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**INSTALLATION AND MONITORING OF THE
WATERLOO EMITTER™ SYSTEM**

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Presentation Outline

- Introduction/Background
- Emitter Installation Details
- Maintenance Program
- Performance Monitoring Results
- Summary

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Introduction

- Emitter Evaluation conducted in 2004

Conclusions

- Potentially effective for dissolved phase plume biodegradation
- Based on Modeling – reduction to be evident between 0.5 and 1.5 years
- Regulatory compliance in approximately 10 years

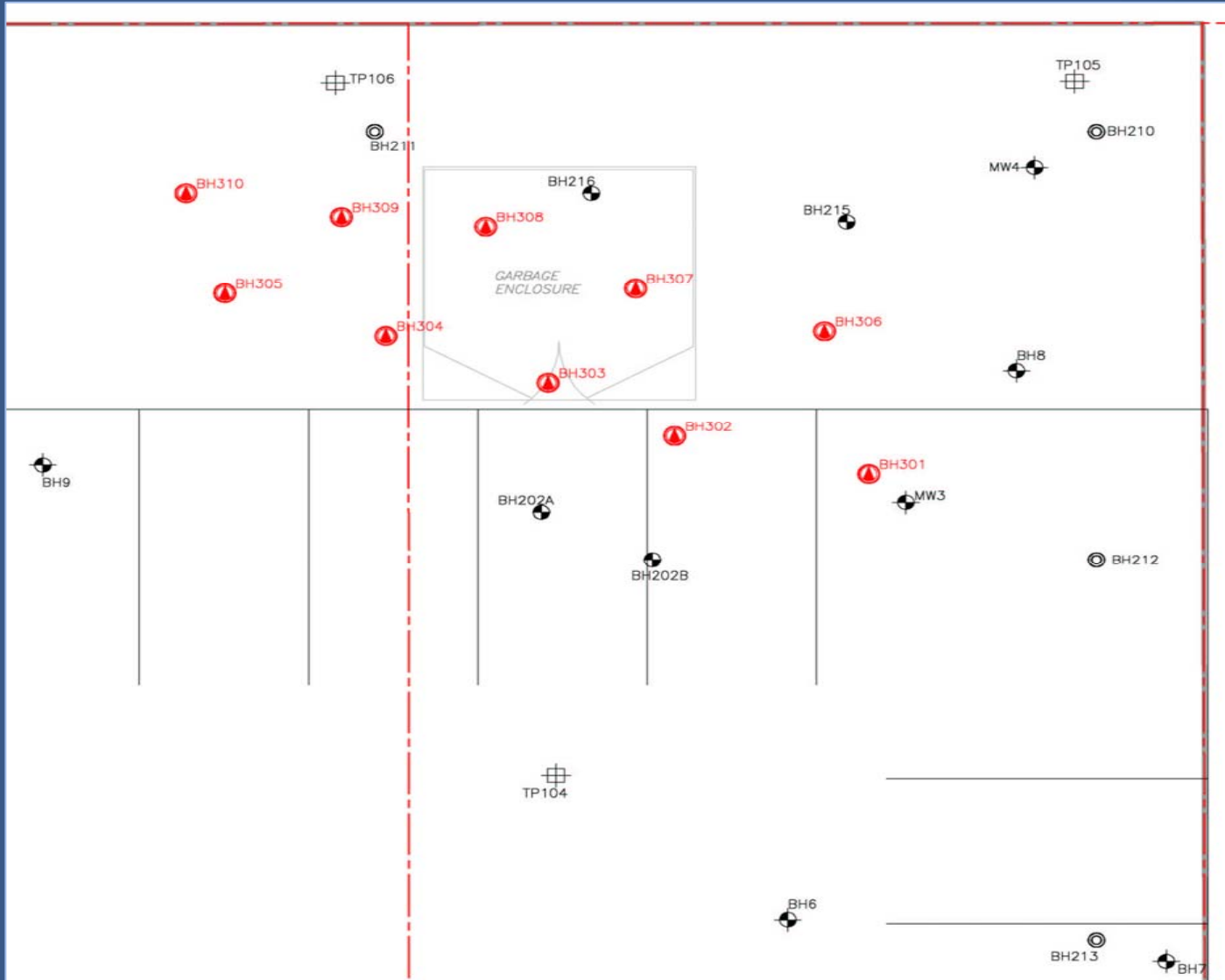
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Installation of Emitter “fence”

- Two rows of 5 emitters – off set by 1.5 m
- Located at down gradient toe of plume
- Effective spacing 1.5 m

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Emitter locations



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Emitter Well Details



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Emitter Details



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Emitter Details



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Emitter Oxygen Delivery Details



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Emitter Maintenance Program

- Ice build up in lines.
- Regulator and pressure relief valve leaks.
- Iron removal and cleaning 6 months intervals

