Hawaii National Marine Renewable Energy Center (HINMREC)

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Task 4: Environmental Impact Monitoring at WETS

WETS Acoustic Measurement Field Reports

Prepared by:
Sea Engineering, Inc.

Prepared for:
Hawaii Natural Energy Institute, University of Hawaii

2015 - 2017

HNEI
Hawai'i Natural Energy Institute
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FIELD REPORT

DATE:	January 27th , 2015	
TO:	Luis Vega	
FROM:	Patrick Anderson, Marc Ericksen	
SUBJECT:	WETS Task 1A Field Report - Acoustics	

Date: November 10, 2014

Locations & Activity: Hydrophone Deployment at 30m Test Site

Crew: Sea Engineering - Andrew Rocheleau, Tyler Borge, Rich Coley and Wyatt Redongo
University of Hawaii - Eva-Marie Nosal, Tom Fedenczuk

Vessel: Bob R

Work: Divers and crew departed from Heeia Kea small boat harbor in SEI's 27ft whaler (Bob R) and proceeded to the WETS 30m berth. The hydrophone system consisted of a battery capsule, and 4 hydrophone units secured to a 4ft by 8ft fiberglass grate base weighted with lead.

The hydrophone system was deployed by divers and the individual hydrophones were positioned on the seafloor at locations shown in the table below. The base was oriented parallel to the prevailing wave approach direction. Following deployment, a diver recall system was used to emit an acoustic signal into the water to calibrate and verify system operation.

Description	Coordinates	
Hydrophone center	21° 27' 56.8801" N	157° 45' 0.9001" W
NE Sounding	21° 27' 57.7801" N	157°45' 2.1" W
NW Sounding	21° 27' 56.7001" N	157° 44' 59.58" W
SW Sounding	21° 27' 54.7201" N	157° 45' 0.6003" W
SE Sounding	21° 27' 55.5" N	157° 45' 2.88" W

On November 14th, 2014 the hydrophone system was recovered. Upon recovery to the vessel it was noted that one of the hydrophone batteries was off-gassing.

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FIELD REPORT

DATE:	April 6th , 2015	
TO:	Luis Vega	
FROM:	Tor Harris	
SUBJECT:	WETS Task 1B Field Report - Acoustics With UW	

Date: March 24, 2015

Locations & Activity: UW Hydrophone Deployment at 30m Test Site, Drifting Hydrophone Buoy Deployments at All WETS Locations

SEI Personnel: Tor Harris, Patrick Anderson, Kydd Pollock
University of Washington Personnel: Brian Polagye, Alex deKlerk
HNEI Personnel: Luis Vega, Keith Bethune

Vessel: Huki Pono

Work:

SEI, UW, and UH personnel boarded SEI vessel Huki Pono at Heeia Kea small boat harbor. The team transited out to the 30 meter test site and deployed UW's sea spider, equipped with three hydrophones. The sea spider was deployed using a winch and an acoustic release, and can be seen in Figure 1. The sea spider was deployed at 21˚27' 58.8635" N, 157˚45' 8.4396" W.

After deployment of the sea spider, the team conducted two drift deployments of the UW drifting buoy hydrophone. The drifting hydrophones consist of a spare shaped buoy with a spherical float. The spar buoy has a weather station, GPS logger, and hydrophone attached to it. Figure 2 shows a deployed UW drifting buoy hydrophone near mooring float A3. Whales were observed near the WETS site, exhibiting normal behavior.

Date: March 25, 2015

Locations & Activity: UW Drifting Hydrophone Buoy Deployments at All WETS Locations

SEI Personnel: Tor Harris, Kydd Pollock
University of Washington Personnel: Brian Polagye, Alex deKlerk
HNEI Personnel: Keith Bethune

Vessel: Huki Pono

Work:

SEI, UW, and UH personnel boarded SEI vessel Huki Pono at Heeia Kea small boat harbor. The work was started in the afternoon so the weather conditions were different than those of the previous day. The team transited out to the 30 meter test site and conducted two drift deployments of the UW drifting buoy hydrophone. One deployment was conducted at the 60 and 80 meter site, and one deployment was conducted at the 30 meter site. Whales were observed near the WETS site, exhibiting normal behavior.

