

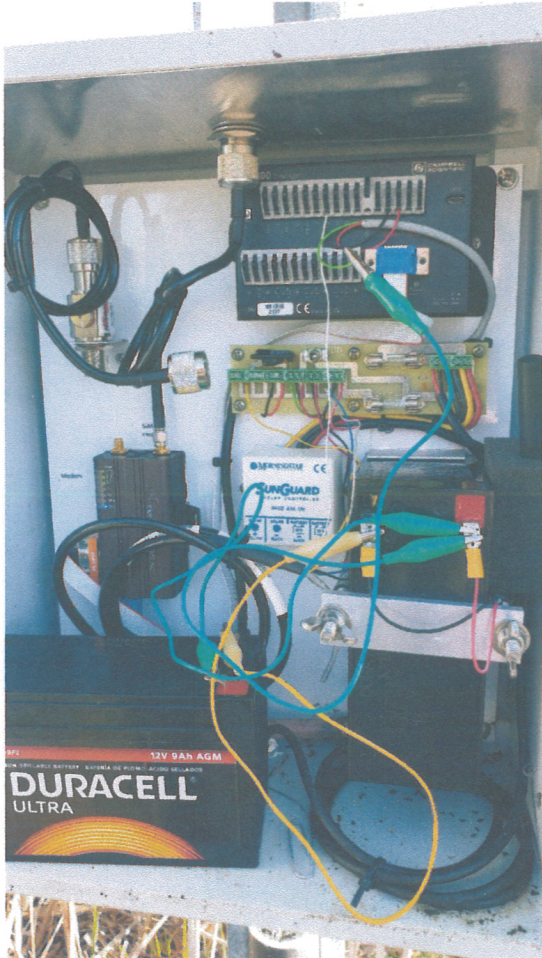
# Lake Monitoring Review To Leelanau Dam Authority

September 9, 2020

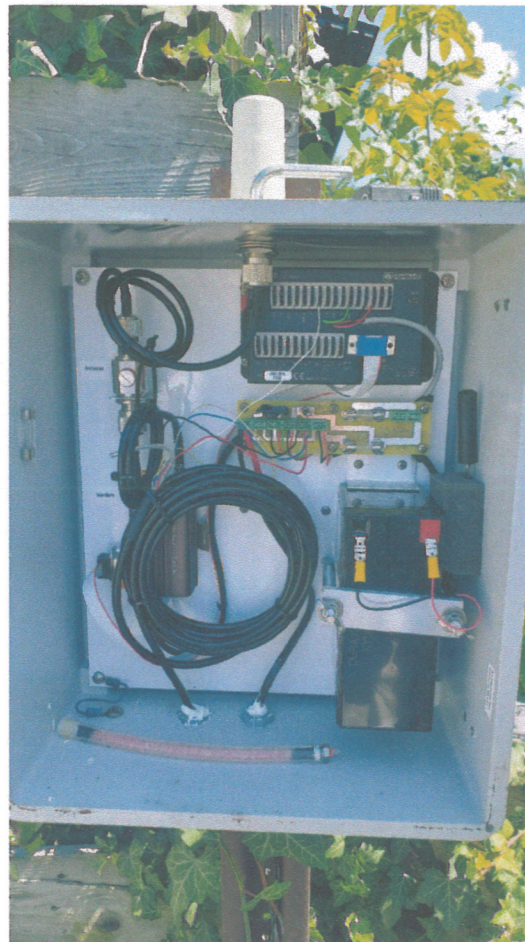
Cal Killen – TIA Software

2016

- LLLA pays for installations at Narrows, South Lake and Dam (~\$15,000)
- County agrees to cover maintenance and cellular phone charges.



Narrows



Dam

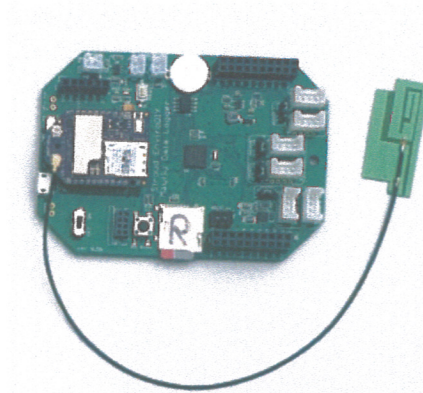


South Lake



2018

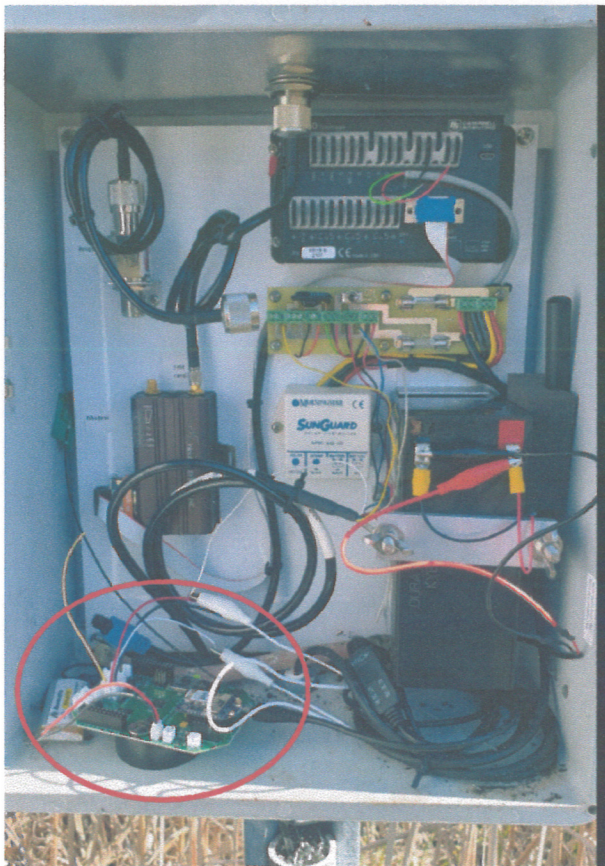
- AT&T & Verizon announce 3G service to be discontinued.
- TIA Software starts developing new technology – 4G communication and low power hardware
- Initial installations of new technology at Crystal River Culverts #3 as test sites



