

**Global Geophysics**  
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June 12, 2015

Our ref: 105-0415.000

Hart Crowser, Inc.  
120 Third Avenue South, Ste. 110  
Edmonds, WA 98020-8411

Attention: Mr. Jim Shannon

**RE: REPORT FOR THE GEOPHYSICAL SURVEY AT BIRD ISLAND,  
RENTON, WA**

This letter report presents the results of the geophysical survey performed by Global Geophysics in June, 2015 around Bird Island, Renton, WA. The objectives of the studies are to locate metal objects and other construction debris.

## **METHODOLOGY, INSTRUMENTATION AND FIELD PROCEDURES**

Magnetics and ground penetrating radar were used for this project.

### **Magnetometry**

This survey was conducted with a Geometrics Model G-858 cesium vapor magnetometer. This instrument measures variations in the magnetic field of the Earth, including local distortions or anomalies of the field caused by ferrous objects or minerals. In general, the magnitude of the magnetometer response is proportional to the mass of the ferrous object. A single drum of container can be detected to a depth of approximately 15 to 20 feet.

The magnetometer survey was conducted with GPS positioning. The magnetic readings were acquired digitally and presented as a magnetic contour map after processing.

### **Ground Penetrating Radar**

The GPR method uses electromagnetic pulses, emitted at regular intervals by an antenna to map subsurface features. The electromagnetic pulses are reflected where changes in electrical properties of materials occur such as changes in lithology or where buried objects are present. The reflected electromagnetic energy is received by an antenna, converted into an electrical signal, and recorded on the GPR unit. The data is recorded and viewed in real time on a graphical display that depicts a continuous profile or cross-section image of the subsurface directly beneath the path of the antenna.

The depth of penetration of the GPR signal varies according to antenna frequency and the conductivity of the subsurface material. The depth of subsurface penetration with GPR

decreases with an increase in the frequency of the antenna and an increase in soil conductivity. Low frequency antennas (50 to 500 MHz) provide the best compromise between obtaining good subsurface penetration and resolution.

The data at this site were collected using Geophysical Survey Systems, Inc. (GSSI) SIR 3000 GPR system with an antenna having center frequency of 200 MHz. The data were digitally recorded for post processing. Real time GPS positioning was used for this project.

## **RESULTS**

The magnetic data contour plan with interpreted GPR anomalies are presented in Figure 1. The track lines are shown in Figure 2. The inner survey line is within 0-5 ft from the shoreline of the island. The followings summarize the findings:

- The magnetic anomalies (areas of dense contour lines) are indicative of the presence of buried metal objects. They are concentrated near the shoreline.
- The GPR anomalies are indicative of the presence of discrete buried objects. Majority of them are near surface, and/or within 2 feet below mudline. There are over 1600 GPR anomalies. The anomalies in linear pattern are indicative of lumbers or concrete pillars or other long objects. Anomalies in cluster indicate large objects or cluster of small objects. The hachured area has the most clustered objects (Figure 1).
- The spatial distribution patterns of the anomalies show objects are near shore.

## **LIMITATIONS**

Global Geophysics's services are conducted in a manner consistent with the level of care and skill ordinarily exercised by other members of the geophysical community currently practicing under similar conditions subject to the time limits and financial and physical constraints applicable to the services. Magnetics and GPR are remote sensing geophysical methods that may not detect all subsurface objects. Furthermore, it is possible that geophysical anomalies that are interpreted to be debris may upon intrusive sampling prove to be misinterpreted.