Date: March 26, 2015

Locations & Activity: UW Hydrophone Deployment at 30m Test Site, Drifting Hydrophone Buoy Deployments at All WETS Locations

SEI Personnel: Tor Harris, Patrick Anderson, Kydd Pollock
University of Washington Personnel: Brian Polagye, Alex deKlerk
HNEI Personnel: Luis Vega, Keith Bethune

Vessel: Huki Pono

Work:

SEI, UW, and UH personnel boarded SEI vessel Huki Pono at Heeia Kea small boat harbor. The team transited out to the 30 meter test site and recovered UW's sea spider, equipped with three hydrophones. The sea spider was recovered using a winch and an acoustic release with pop up floats. The team then transited back into the harbor and offloaded data. After offloading data and preparing the sea spider for redeployment, the team went out to the 30 meter test site and redeployed the sea spider. Deployment was conducted using an acoustic release and winch. The coordinates of the UW sea spider are 21˚27' 59.4329" N, 157˚45' 7.9897" W. The sea spider instrument package is planned to remain deployed for 3 months.

After deployment of the sea spider, the team conducted two drift deployments of the UW drifting buoy hydrophone. One deployment was conducted at the 60 and 80 meter site, and one deployment was conducted at the 30 meter site. Whales were observed near the WETS site, exhibiting normal behavior.