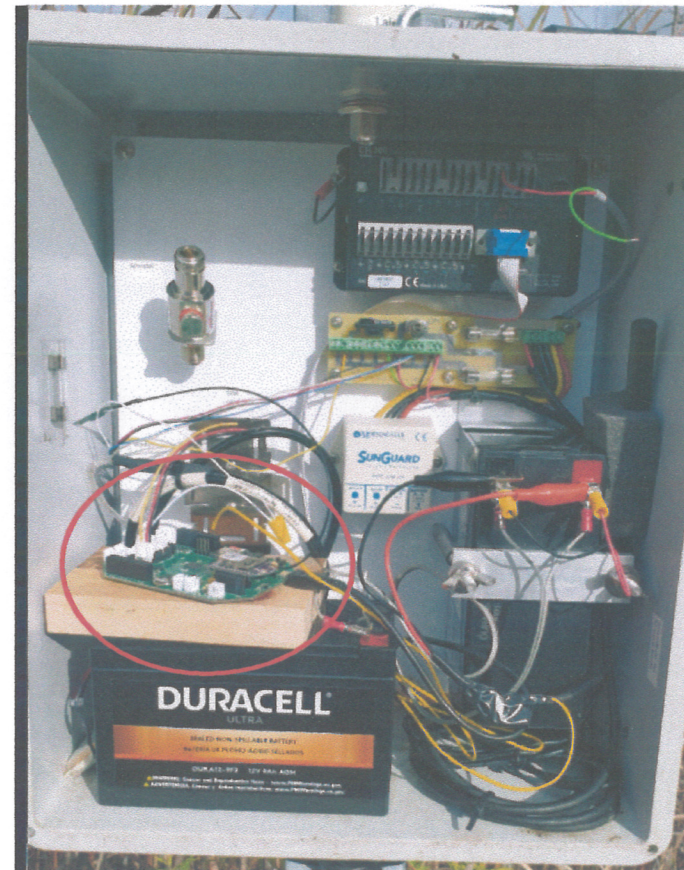


2019

- January – station at Narrows starts to fail intermittently.
  - No replacement parts are available since 3G modem was discontinued
- May – Narrows hardware (datalogger and modem) failed and replaced by new technology Version 1
  - Existing solar panel, sensor, battery continue to be used
  - County billed \$355
- November – Added a battery and removed old modem



May

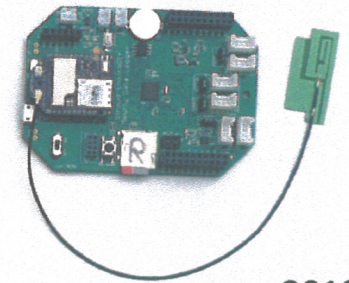
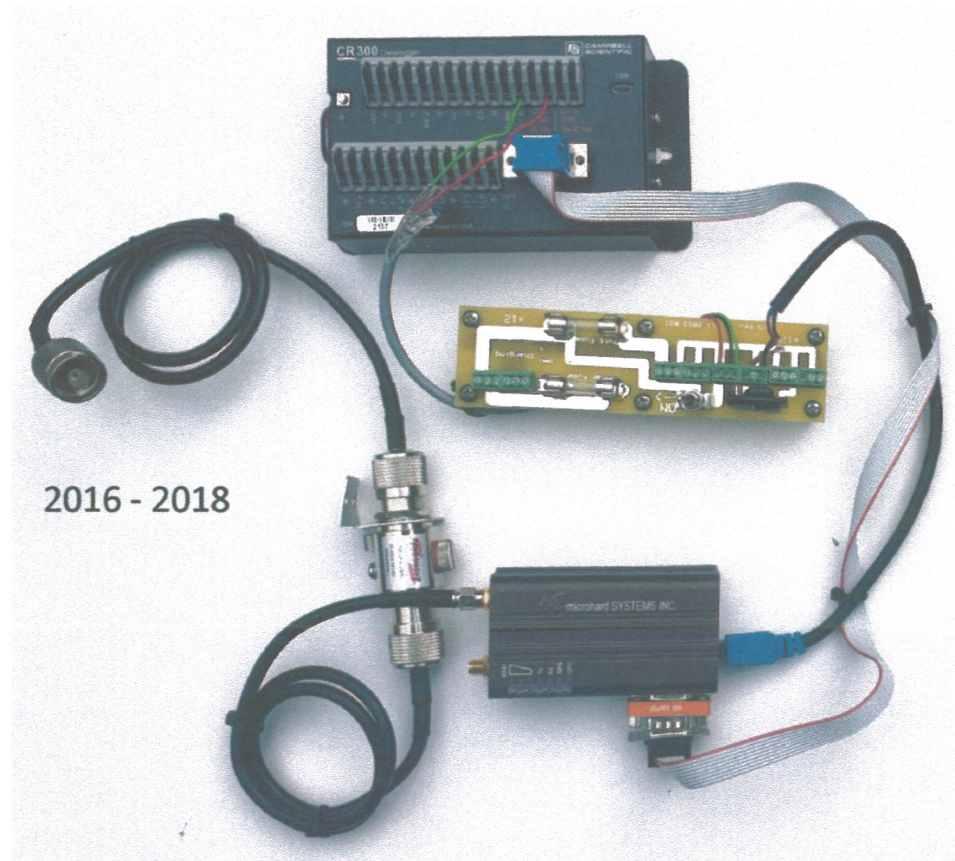
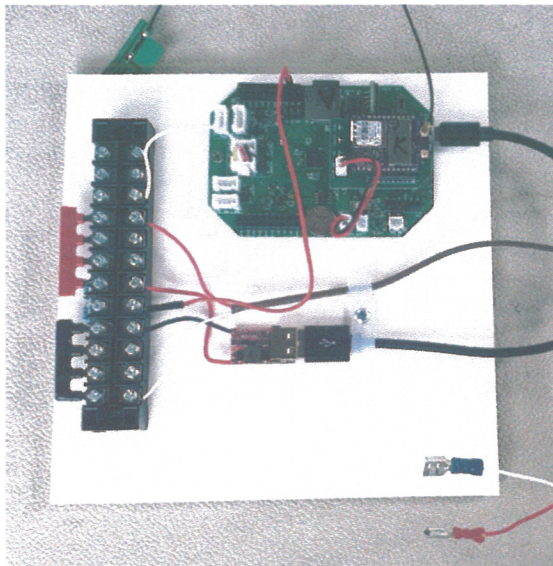