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Maintenance Program



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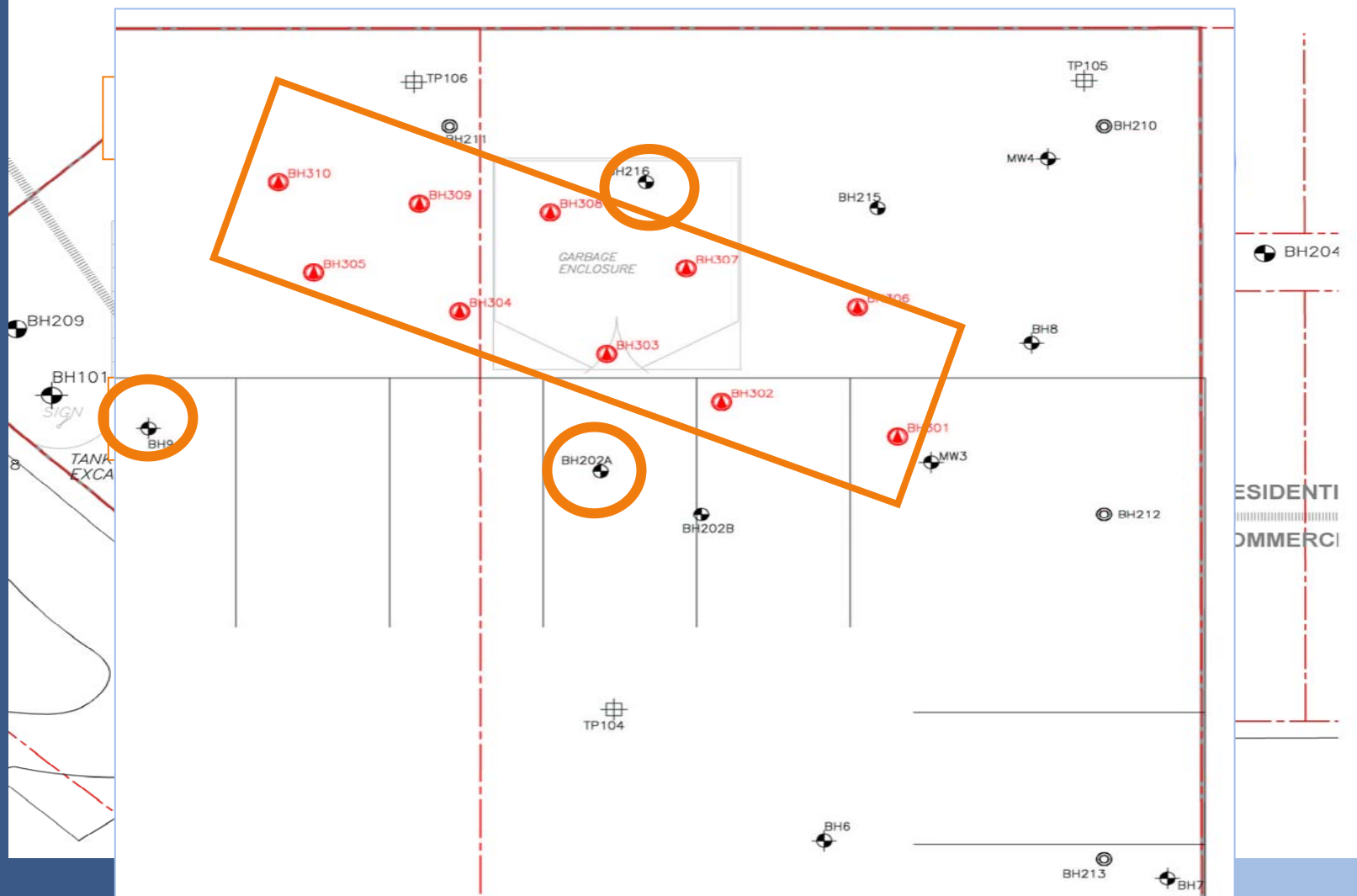
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Modifications to Oxygen Delivery System

- Dry Oxygen – less than 10 ppm impurities.
- Separate lines to each emitter and needle valve for each emitter.
- Weekly monitoring by local subcontractor
- Six months of continuous oxygen delivery @30 L per day.