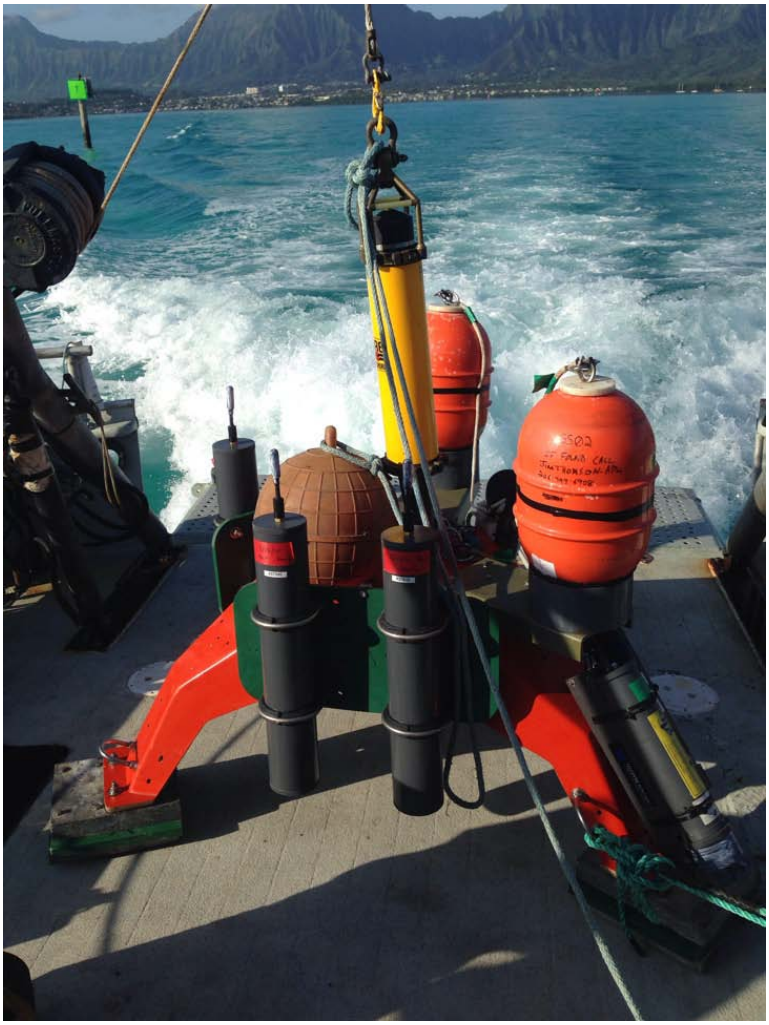

Figure 1 UW Sea Spider, Acoustic Release, and Winch

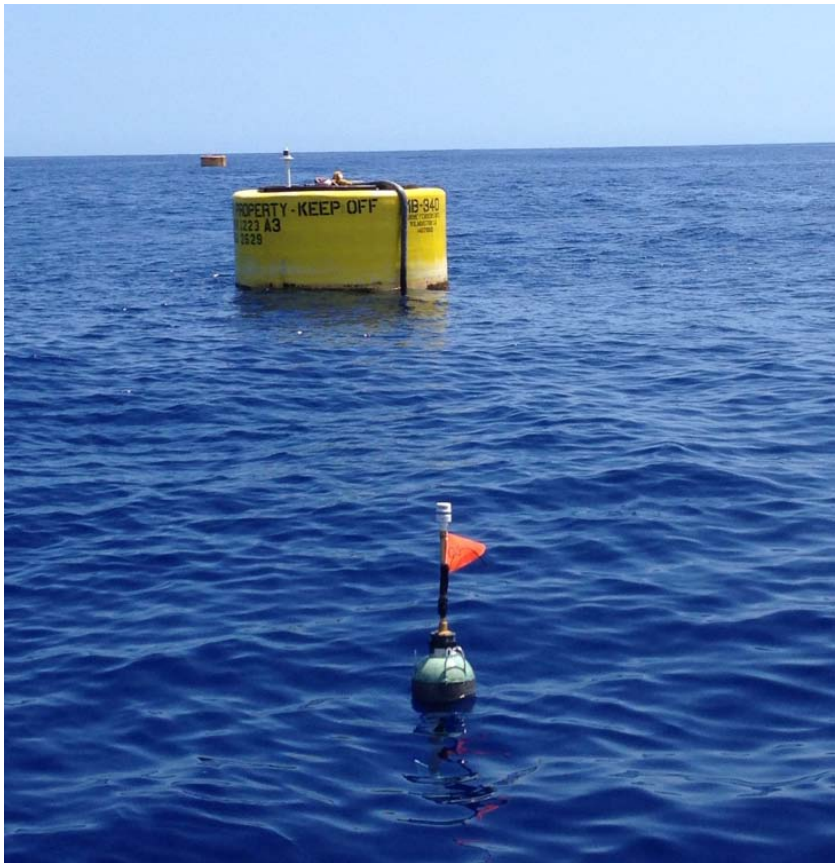

Figure 2 Deployed UW Drifting Buoy Hydrophone

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FIELD REPORT

DATE:	July 20th , 2015	
TO:	Luis Vega	
FROM:	Tor Harris	
SUBJECT:	WETS Task 1C Field Report - Acoustics With UW	

Date: July 6, 2015

Locations & Activity: UH Sea Spider Hydrophone and SEI ADCP Deployment at 30m Test Site. UW Sea Spider Hydrophone Recovery at 30m Test Site.

SEI Personnel: Tor Harris, Patrick Anderson, Ryan Wagner
University of Washington Personnel: Brian Polagye, Alex de Klerk, James Joslin

Vessel: Huki Pono

Work Activities Included the Following:

- SEI and UW personnel boarded SEI vessel Ambar at Heeia Kea small boat harbor, transited out to the 30m test site, and transferred onto SEI vessel Huki Pono to begin work.
- The UH sea spider, equipped with three hydrophones was deployed at the 30m test site. Deployment was accomplished by using a winch and an acoustic release.
- The 300kHz ADCP originally deployed at 80m water depth was retrieved on 6/4/2015 and returned to the manufacturer for repair of a faulty plug. This ADCP was redeployed at the 30m test site during the UW operations. The ADCP was lowered to the bottom using a winch and a slip line.
- The UW sea spider that was deployed on 3/26/2015 was recovered. A photo of the recovery can be seen in Figure 1. Recovery was accomplished by use of an acoustic release and winch.
- Differential GPS was used to mark the locations of all deployed instruments. Locations can be seen in Table 1 at the end of this report.

Date: July 7, 2015

Locations & Activity: UW Drifting Hydrophone Buoy Deployments at 30m Test Site

SEI Personnel: Tor Harris, Patrick Anderson
University of Washington Personnel: Brian Polagye, Alex de Klerk, James Joslin

Vessel: Bob R

Work:

SEI and UW personnel boarded SEI vessel Bob R at Heeia Kea small boat harbor. The team transited to the 30 meter test site and conducted numerous drift deployments of the UW drifting buoy hydrophones. The drifting hydrophones consist of a spar shaped buoy with a spherical float. The spar buoy has a weather station, GPS logger, inertial motion unit (IMU) and hydrophone attached to it. The buoy is deployed upwind/current of the area of interest, and drifts down through the given area constantly logging information. Figure 2 shows a drifting buoy hydrophone at the 30 meter test site, with the Azura buoy behind.