November

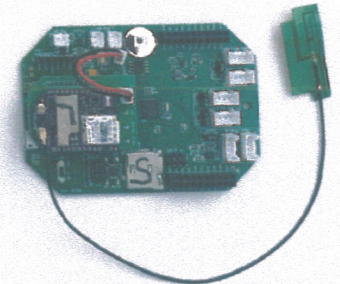


## Late 2019 to Early 2020

- Technology & software improved
- FRU Form factor developed



2020

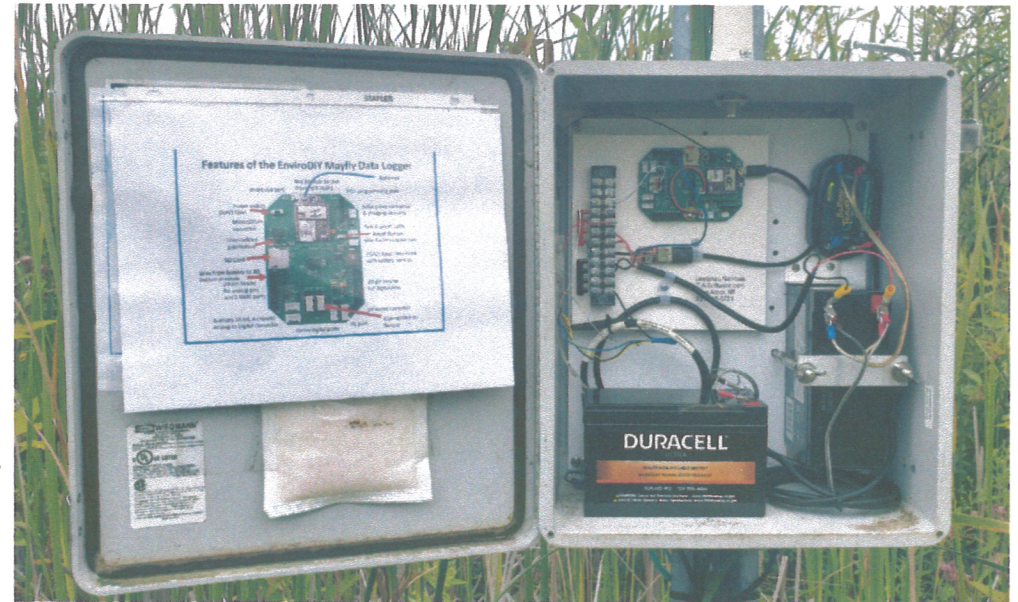


2020 FRU



2020

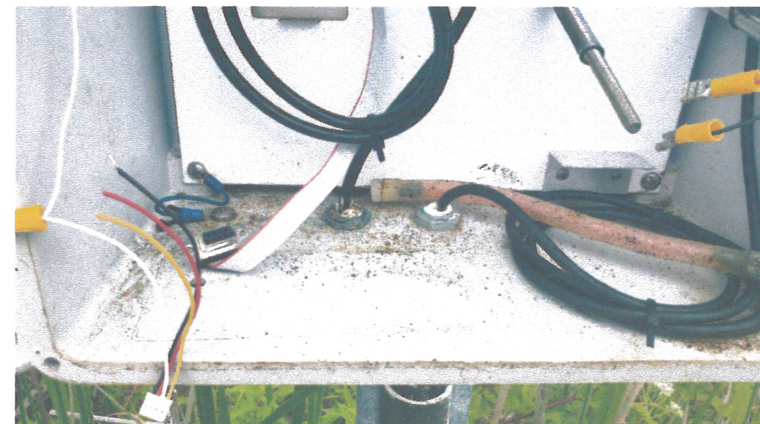
- May 2020 – software upgraded to Version 2 which includes additional hardware adapter - No charge
- July 2020
  - All old hardware removed from all enclosures
  - Dam and South Lake installations converted to new technology FRU
  - Dam gets new solar panel
  - Narrows upgraded to FRU form factor
  - County billed \$1063
  - **NO MORE PHONE BILLS**
- Enclosure at Narrows invaded by ants, gasket ruined, County orders replacement enclosure. To be installed soon.



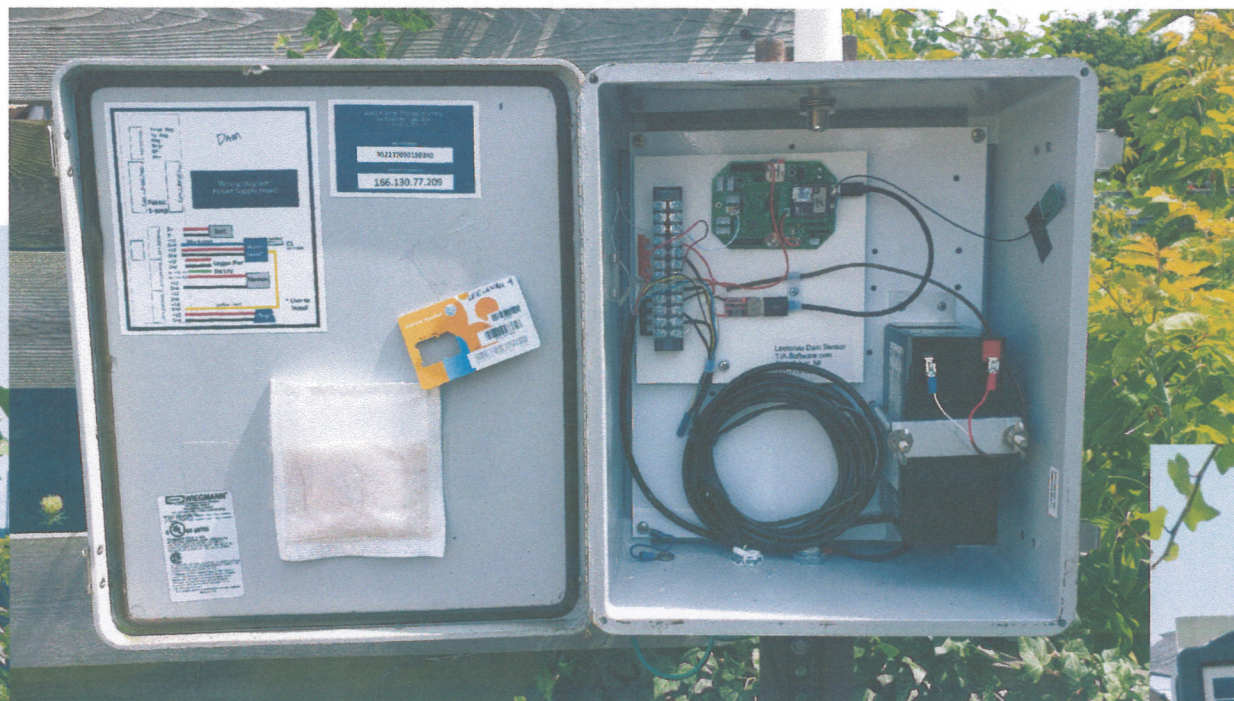
Leelanau Narrows Station  
September 2020