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Emitter Monitoring Program



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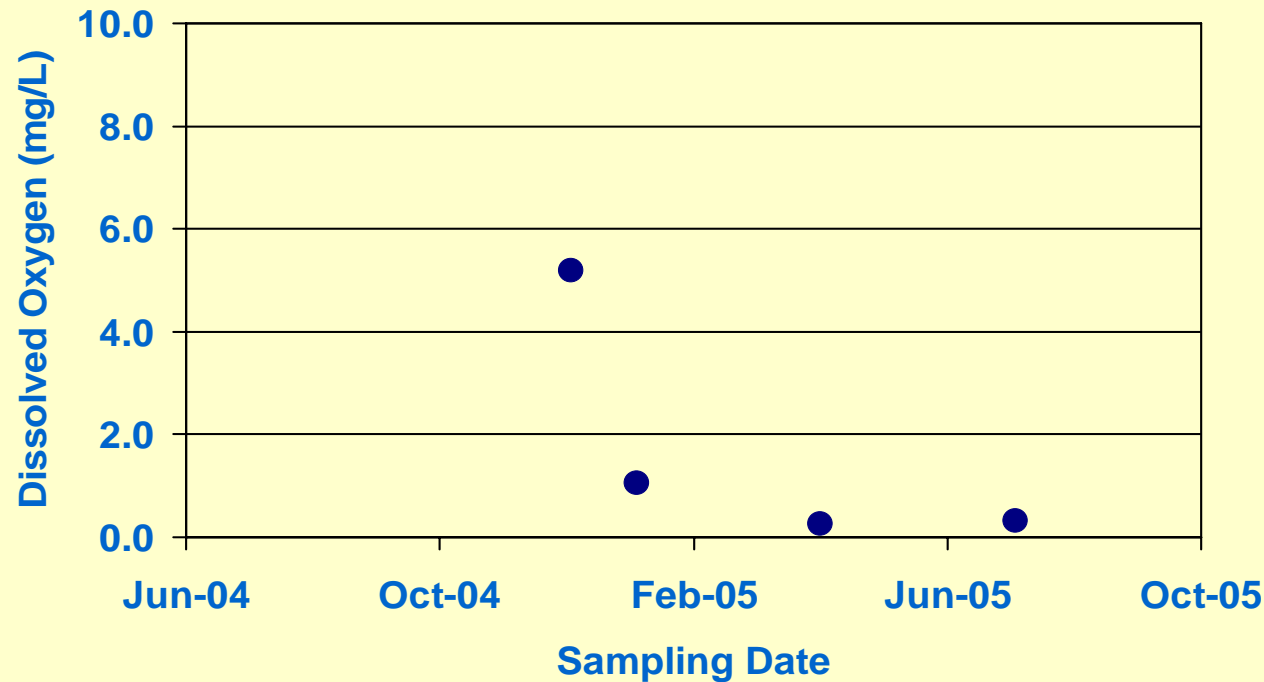
Groundwater Flow

- Seasonal fluctuation of 0.2 m July 2004 to July 2005.
- Groundwater high July groundwater low January.
- Flow in northeast – gradient 0.003 m/m
- Flow rate approximately 5 m to 10 m per year.