Date: July 8, 2015

Locations & Activity: UW Sea Spider Hydrophone Deployment at 30m Test Site, Drifting Hydrophone Buoy Deployments at 30m Test Site

SEI Personnel: Tor Harris, Patrick Anderson, Ryan Wagner
University of Washington Personnel: Brian Polagye, Alex de Klerk, James Joslin

Vessels: Huki Pono, Bob R

Work:

SEI and UW personnel boarded SEI vessel Huki Pono at Heeia Kea small boat harbor. The team transited to the 30 meter test site and deployed UW's sea spider, equipped with three hydrophones. The sea spider was deployed using a winch and an acoustic release. Differential GPS was used to mark the deployment location, which can be seen in Table 1 at the end of this report. The team then transited back into the harbor and mobilized onto SEI's smaller vessel Bob R. Once on the Bob R, SEI and UW personnel conducted numerous drift deployments of the UW drifting buoy hydrophones around the 30m site.

Date: July 9, 2015

Locations & Activity: UW Drifting Hydrophone Buoy Deployments at 30m Test Site

SEI Personnel: Tor Harris
University of Washington Personnel: Brian Polagye, Alex de Klerk, James Joslin
HNEI Personnel: Keith Bethune

Vessel: Bob R

Work:

SEI, UH and UW personnel boarded SEI vessel Bob R at Heeia Kea small boat harbor. The team transited to the 30 meter test site and conducted numerous drift deployments of the UW drifting buoy hydrophones. After verifying sufficient spatial coverage around the 30 meter test site, the UW drifting buoys were deployed near the UH Waverider buoy at the 60 meter test site. The purpose of this deployment was to use data from the UH Waverider buoy to verify the accuracy of the IMU's in the drifting buoy hydrophones, as well as to collect more acoustic background data.

Table 1. Deployment Locations

	N	W
UH Sea Spider	21° 27' 59.2680"	157° 45' 00.6299"
WETS ADCP	21° 27' 56.1738"	157° 45' 05.0563"
UW Sea Spider	21° 27' 58.8192"	157° 45' 04.5443"

(Coordinates were collected using a Trimble SPS 461 U.S. Coast Guard Differential GPS)

Figure 1. UW Sea Spider Recovery

Figure 2. UW Drifting Buoy Hydrophone at 30 Meter Test Site

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FIELD REPORT

DATE:	April 6, 2015	
TO:	Luis Vega	
FROM:	Patrick Anderson	
SUBJECT:	WETS Task 1D and 1E Field Report - Acoustics	

Deployment Date: January 21st, 2015
First Recovery Attempt Date: February 20th, 2015
Second Recovery Attempt Date: February 26th, 2015

Locations & Activity: Second Hydrophone Deployment at 30m Test Site

Deployment Personnel: Sea Engineering - Patrick Anderson, Tor Harris,
University of Hawaii - Eva-Marie Nosal, Tom Fedenczuk, Brendan Rideout

Recovery Personnel: Sea Engineering, Patrick Anderson, Tor Harris, Ryan Wagner
Divers: Andrew Rocheleau, Kyle Myers
University of Hawaii - Eva-Marie Nosal, Tom Fedenczuk,

Deployment Vessel: Bob R
RecoveryVessel: Huki Pono

Deployment:

On January 21st, 2015 the crew departed from Heeia Kea small boat harbor in SEI's 27ft whaler (Bob R) and proceeded to the WETS 30m berth. The new hydrophone system consisted of an anchor joined to multiple pressure housings by a tether. The housings contained the batteries, electronics, and hydrophones.

The hydrophone system was deployed by using a slip line run from the bow cleat to the stern cleat on the Bob R and slowly lowered to the seafloor. This is shown in Figure 1which also shows the hydrophone anchor lifted by the Bob R.'s davit wench. Once off the deck and over the water the anchor is held by a poly line tied around the davit's main support. Finally, when the hydrophone is connected to the anchor the assembly is released from the davit entirely and slowly lowered to the seafloor.