Enclosure  
Damage

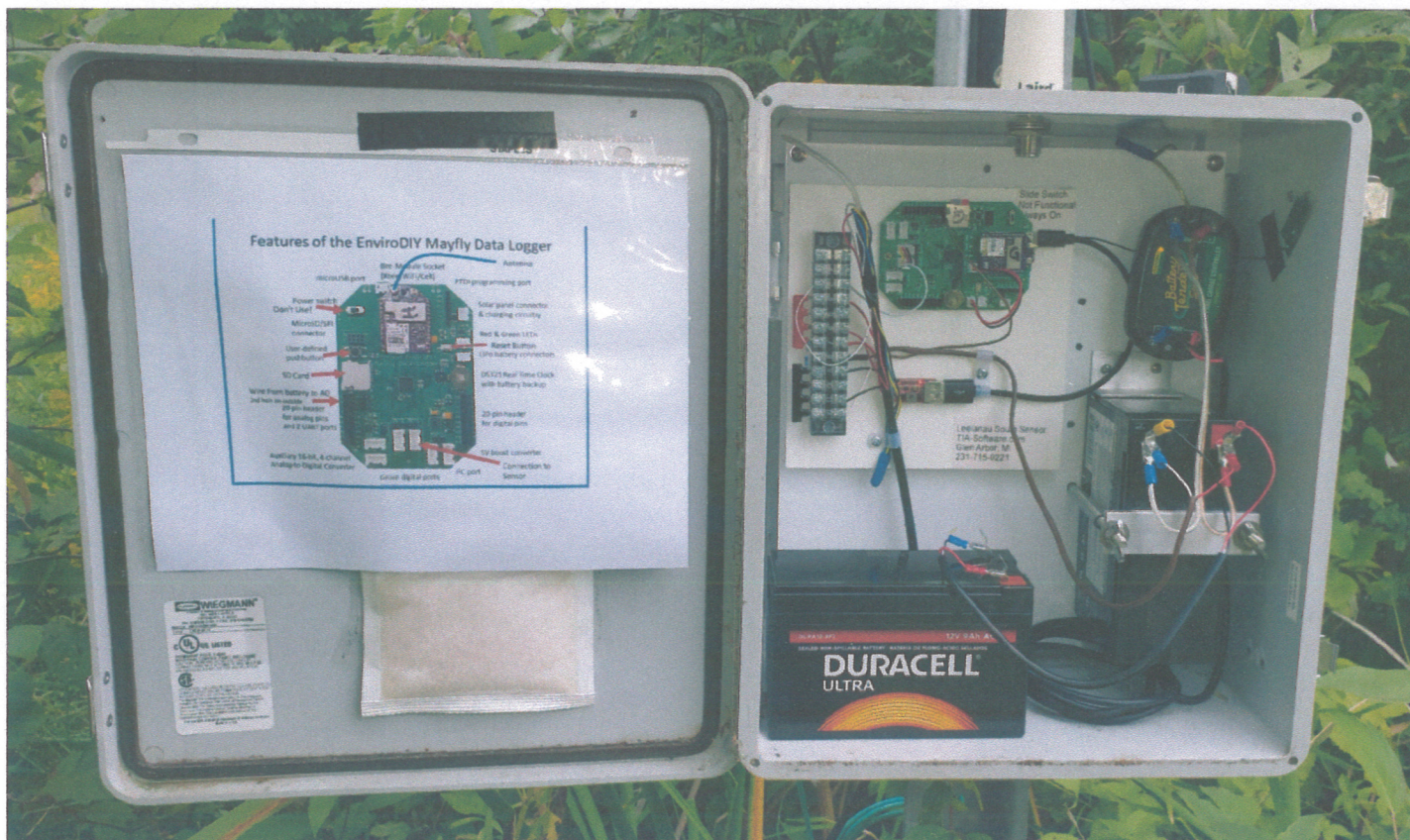






Leelanau Dam Station  
August 2020

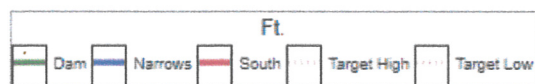
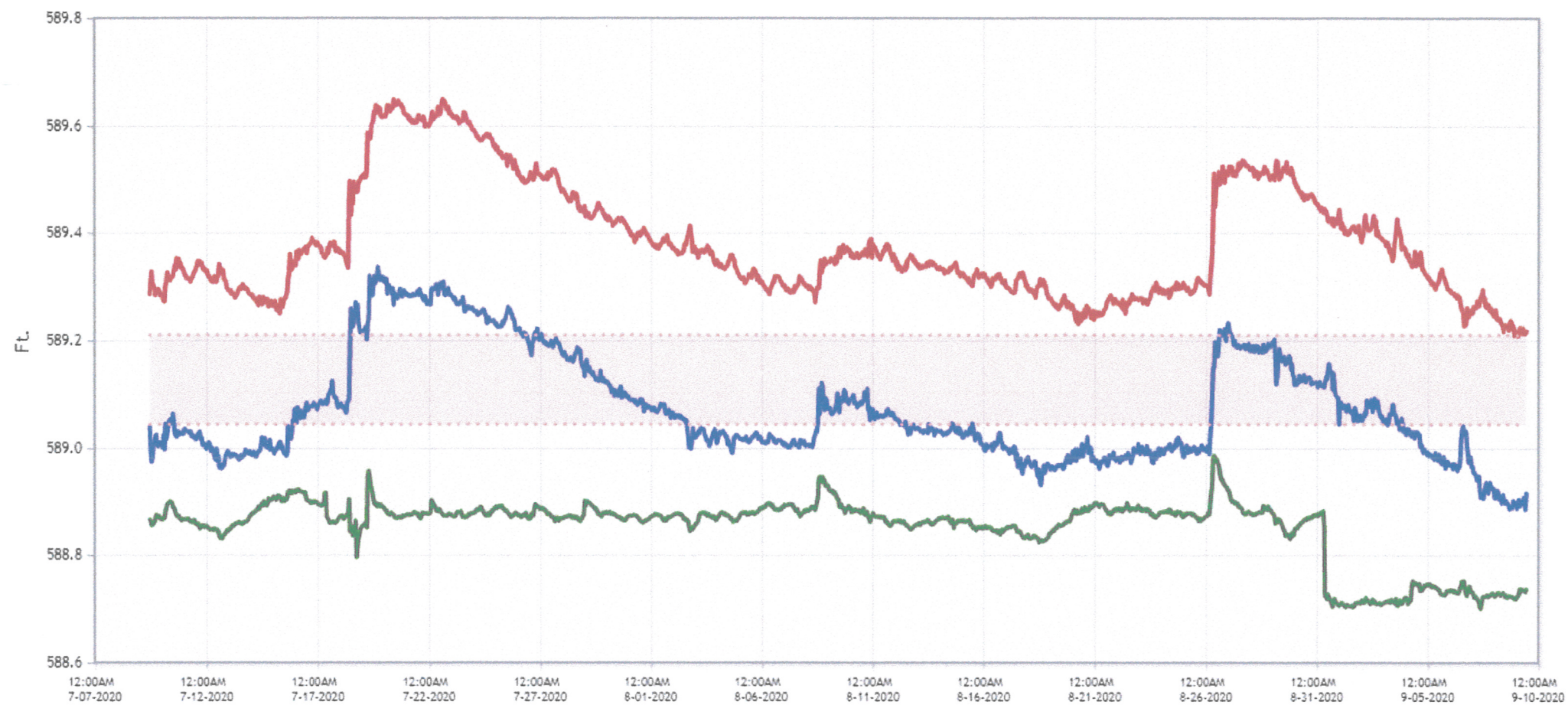




