Deliverable 3.1 – Memo on Instrumentation Completion

From IAA: Deliverable 3.1: A memo demonstrating with photos the completed instrumentation of sixteen bioretention cells at the study site. Appendices will include receipts for the soil moisture sensors and other low value incidental equipment to complete instrumentation of the bioretention cells.

$ 10,400 Target Date: July 31, 2019

This memo is written to fulfill Deliverable 3.1 stating that instrumentation need to carry out the project titled The effects of mulch on stormwater treatment and maintenance effort in bioretention systems.

Soil Moisture Sensors (charged to this project)

Sixteen bioretention cells have been instrumented with 2 soil moisture sensors apiece, one close to the cell inlet, the other by the outlet. Each soil moisture sensors connects wirelessly to a datalogger that then sends data at 30-minute intervals to cloud-server where data can be viewed and downloaded.

Figure 1: Image shows layout of 16 bioretention cells
Figure 2: Image shows the two soil moisture sensors in each cell, one at inflow and one at outflow.

Figure 3: Soil moisture sensors at inflow and outflow installed at 12 inches below the surface. The white mote transmits sensor data to a central datalogger (not shown) wirelessly.
Figure 4: Soil moisture sensor data viewed on a cloud server allowing remote access
Cistern Pressure Transducer (charged to this project)

A replacement pressure transducer was purchased and installed in our stormwater collection cistern. The pressure transducer will enable us to determine water levels in the cistern, and thereby enable determination of outflow flow rates from the cistern to the bioretention cells. Stormwater collected in this cistern will be dosed and distributed to all 16 bioretention cells.

Figure 5: Pressure transducer installed to record water level in the main stormwater cistern. Water level in the cistern enables the determination of outflow from the cistern to the bioretention cells.
**Outflow flow meters** (not charged to this project)

Outflow from each of the 16 bioretention cells and one direct outflow from the cistern are plumbed to 17 flow meters. During sampling events, each one of these 17 set ups will be associated with an automatic water sampler that will collect flow-paced water quality samples.

*Figure 6: Flow meters to measure outflow from the 16 bioretention cells and direct outflow from the cistern*
Figure 7: Outflow flow meter and sampling port configuration
Appendix A – Receipts for Soil Moisture Sensors and Pressure Transducer
**WSU PURCHASE ORDER NUMBER MUST APPEAR ON ALL SHIPPING LABELS, INVOICES AND CORRESPONDENCE**

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>DESCRIPTION</th>
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<th>AMOUNT</th>
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--- LINE ITEM TOTAL ---

SHIPPING AND HANDLING

--- ORDER TOTAL ---

Amount: 8,540.35

By accepting this order, vendor agrees to the terms and conditions available at: [http://purchasing.wsu.edu/terms](http://purchasing.wsu.edu/terms)

PAGE 001

By: Robert Kenneth Ames
Buyer

PAOP01-0610
**Proforma Invoice/Quote**

9/11/2019 3:56:22 PM  
Onset Computer Corporation  
470 MacArthur Blvd  
Bourne MA 02532

508-759-9500  
Customer: WC05186  
Ship To: Ani Jayakaran  
Address: WSU Puyallup REC  
2606 W Pioneer  
Puyallup WA 98371-4900  
United States  
Phone:  
Fax: 
Email Address: anand.jayakaran@wsu.edu

<table>
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<td>SP-006 RX3000 Eth/Wifi Max Plan</td>
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<td>RXMOD-RXW-900 RX3000 HOBOnet Manager NA</td>
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<td>HRB-U30-S100 U30 Replacement 10 Ahr battery</td>
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ONSET Onset Computer Corporation  
skelly
Onset Computer Corporation
470 MacArthur Blvd
Bourne MA 02532

508-759-9500

Customer: WC05186

WSU Puyallup REC
2606 W Pioneer
Puyallup WA 98371-4900
United States

Phone:

Fax:

Ship To: Ani Jayakaran

WSU Puyallup REC
2606 W Pioneer
Puyallup WA 98371-4900
United States

Phone:

Email Address: anand.jayakaran@wsu.edu

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Sale Amount: $8,540.35
Sales Tax: 0.00

Freight: $29.00
Additional Fees: $59.13
Total Amount: $8,628.48
Manufacturer's Sales and Use Tax Exemption Certificate
For Manufacturing Machinery and Equipment

Type of Certificate
☒ Single Use Certificate
☐ Blanket Certificate

A single use certificate must be used each time an exempt item is purchased.
Blanket certificates are valid for as long as the buyer and seller have a recurring business relationship. A "recurring business relationship" means at least one sale transaction within a period of twelve months.
RCW 82.08.050 (7)(e).

1. Buyer/User UBI/Account ID 385 000 328
2. Name of Buyer/User Washington State University
3. Address of Buyer/User 240 French Administration Building
   City Pullman State WA Zip 99164
4. Name of Seller ONSET COMPUTER (F815754)

The buyer/user certifies that it is a qualified manufacturer engaged in manufacturing or processing for hire activities and that the items purchased will be used directly in manufacturing or processing for hire operation. The seller must keep a copy of the certificate for his/her records. Do not attach to the Combined Excise Tax Return.

House Bill 1347 (Laws of 2011) clarifies those qualified to use the manufacturing machinery and equipment exemption, and updates the definition of "manufacturer," "manufacturing," and "manufacturing operation."

Changes include, but are not limited to:
The state and its departments and institutions, public utilities, and others taxable under public utility tax are not eligible for the exemption. Four-year institutions of higher education are eligible for the exemption on machinery and equipment used primarily in a technological research and development operation.

To be considered "used directly" in a manufacturing operation or research and development operation, the machinery and equipment must:

- Act upon or interact with an item of tangible personal property;
- Convey, transport, handle, or temporarily store an item of tangible personal property at the manufacturing site;
- Control, guide, measure, verify, align, regulate, or test tangible personal property;
- Provide physical support for or access to tangible personal property;
- Produce steam or mechanical power for, or lubricate machinery and equipment;
- Produce another item of tangible personal property for use in the manufacturing operation or research and development operation;
- Place tangible personal property in the container, package, or wrapping in which the tangible personal property is normally sold or transported;
- Be integral to research and development as defined in RCW 82.63.010; or
- Be for repair and replacement parts or repair and cleaning labor for eligible items.

The sales and use tax exemption does not include:

- Consumable items;
- Hand-powered tools;
- Property with a useful life of less than one year;
- Building fixtures that are not integral to the manufacturing operation that are permanently affixed to and become a physical part of a building. This includes utility systems for heating, ventilation, air conditioning, communications, plumbing, or electrical.

➤ This certificate is given with full knowledge of, and subject to, the legally prescribed penalties for fraud and tax evasion.

Authorized Agent of Buyer/User (please print) Robert K. Ames
Authorized Signature [Signature]
Title Procurement & Supply Specialist 4
Date 9/20/19

For tax assistance or to request this document in an alternate format, visit http://dor.wa.gov or call 1-800-647-7706. Teletype (TTY) users may use the Washington Relay Service by calling 711.
(REV 27 0021(02/23/18)
## Invoice

| B | L | T | O | Anand Jayakaran | Washington State University | French 220 | PO Box 641020 | Pullman, WA 99164 |
| S | H | I | P | T | O | Anand Jayakaran | Washington State University | 2606 W Pioneer Ave | WSU Puyallup | Puyallup, WA 98371-4998 |

### Buyer Contact
- **Phone**: 253-445-4523
- **Email**: anand.jayakaran@wsu.edu
- **User Name**: Anand Jayakaran

### Payment Terms
- **Ship Via**: FEDEX GROUND
- **Freight Terms**: PP&A
- **Incoterm**: FOB Logan, UT

### Description of Items

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Subtotal: 956.00
Sales Tax: 95.86
Freight: 12.31

**Total**: 1,064.17

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Terms and conditions with Campbell Scientific Inc. are governed by the terms found at [http://www.campbellsci.com/terms](http://www.campbellsci.com/terms).

Banking details will never be done via unsolicited email.