Throughout the duration of the deployment the crew kept a watchful eye out for endangered species. During the time between when we arrived at the 30m site and the deployment of the hydrophone we did spot some dolphins far in the distance. There was a pod

of about 7 dolphins; unfortunately, their species could not be determined due to distance away from our vessel. This observation was reported in the Endangered Species Observation Log.

Figure 1 Hydrophone Anchor Deployment

The position of the hydrophone is shown in the table below.

Description	Coordinates	
Hydrophone	21° 27.920481' N	157° 45.004559' W

Recovery:

On February 20th, 2015 the first attempt to recover the hydrophone using SEI's 22

foot Whaler. The outing was unsuccessful because of issues with the acoustic release system and eventually the operation had to be cut short due to rain and the likelihood degrading weather conditions.

On February 26th, 2015 the crew mobilized out of Heeia Kea Boat Ramp onto the Huki Pono. An ADCP was recovered first and then an attempt to recover the hydrophone using the acoustic release. After the acoustic release system was unable to connect with the hydrophone, an attempt was made to use SEI's ROV to manually activate the hydrophone release. A magnet was attached to a PVC pipe and placed in the bracket to for the manipulator. Unfortunately, the ROV had a high voltage trip and was not usable. Finally divers needed to be used release the hydrophone, which required a diver to place a magnet on the side of the hydrophone to activate the hydrophone release. The divers were provided by Sea Engineering Inc. and were Andrew Rocheleau and Kyle Myers. Once released the hydrophone ascended to the surface and was recovered onto the Huki Pono. The anchor was recovered by attaching the recovery line to a winch and spooling it up from the seafloor.

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FIELD REPORT

DATE:	March 1, 2016	
TO:	Luis Vega	
FROM:	Patrick Anderson	
SUBJECT:	WETS Task 1F Field Report – Acoustic Measurements with University of Washington	

Date: January 12, 2016
Locations & Activity: SWIFT Hydrophone Drifts around the Azura WEC
SEI Personnel: Patrick Anderson, Kydd Pollock
University of Washington Personnel: Brian Polagye, Paul Murphy
HNEI Personnel: Keith Bethune
Vessel: Huki Pono
Work Activities Included the Following:

- SEI, UW, HNEI personnel boarded SEI' Huki Pono at Heeia Kea small boat harbor, transited out to the 30m test site.
- Multiple drifts of the SWFT Hydrophones were conducted around the Azura WEC at the 30m mooring. Additional drifts were determined to be unnecessary due to the similarity of wave conditions to previous SWIFT hydrophone deployments. Figure 1 shows the Azura and two SWIFT Hydrophones. Sea conditions were calm during the deployment.
- Two CTD casts were conducted by SEI personnel at the A3 buoy and the 30m site.

Figure 1 Azura and SWIFT Hydrophones

Date: January 13, 2016

Locations & Activity: Diver installation of SLOW hydrophone at the 30m site. UW and UH Sea Spider Hydrophones were deployed at the 30m site. Recovery of the SEI ADCP from the 30m Test Site.

SEI Personnel: Patrick Anderson, Kyle Myers
University of Washington Personnel: Brian Polagye, Paul Murphy
HNEI Personnel: Keith Bethune

Vessel: Huki Pono

Work Activities Included the Following:

- SEI, UW, HNEI personnel boarded SEI' Huki Pono at Heeia Kea small boat harbor, transited out to the 30m test site.
- A SEI diver was used to deploy the SLOW hydrophone. It was attached to the top of the AB mooring at the 30m test site. The SLOW hydrophone is shown in Figure 2.
- The UW Sea Spider was deployed using the A-frame winch and a load bearing acoustic release at 11:39 AM at the following position:
    - 21°27'53.222" N 157°45'2.355" W
- The UH Sea Spider was deployed using the A-frame winch and a load bearing acoustic release at 12:20 at the following position:
    - 21° 27' 56.446" N 157° 44' 58.928" W
    - The UH Sea Spider is shown in Figure 3.
- Differential GPS was used to mark the locations of all deployed instruments. The instrument locations are presented in Figure 4.
- The SEI ADCP was recovered from the 30m site using an acoustic release and a pinch puller winch.