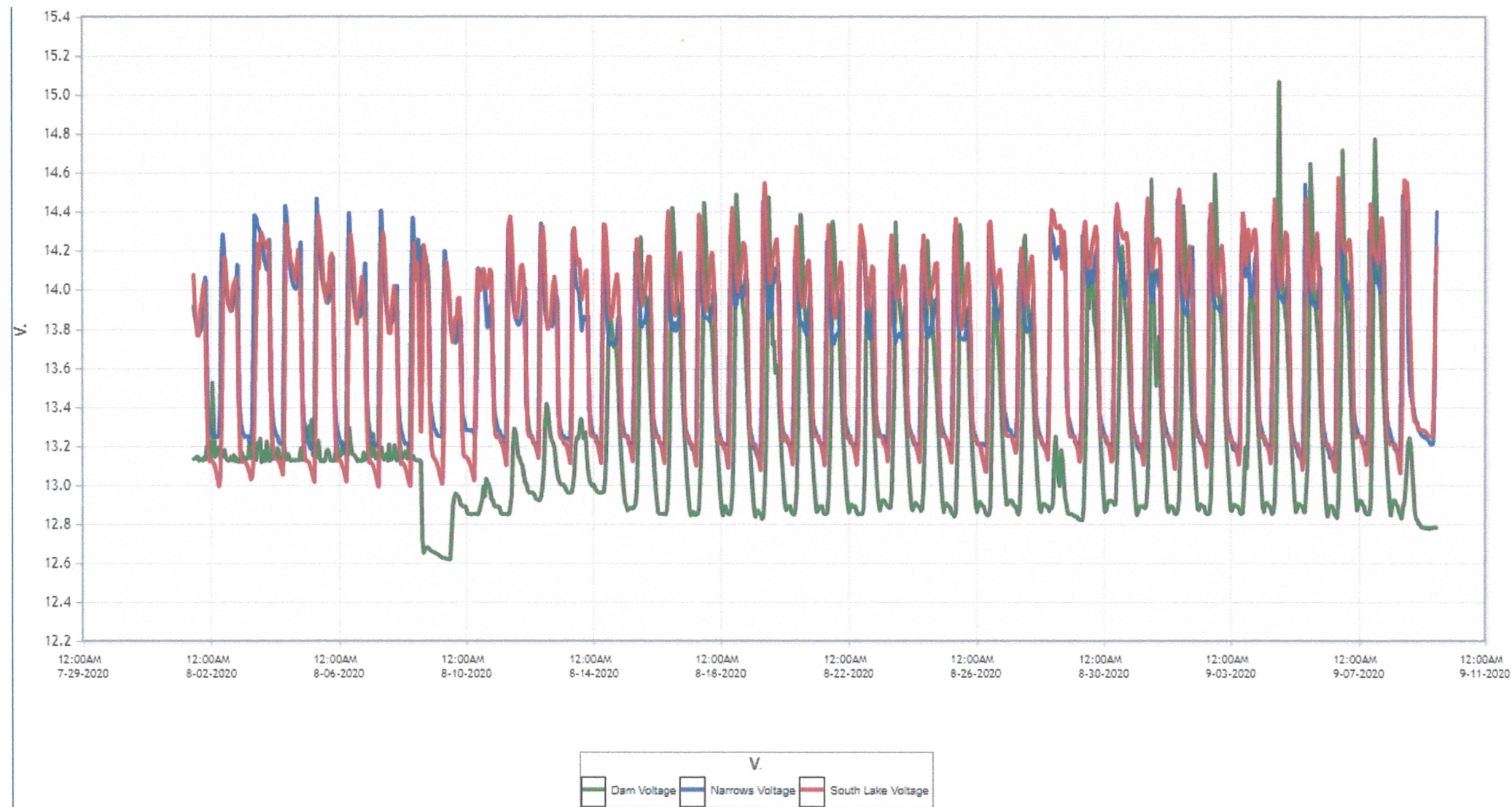
Leelanau South Lake Station  
September 2020