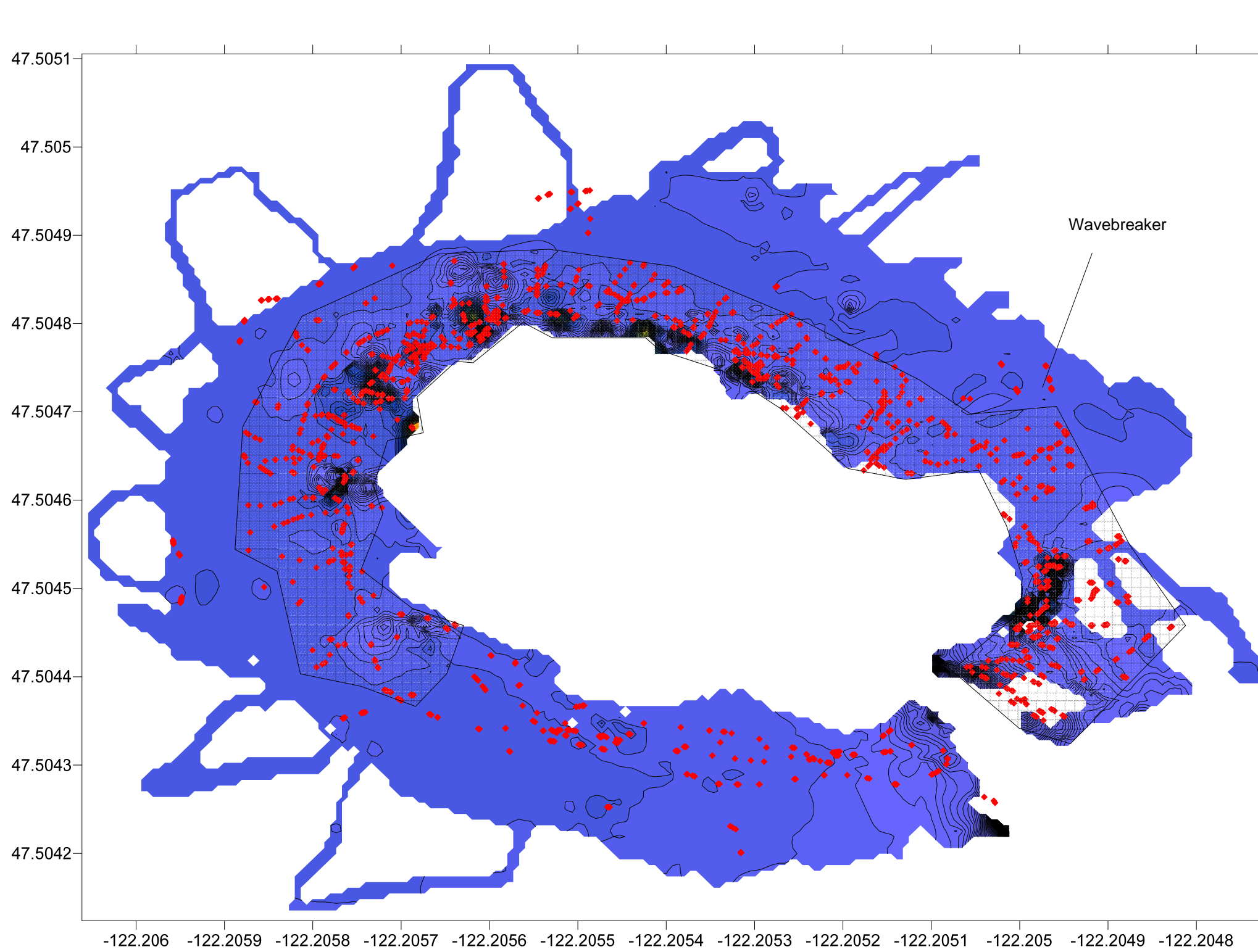
If you have any questions or require additional information, please contact us at 425-890-4321.

Sincerely,

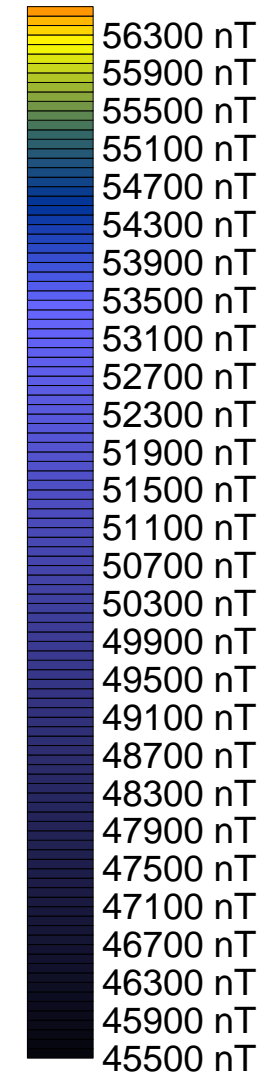
**Global Geophysics**




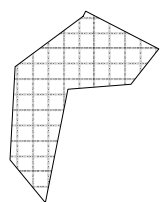
John Liu, Ph.D.  
Principal Geophysicist