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Dissolved Oxygen Levels

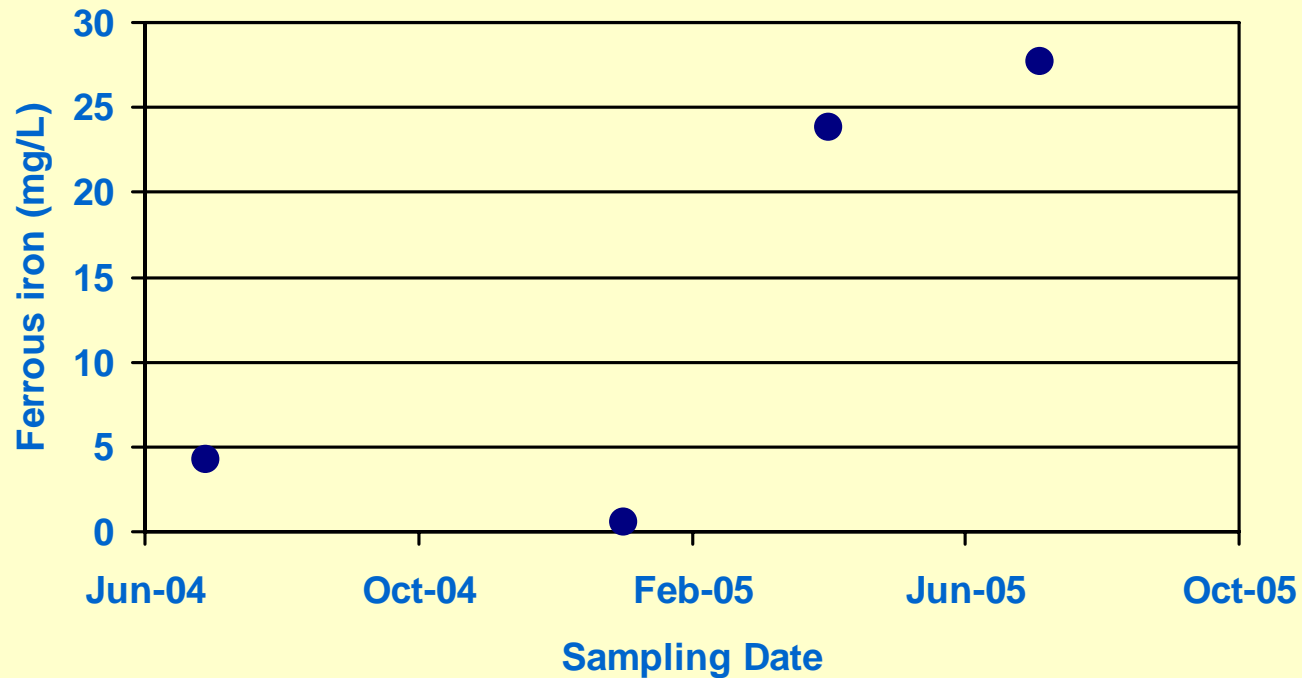
Down Gradient BH216



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Geochemistry

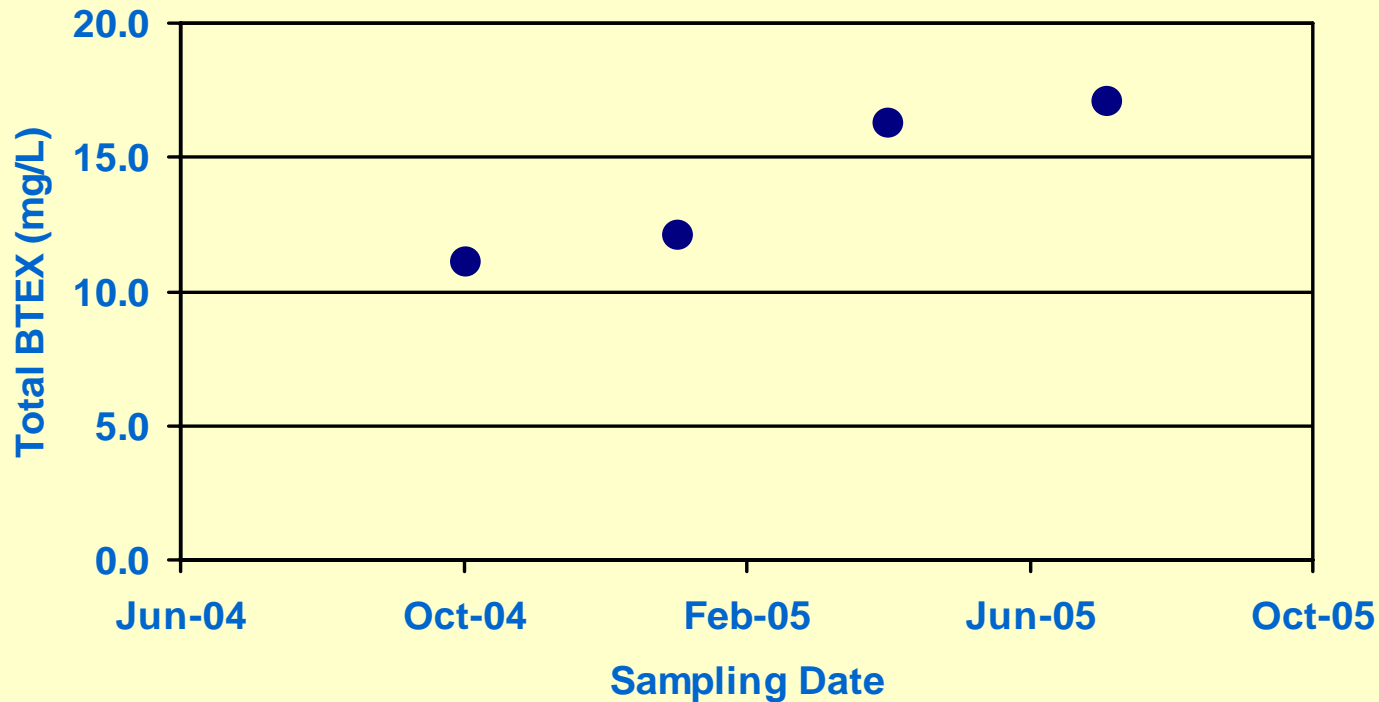
Down Gradient BH104



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Hydrocarbon Parameters

Down Gradient BH216



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Performance Results

- Consistent elevated DO levels in Emitter wells. Delivery has been successful.
- DO and hydrocarbon levels have not shown indications of increased bioremediation.
- Results are consistent with modelling predictions
- Additional monitoring in 2006 is required.

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Summary

- Cold temperature installation requires low moisture oxygen, separate lines.
- Cleaning on a six month basis likely required with well re- development
- No indication of increased enhanced bioremediation as of July 2005 – approximately 6 months.

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