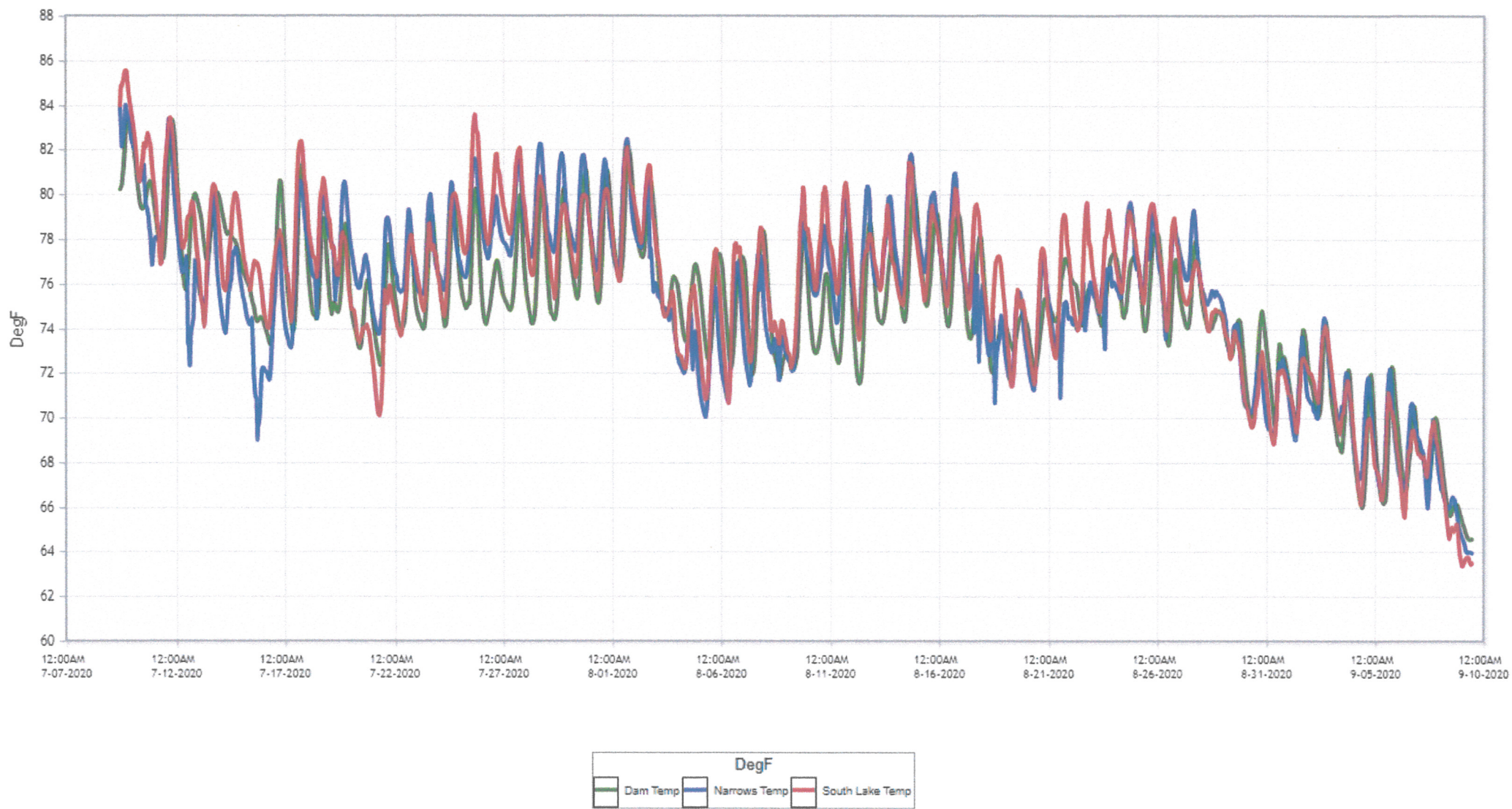














## Summary

- 2016 – LLLA pays for installations at Narrows, South Lake and Dam (~\$15,000), County agrees to cover maintenance and cellular phone charges.
- 2018 –
  - AT&T & Verizon announce 3G service to be discontinued.
  - TIA Software starts developing new technology – 4G communication and low power hardware
  - Initial installations of new technology at Crystal River Culverts #3 as test sites.
- January 2019 – station at Narrows starts to fail intermittently.
  - No replacement parts are available since 3G modem discontinued
- May 2019 –Narrows hardware (datalogger and modem) replaced by new technology Version 1
  - Existing solar panel, charge controller, sensor, battery continue to be used
  - County billed \$355
- May 2020 – software upgraded to Version 2 which includes additional hardware adapter
  - No charge
- July 2020
  - All old hardware removed from enclosures
  - Dam and South Lake installations converted to new technology FRU
  - Dam gets new solar panel
  - Narrows upgraded to FRU form factor
  - County billed \$1063
- Enclosure at Narrows invaded by ants, gasket ruined, County orders replacement enclosure. To be installed soon.
- September 2020
  - The solar panel charge controller replaced



# Backup Slides



## Background 2016 - 2018

- Powered by:
  - Solar Panel at Narrows & South Lake
  - Battery eliminator at Dam
- 3G cellular communication
  - Required phone line + static IP address
  - Website called station
- Used lots of power – required 2 batteries
- Hardware cost per station paid by LLLA
- Service fee paid by Leelanau County for Lake-Man.com:
  - Website for users
  - Data collection, processing & storage
  - Graphs to the hour
  - Analysis
  - Alerts
  - Links for LLLA website
- Maintenance fees paid by Leelanau County for:
  - Phone lines
  - Batteries



## 2019 & 2020

### 2019

1. January 2019 - Leelanau Narrows modem & datalogger experiencing intermittent errors, modem sent to Cal for repair/reprogram.. The modem was discontinued – no replacement.
2. May 2019 - System eventually fails for good. Narrows hardware replaced with new technology as only option.
  - i. 8/2019 - Billed for parts & installation - \$355
  - ii. 11/2019 – Billed for batteries - \$86
3. Technology working fine, so replaced at additional sites/lakes:
  - i. Crystal Lake Dam – 7/2019
  - ii. Glen Lake Narrows – 11/2019
  - iii. Glen Lake Dam – 11/2019

### 2020

1. 1-5/2020 saw problems with new hardware/software:
  - a) Inefficient 5v power converter
  - b) End-of-year Clock change
  - c) Modem firmware errors
2. 5/2020 - New Software + HW adapter developed & installed at the Narrows
3. 7/2020 - Old technology removed and new FRU installed at all 3 locations.
  - a) Dam gets solar panel
  - b) Itemized Bill – 8/18/2020 \$1063
  - c) Enclosure at Narrows invaded by ants and ruined gasket. County ordered replacement yet to be installed.
4. 9/2020 charge controllers replaced at Narrows and South Lake
5. 9-10/2020 Duck Lake and Little Travers Lake installing 4 stations using this technology.