Figure 2 SLOW Diver Deployed Hydrophone

Figure 3 UH Sea Spider Hydrophone before Deployment

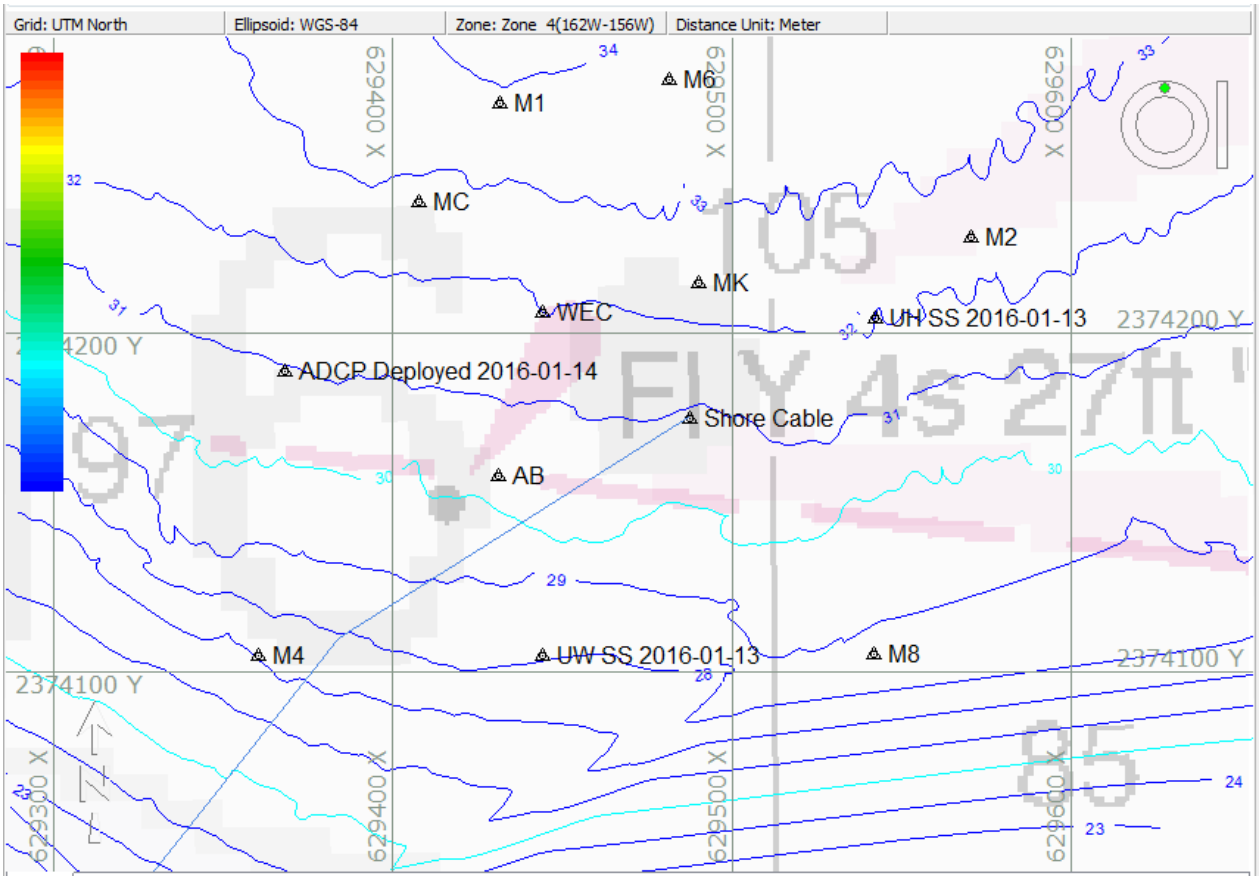

Figure 4 30m Site Layout with UH and UW Sea Spiders and the SEI ADCP

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FIELD REPORT

DATE:	August 23rd, 2016	
TO:	Luis Vega	
FROM:	Patrick Anderson	
SUBJECT:	WETS Task 1G Field Report – Acoustic Measurements with University of Washington	

Date: August 18-21, 2016

Activity & Location: SWIFT Hydrophone Drifts around the Azura WEC at the 30m site

SEI Personnel: Wyatt Redongo

HNEI Personnel: Keith Bethune

University of Washington Personnel: Brian Polagye, Paul Murphy

Vessel: 8m AMBAR

SWIFT hydrophones were deployed on multiple days around the Azura WEC system and the Fred Olsen Lifesaver at the 30m site and 60m site on August 18, 19 and 21, 2016. On August 18th the SWIFT hydrophones were deployed in the vicinity of the Azura with the power take off (PTO) of the device turned off to record the sound of the WEC without energy production taking place. The PTO was then reengaged for the remaining days of the acoustic survey.