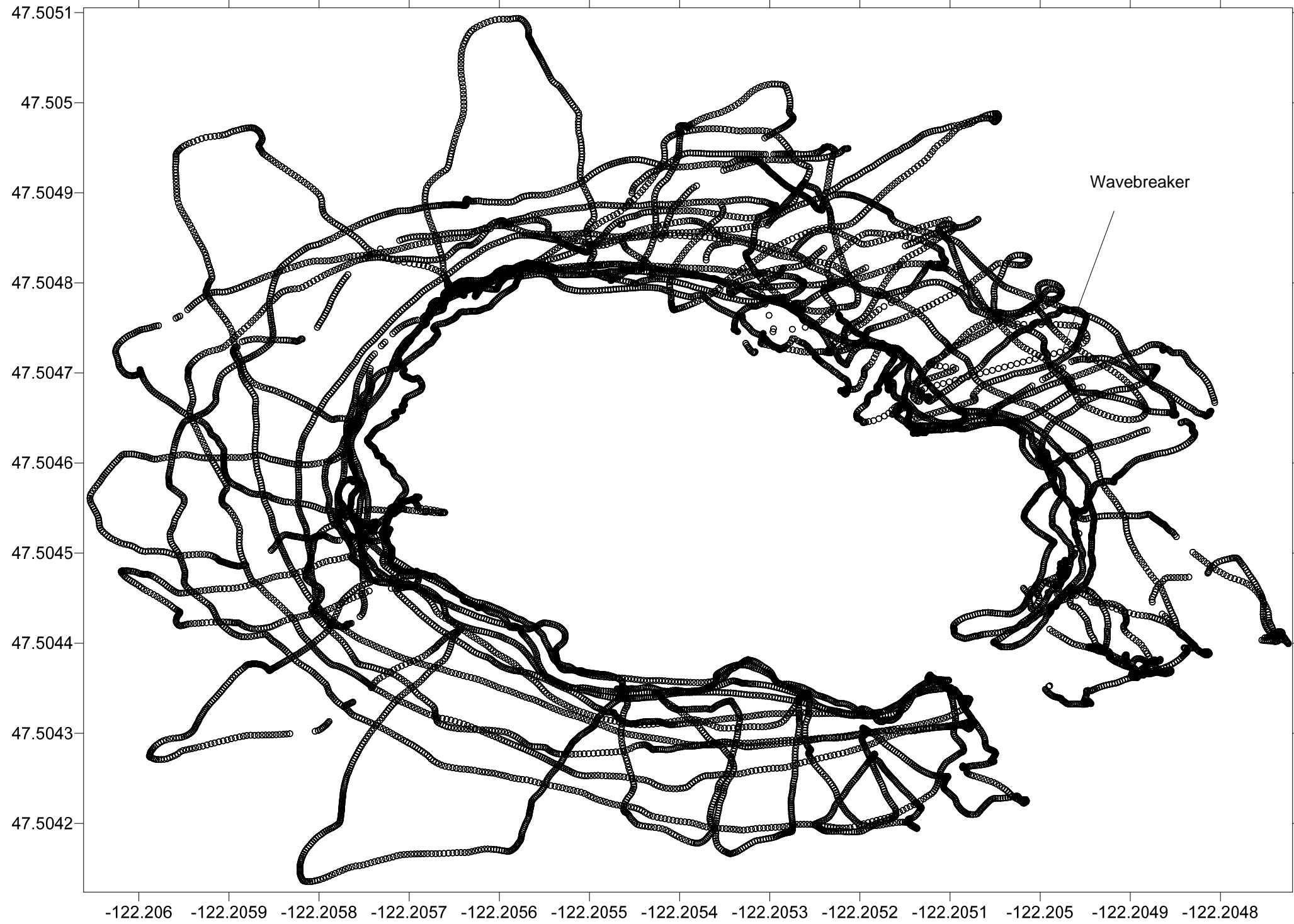
North



**Legend:**

-  GPR anomaly
-  Area of dense cluster of debris

PROJECT			<b>Gene Coulon Memorial Beach Park Renton, WA 98056</b>		
TITLE			<b>Magnetic Data Contour Plan with GPR anomalies</b>		
Global Geophysics P.O. Box 2229 Redmond, WA 98073-2229 Tel: 425-890-4321	Project #		FILE No: Renton - MapMap		
	DESIGN	--	SCALE	AS SHOWN	REV.
	CADD	JL	<b>FIGURE 1</b>		
	CHECK	JL			
	REVIEW	--			



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			<b>FIGURE 2</b>		