**TIA Software, LLC**

**INVOICE**

**SOLD TO:**

Leelanau County - Dam Authority  
Attn: Steve Christensen

**INVOICE NUMBER** 330

**INVOICE DATE** June 30, 2020

QUANTITY	DESCRIPTION		AMOUNT
1	Lake-Man Software / Installation and Adjustment Lake level monitoring, data retrieval & storage, analysis, and presentation	Installment 1 of 2 for 2020	\$1,000.00
		SUBTOTAL	1,000.00
			\$1,000.00
			PAY THIS AMOUNT

**DIRECT ALL INQUIRIES TO:**

Calvin Killen

(231)715-0221

[ckillen@tia-software.com](mailto:ckillen@tia-software.com)

**MAKE ALL CHECKS PAYABLE TO:**

TIA Software, LLC

5897 Northwood Dr.

Glen Arbor, MI 49636



TIA Software, LLC

INVOICE

**SOLD TO:**

Leelanau County - Dam Authority  
Attn: Steve Christensen

INVOICE NUMBER 329

INVOICE DATE February 7, 2020

QUANTITY	DESCRIPTION		AMOUNT
1	Lake-Man Software / Installation and Adjustment Lake level monitoring, data retrieval & storage, analysis, and presentation	Installment 2 of 2 for 2019	\$1,000.00
		SUBTOTAL	1,000.00
			\$1,000.00
			PAY THIS AMOUNT

**DIRECT ALL INQUIRIES TO:**

Calvin Killen

(231)715-0221

[ckillen@tia-software.com](mailto:ckillen@tia-software.com)

**MAKE ALL CHECKS PAYABLE TO:**

TIA Software, LLC

5897 Northwood Dr.

Glen Arbor, MI 49636

**TIA Software, LLC**

118 Mark Drive  
Hollidaysburg, PA 16648-9266

**INVOICE****Description:**

Update Lake Leelanau sensor  
stations (Dam and South Lake)  
to latest hardware versions.

Steve Christensen  
8527 E Government Ctr Dr  
Suite 205  
Suttons Bay, MI 49682-9742

Invoice Number: 331

Invoice Date: August 18, 2020

DESCRIPTION	QTY	RATE	AMOUNT
Mayfly card	2	\$60.00	\$120.00
Modem card	2	\$69.00	\$138.00
Solar panel	1	\$31.00	\$31.00
Modem daughter card	2	\$15.00	\$30.00
SIM card	2	\$5.00	\$10.00
SD card	2	\$5.20	\$10.40
Antenna	2	\$3.00	\$6.00
Terminal strip	2	\$2.60	\$5.20
Grove connector	2	\$2.20	\$4.40
12v-5v charger	2	\$1.60	\$3.20
USB cable	2	\$1.50	\$3.00
Coin battery	2	\$0.70	\$1.40
Resistors	2	\$0.40	\$0.80
Labor: build, assembly, programming	2	\$100.00	\$200.00
Labor: installation at Dam	3	\$100.00	\$300.00
Labor: installation at South Lake	2	\$100.00	\$200.00
<b>TOTAL:</b>			<b>\$1,063.40</b>

**TECHNICAL QUESTIONS:**

Calvin Killen  
(231) 715-0221  
ckillen@tia-software.com

**BILLING QUESTIONS:**

David Fisher  
(601) 724-2119  
dfisher@tia-software.com

**MAKE CHECKS PAYABLE TO:**

TIA Software, LLC  
118 Mark Drive  
Hollidaysburg, PA 16648-9266



# TIA Software, LLC

# INVOICE

**SOLD TO:**

Leelanau County - Dam Authority

Attn: Steve Christensen

INVOICE NUMBER 328

INVOICE DATE November 5, 2019

QUANTITY	DESCRIPTION	AMOUNT
2	12v 9AH Batteries replacement at Narrows Sensor Station	\$85.84
SUBTOTAL		\$85.84
		\$85.84
		PAY THIS AMOUNT

**DIRECT ALL INQUIRIES TO:**

Calvin Killen

(231)715-0221

[ckillen@tia-software.com](mailto:ckillen@tia-software.com)

**MAKE ALL CHECKS PAYABLE TO:**

TIA Software, LLC

5897 Northwood Dr.

Glen Arbor, MI 49636

TIA Software, LLC

INVOICE

**SOLD TO:**

Leelanau County - Dam Authority

Attn: Steve Christensen

INVOICE NUMBER 327

INVOICE DATE August 8, 2019

QUANTITY	DESCRIPTION		AMOUNT
1	Repair of Narrows Sensor for lake level monitoring		\$355.00
		SUBTOTAL	\$355.00
			\$355.00
			PAY THIS AMOUNT

**DIRECT ALL INQUIRIES TO:**

Calvin Killen

(231)715-0221

[ckillen@tia-software.com](mailto:ckillen@tia-software.com)

**MAKE ALL CHECKS PAYABLE TO:**

TIA Software, LLC

5897 Northwood Dr.

Glen Arbor, MI 49636




Fri 11/1/2019 8:22 AM

John Popa <jjpopa@charter.net>

**Re: Narrows Batteries going bad**

To: Calvin Killen

 You replied to this message on 11/1/2019 8:30 AM.

Sure. Thanks for checking it. We use that one to measure the normal lake level. Yes, send me the receipt. Is this the one that you adjusted/changed so that it does not have to send out as often...and or at night?

**From:** Calvin Killen

**Sent:** Friday, November 1, 2019 7:44 AM

**To:** John Popa

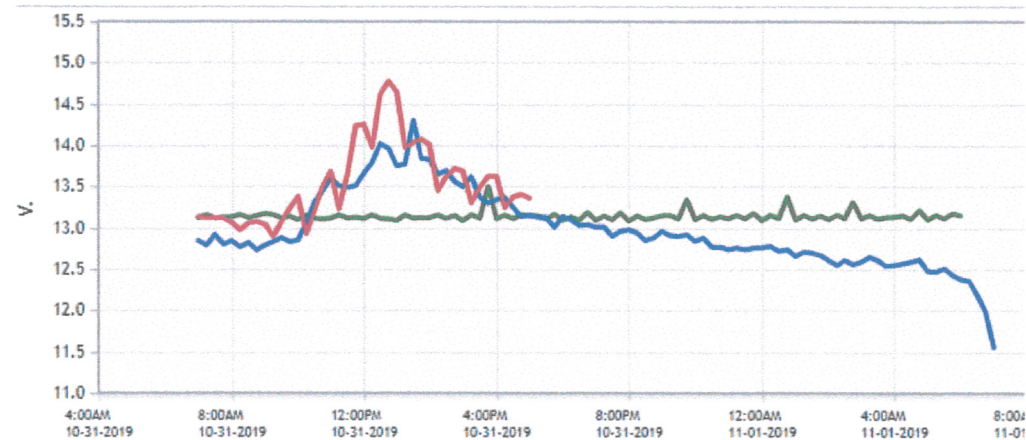
**Cc:** Steve Christensen ; Jerry Culman

**Subject:** Narrows Batteries going bad

John, the Narrows batteries have reached their end-of-life. We'll get an ALERT from Lake-Man soon. I expect the logging of data will continue but transmissions will stop probably today.