Work Activities:

- SEI and UW personnel boarded SEI's 8 m AMBAR at Heeia Kea small boat harbor, and transited out to the 30m and 60 m test site.
- Multiple drifts of the SWIFT Hydrophones were conducted around the Azura WEC and the Fred Olsen Lifesaver at the 30m and 60m moorings on each day.
- CTD casts were conducted by UW personnel to record the sound speed profile.

The average wave parameters reported by the Waverider buoy were recorded during each of the SWIFT drifts:

Date (HST)	Hs (m)	Tp (s)	Dp (deg)	Ta (s)	SST (C)
8/18/2016 19:09	1.46	6.6	52.0	5.2	26.74
8/18/2016 22:09					
8/19/2016 9:09	1.87	7.1	59.4	5.5	26.50
8/19/2016 12:09					
8/21/2016 9:09	1.77	7.5	51.1	5.6	26.77
8/21/2016 12:09					

Hs – Wave height
Tp – Peak period
Dp – Peak direction
Ta – Average period
SST – Sea Surface Temperature

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FIELD REPORT

DATE:	August 31st, 2016	
TO:	Luis Vega	
FROM:	Patrick Anderson	
SUBJECT:	WETS Task 1H Field Report – Sea Spider Hydrophone Recovery and Redeployment	

Date: August 3rd, 2016
Locations & Activity: Recover the Sea Spider Hydrophones and ADCP at the 30m site.
SEI Personnel: Patrick Anderson, Kydd Pollock, Wyatt Redongo
Vessel: Huki Pono
Work Description:

The two Sea Spider Hydrophones and ADCP deployed at the 30m site were deployed on January 13 and 14, 2016. The recovery of the Sea Spider Hydrophone and ADCP originally scheduled for April was delayed several times There were three separate repairs to parted hawsers and PTO bands of the Lifesaver that took priority. The Head of Security for the Vice President also requested that we reschedule one attempt. Recovery operations were conducted on August 3rd, 2016. Each Sea Spider hydrophone has two Loggerhead hydrophones attached to the Sea Spider fiberglass frame. The Teledyne RDI ADCP is attached to a gimbal mount in an aluminum frame.

SEI personnel boarded the Huki Pono at Heeia Kea boat ramp and transited to WETS 30m site. The ADCP and UW Sea Spider hydrophone were recovered using their acoustic releases and recover lines on the first attempt. The UH Sea Spider Hydrophone's two acoustic releases did not respond to their release codes. Multiple attempts were made from various locations around the 30m site without any response. A remote operated vehicle, ROV, was mobilized and delivered to the site and used to visually look for the hydrophone. A marker float was placed at the GPS position of the hydrophone and used as a downline for the ROV to follow. No evidence of the UH Hydrophone was found by the ROV after a thorough search of its deployment location. Addition visual surveys will be conducted by divers in the future to confirm that the hydrophone is not in its original deployment location.

Data from the Teledyne RDI Sentinel V100 ADCP was not able to be download after the recovery due to a failure of the memory card inside the ADCP. The ADCP was returned to Teledyne RDI for servicing. After inspection of the ADCP the Teledyne RDI service manger stated the following:

> "The card will not communicate in the system or in a computer. The Engineer stated that the PC would not even recognize the card. The inspection showed no other problems therefore the most likely hypothesis is failure of the recorder card itself. Unfortunately, we do not have any way to prove this with certainty. Note: We do not know of a single failure of this type.

Due to this and previous issues, SEI negotiated an exchange of the ADCP for a different, newer unit. This exchanged unit will be upgraded to Ethernet connectivity.

There were n issues with data from the UW Sea Spider Hydrophone.

