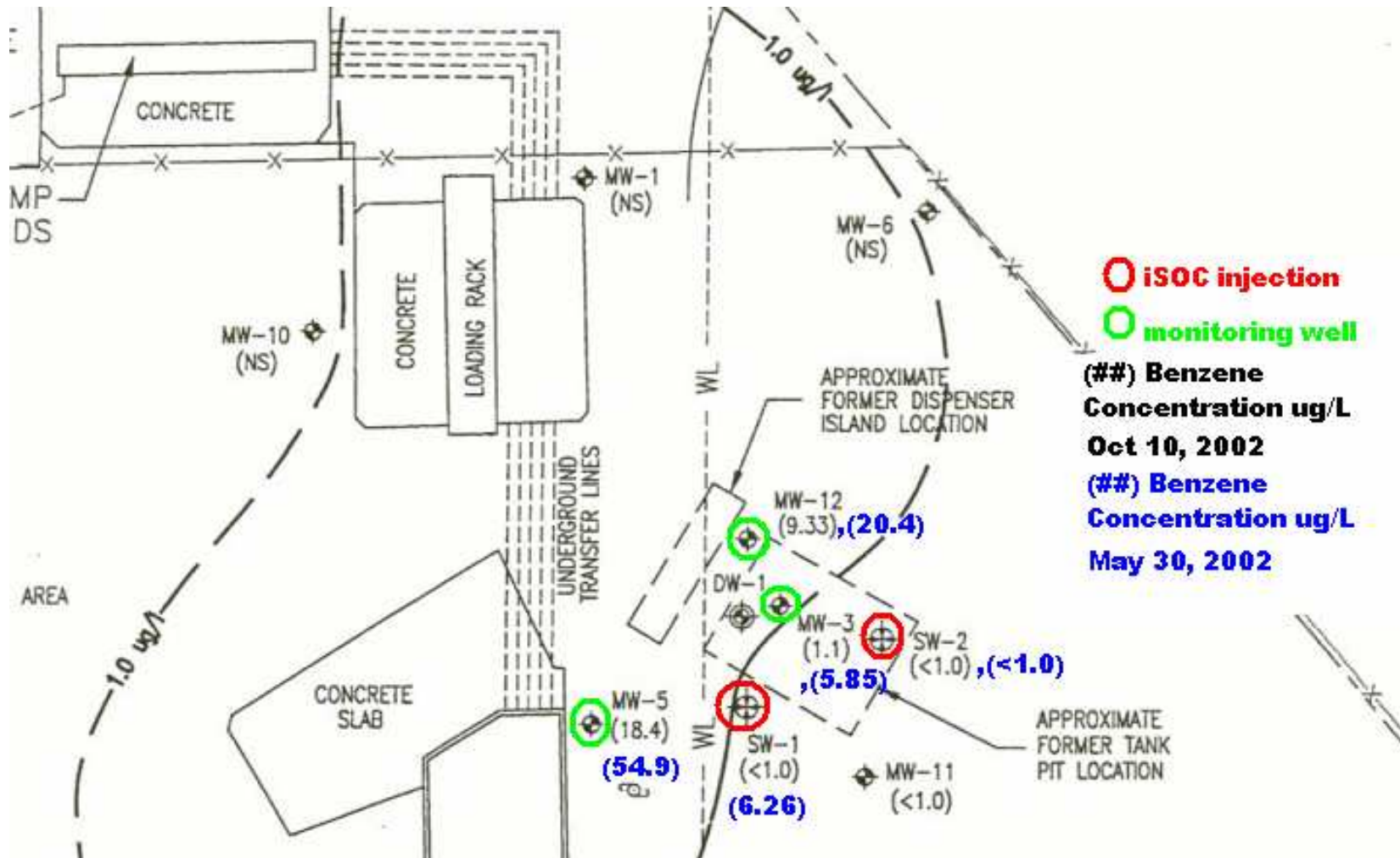
iSOC™ System Implementation

- Two *iSOC™* installed June 2002 as pilot test.
- Pilot ran for 132 days.
- Groundwater sample collected in May prior to test and in October at the conclusion of pilot test.
- *iSOC* injection wells were 5 cm diameter with 3 metres of water column in each well.
- Injection wells were 6.1 metres apart.
- Dissolved Oxygen (DO) concentrations were maintained between 20 and 40 ppm.
- Radius of influence of each injection well was in excess of 6 metres.