I'll replace them in the next day or so and send you the receipt. OK?

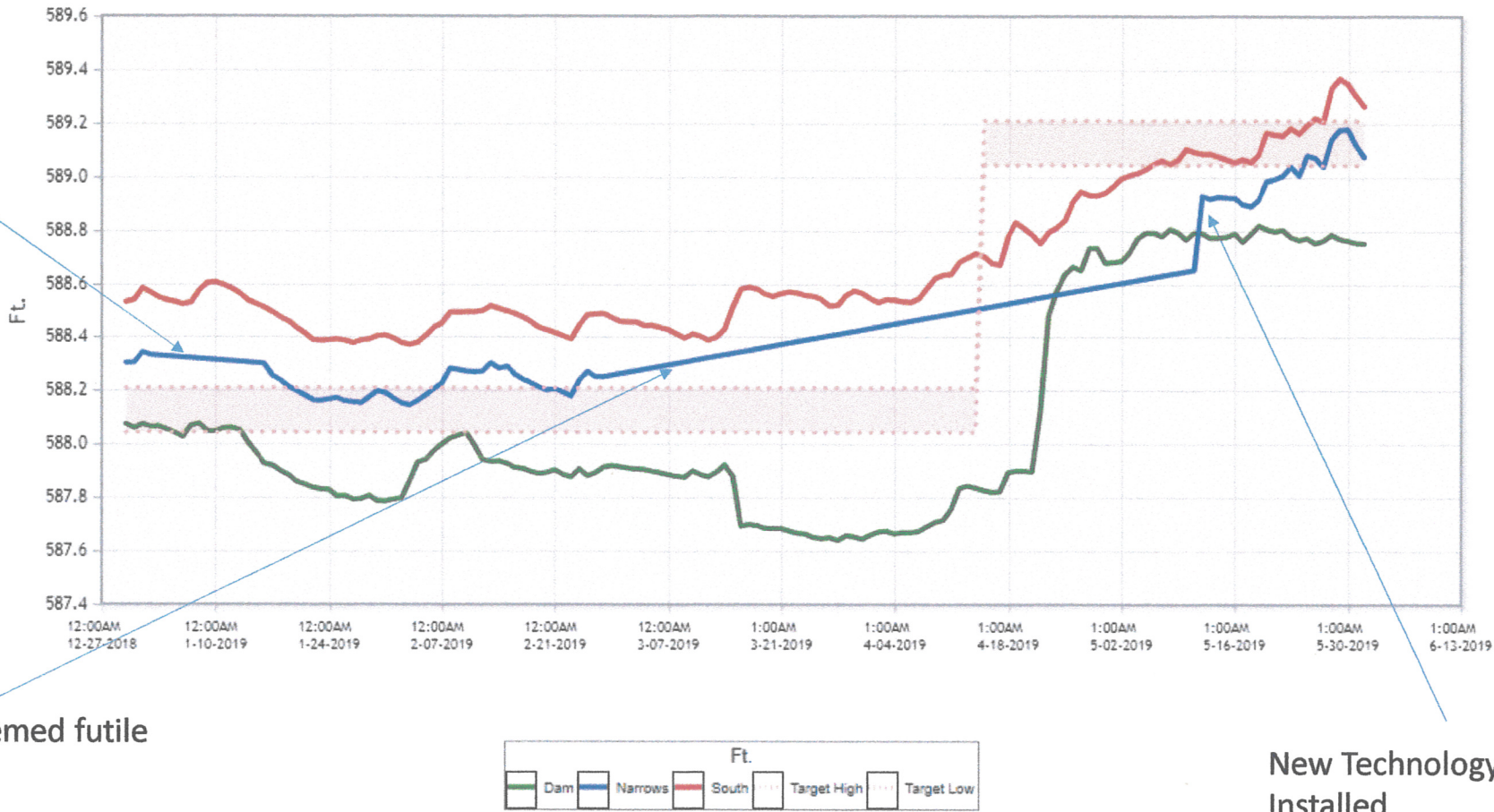
Cal



No Data  
modem  
sent to Cal  
In FL for  
repair

No Data  
Repair deemed futile

New Technology  
Installed





Sat 5/11/2019 5:04 PM

John Popa <jjpopa@charter.net>

**Re: Narrows**

To: Calvin Killen

OK Cal...if you need help or a companion, let me know.

---

Jerry and Steve...we attempted to get the narrows up and running...just when we think we found the problems (plug, etc.) it still does not work.

John

**From:** Calvin Killen

**Sent:** Saturday, May 11, 2019 3:51 PM

**To:** John Popa

**Subject:** Narrows

John, the equipment failed again. I went back and saw that the modem wasn't working. The datalogger has problems too. Monday or Tuesday I'll install a complete new system.

Cal

**RE: Dam Authority Meeting Proposal**

To: 'John Popa'

OK.

Let me know if you want any documentation for your meeting this week.

Cal

**From:** John Popa [<mailto:jjpopa@charter.net>]

**Sent:** Monday, October 28, 2019 3:02 PM

**To:** Calvin Killen <[ckillen@charter.net](mailto:ckillen@charter.net)>

**Subject:** Re: Dam Authority Meeting Proposal

OK....I agree with you on the scheduleing. We will wait until spring, so I will get with you prior to april and talk about ording things.

Have a great winter if I don't hear from you.

I was in the UP for a week, so I did not get computer or phone messages.

John

**From:** Calvin Killen

**Sent:** Thursday, October 24, 2019 3:33 PM

**To:** John Popa

**Subject:** Dam Authority Meeting Proposal

John,

**NEW TECHNOLOGY:**

I explained on the phone and in my previous note that it's too late this year to install the new technology. It would be well into November before I could procure the parts, tested them and installed them. I'm leaving for Florida the last week of November and won't be back until late April. Even if I could get the parts installed this year, I want to be around for about a month to make sure everything is working OK. The last think I want to do is have a problem which prevents us from collecting data all winter.

**SOLAR PANEL**

As for your desire to install a solar panel at the Dam, we can do that. But WHEN we do it depends on how often we have a problem with the current configuration. As you know, solar panels can collect snow and require someone (or wind or warm temperature) to clear them. If not cleared, the battery runs down and we get into real trouble with the current technology like we had at the Narrows last year. So the question is, would you need to spend more time/effort clearing snow or resetting the outdoor GFI outlet in the winter? From what I recall, the outdoor outlet is more reliable that the solar panel and we should wait until spring to install it with the new technology.