Case Study- Ground Water Flow



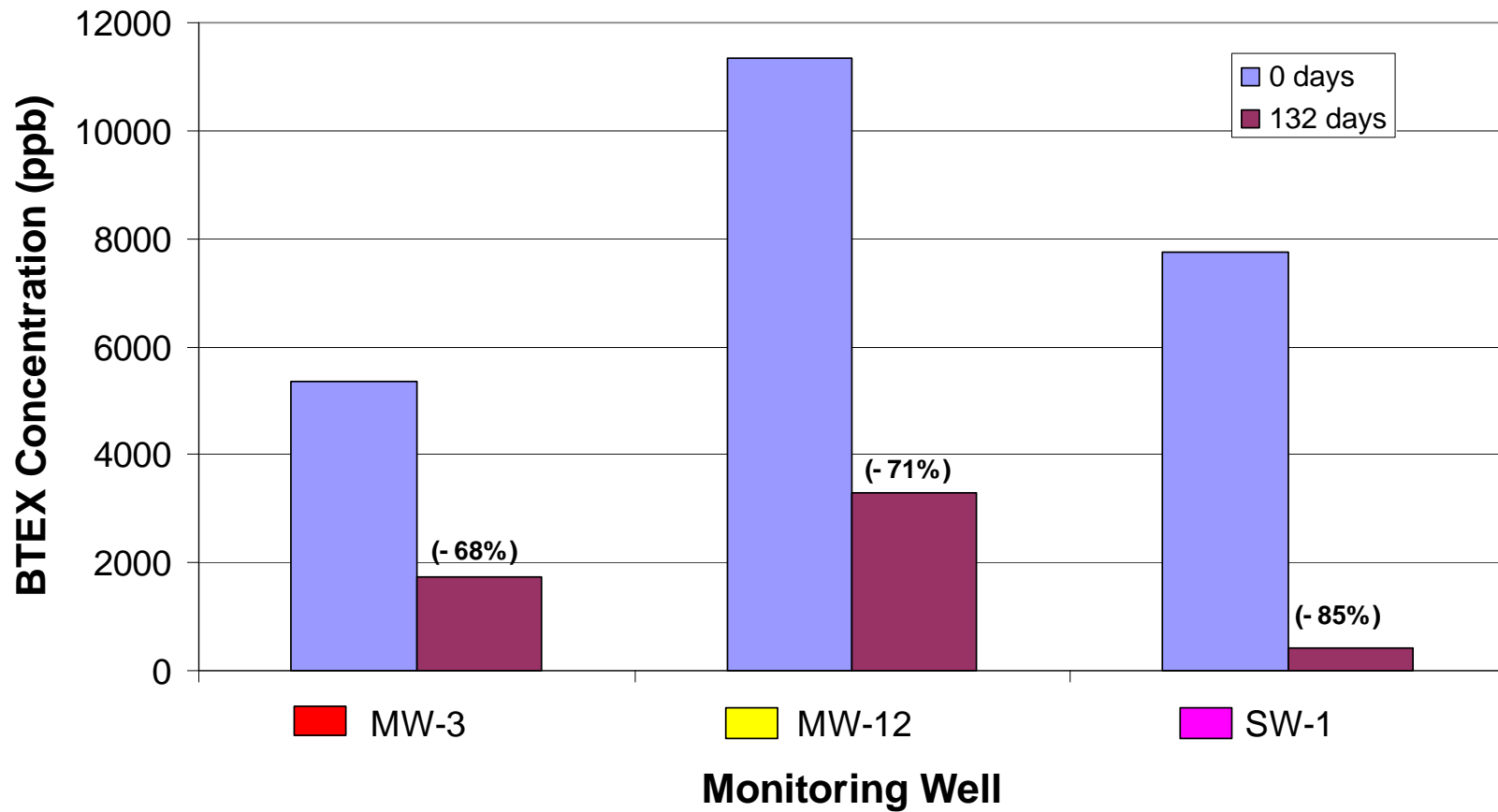
Case Study – Benzene Reduction



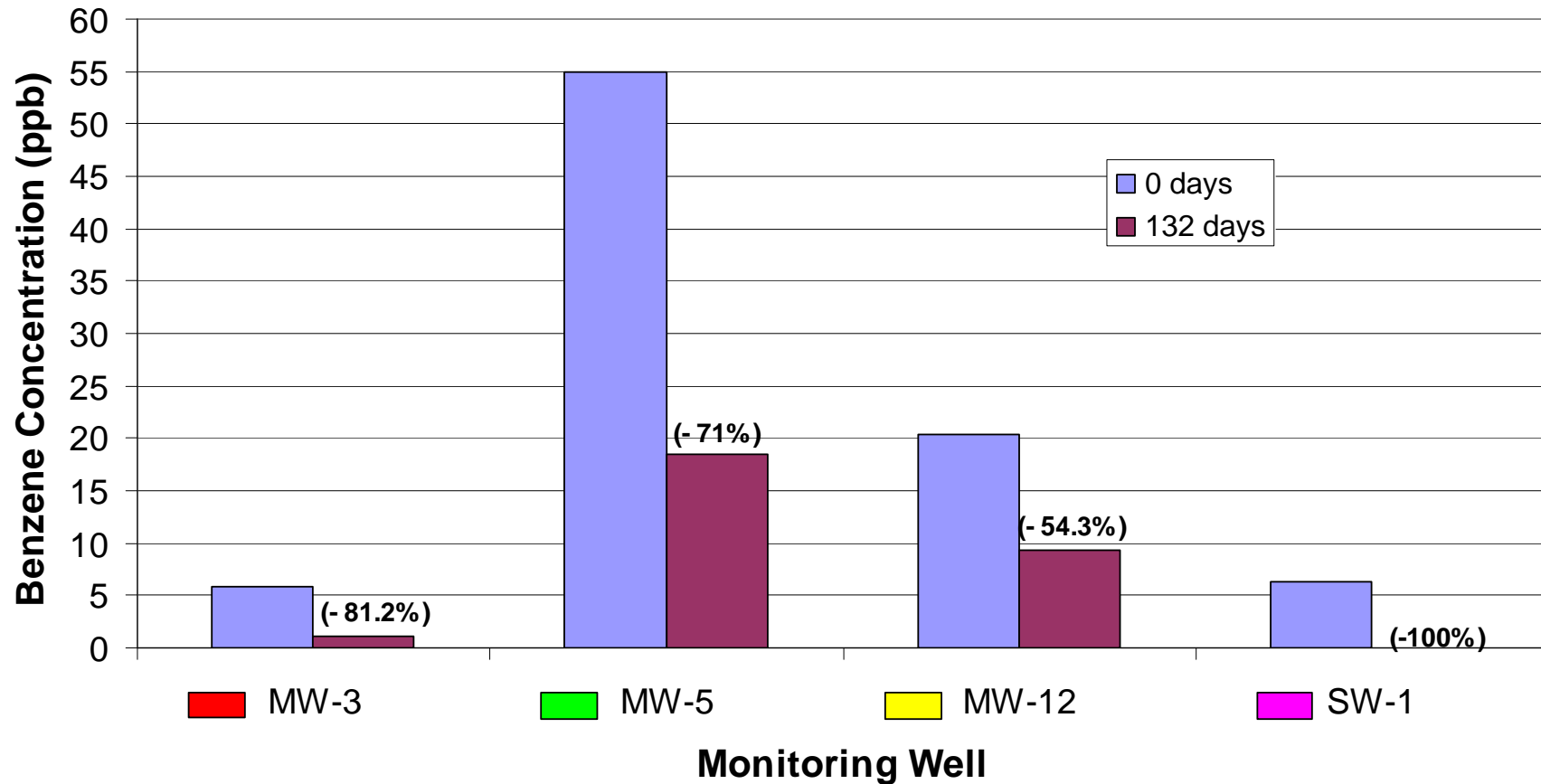
Case Study Results

LOCATION	DATE	BENZENE ppb	BENZENE % CHANGE	XYLENES ppb	XYLENES % CHANGE	BTEX ppb	BTEX % CHANGE	HETER. PLATE	HET.PLATE % CHANGE
MW-3	5/30/02	5.85		4540		5362		0.02	
	10/9/02	1.1	-81.2	1512	-67	1745	-67.5	160	+8000
MW-5	5/30/02	54.9		9		84.3		14	
	10/9/02	18.4	-66.5	1.2	-87	25.74	-69.5	170	+1114
MW-11	5/30/02	<1.0		<2		<5.0		340	
	10/9/02	<1.0	-	<2	no change	1.84	-	710	+52.1
MW-12	5/30/02	20.4		8390		11,340		400	
	10/9/02	9.33	-54.3	2400	-71	3,284	-71	160	-60
SW-1	5/30/02	6.26		2326		7,736		510	
	10/9/02	<1.0	-100	346	-85	417	-84.8	2,900	+469
SW-2	5/30/02	<1.0		<2		<5.0		290	
	10/9/02	<1.0	-	12.2	slight increase	13.9	-	1	-99.7

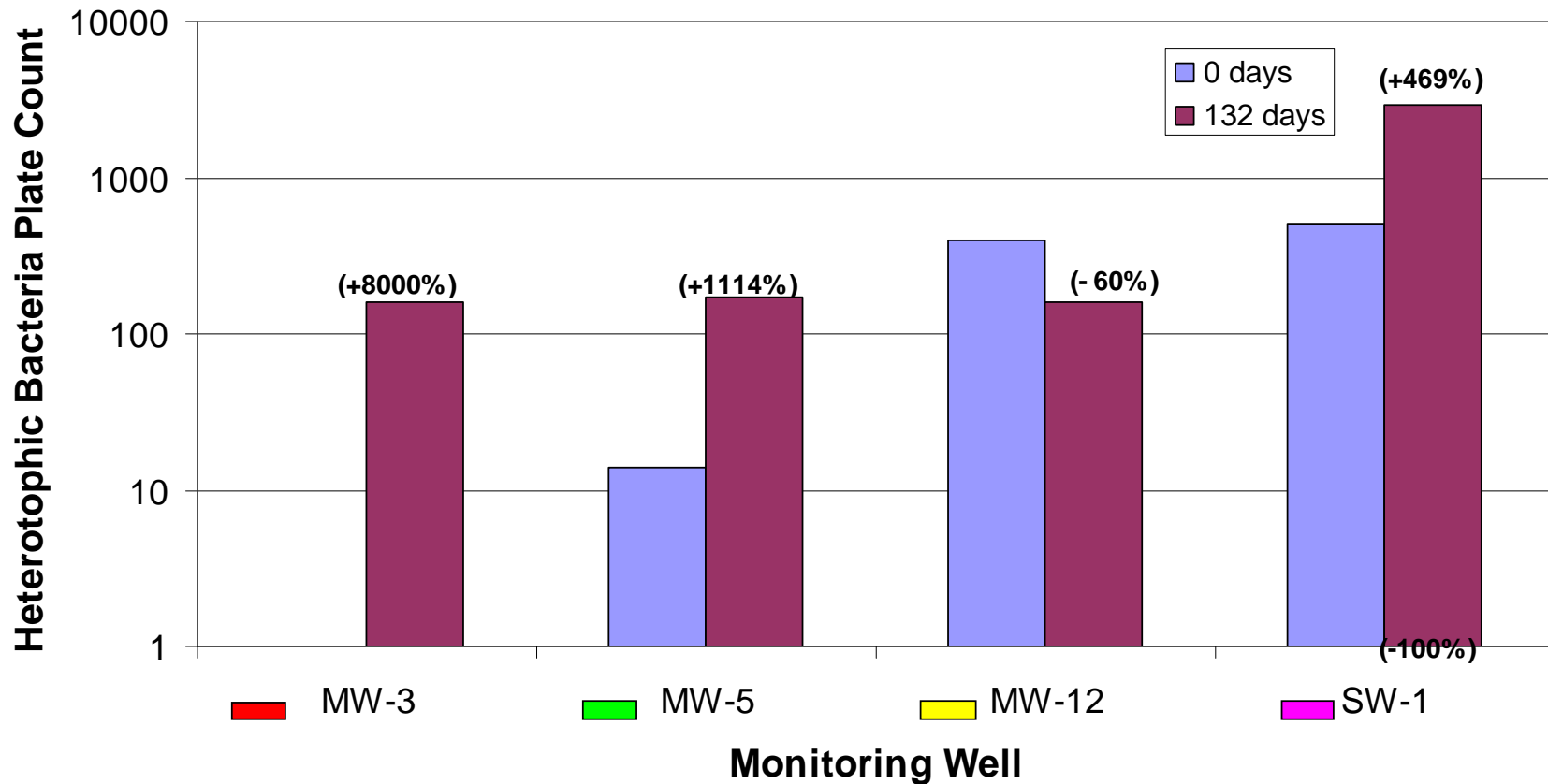
Results - BTEX Degradation



Results - Benzene Degradation



Results - Increase in Bacteria Activity



Conclusions

- The pilot study ran 132 days.
- Heterotrophic bacteria late count was increased in most wells by between 470% to 8000%
- Benzene was reduced between 54% and 100%
- The largest BTEX component of contamination on site, xylenes, were reduced by between 67% to 87%
- Overall BTEX contamination in the sampled monitor wells were reduced by between 68% to 85%

Future Remedial Activities

- Consultant recommended Florida Department of Environmental Protection continue pilot test to collect more data. Pilot should resume once FDEP funding levels are restored.
- Consultant has recommended a full scale *iSOC™* remedial system be installed to remediate all ground water contamination to protect two municipal wells approximately 0.4 km southwest of the bulk plant.