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FIELD REPORT

DATE:	April 8, 2016	
TO:	Luis Vega	
FROM:	Patrick Anderson	
SUBJECT:	WETS Task 1I Field Report – Acoustic Measurements with University of Washington	

Date: March 18, 2016

Locations & Activity: SWIFT Hydrophone Drifts around the Azura WEC

SEI Personnel: Kydd Pollock

University of Washington Personnel: Brian Polagye, Paul Murphy

Vessel: 8m AMBAR

Work Activities Included the Following:

- SEI and UW personnel boarded SEI's 8 m AMBAR at Heeia Kea small boat harbor, transited out to the 30m test site.
- Five drifts of the SWIFT Hydrophones were conducted around the Azura WEC system at the 30m mooring.
- The wave parameters reported by the Waverider buoy were:
  - Significant wave height, Hs, was 2.5m to 2.9m
  - Peak direction, Dp, was 354° – 1°
  - Peak period, Tp, was 11sec to 14sec
- Two CTD casts were conducted by UW personnel to record the sound speed profile.

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FIELD REPORT

DATE:	April 8, 2016	
TO:	Luis Vega	
FROM:	Patrick Anderson	
SUBJECT:	WETS Task 1J Field Report – Acoustic Measurements with University of Washington	

Date: March 19 -22, 2016

Activity & Location: SWIFT Hydrophone Drifts around the Azura WEC at the 30m site

SEI Personnel: Kydd Pollock

University of Washington Personnel: Brian Polagye, Paul Murphy

Vessel: 8m AMBAR

Sea conditions on March 19-22 were not safe for the installation of the diver deployed SLOW hydrophone. Alternatively, the SWIFT hydrophones were deployed on multiple days around the Azura WEC system at the 30m site on March 19 – 21, 2016. On March 22, 2016 the SWIFT hydrophones were deployed along the path of the Healy Tibbitts tug, the Bill M, as it towed the Fred Olsen Lifesaver out to the 60m site. A GPS tracker was placed on the Bill M and used to attain a time series of the positions to be used in post-processing of the acoustic data from the SWIFT hydrophones.

Work Activities:

- SEI and UW personnel boarded SEI's 8 m AMBAR at Heeia Kea small boat harbor, and transited out to the 30m test site.
- Multiple drifts of the SWIFT Hydrophones were conducted around the Azura WEC at the 30m mooring on each day:
  - March 19, 2016, Nine SWIFT drifts;
  - March 20, 2016, Six SWIFT drifts;
  - March 21, 2016, Ten SWIFT drifts.
- CTD casts were conducted by UW personnel to record the sound speed profile.
- On March 21, 2016 a sound propagation test was completed after the SWIFT drifts.

The average wave parameters reported by the Waverider buoy were recorded during each of the SWIFT drifts:

Date (HST)	Hs (m)	Tp (s)	Dp (deg)	Ta (s)	SST (C)
Start 3/19/2016 9:09	2.324	14.97	0	7.613	24.01
End 3/19/2016 12:39					
Start 3/20/2016 9:09	2.81	14.63	359	8.44	23.93
End 3/20/2016 12:39					
Start 3/21/2016 9:09	2.183	13.21	359	8.823	24.43
End 3/21/2016 12:39					
Start 3/22/2016 6:09	1.49	12.18	2	7.616	24.04
End 3/22/2016 9:09					

Figure 1 shows the Healy Tibbitts tugs, Caroline and Bill M, positioning the Fred Olsen Lifesaver WEC at the 60m site on March 22, 2016.

Figure 1 Healy Tibbitts Tugs Caroline and Bill M with the Lifesaver.

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FIELD REPORT

DATE:	November 17, 2016	
TO:	Luis Vega	
FROM:	Patrick Anderson	
SUBJECT:	WETS Task 1K Field Report – Sea Spider Deployment	

Date: October 10, 2016
Locations & Activity: Deploy Sea Spider Hydrophone at the 60m site.
N 21.4739° and W 157.7544°
SEI Personnel: Patrick Anderson, Kydd Pollock
HNEI Personnel: Keith Bethune
Vessel: Huki Pono
Work Description:

The UW Sea Spider Hydrophone base was mobilized for deployed at the WETS 60m mooring site. Modifications were made to the setup to allow for the deployment in deeper water and to allow for retrieval with a pinch puller. The Huki Pono mobilized out of Honolulu Harbor with the Sea Spider base and arrived at Heeia Kea boat ramp mid-morning. The hydrophones and acoustic releases were installed on the Sea Spider base by mid-day. Wave height and wind speeds were increasing throughout out the day. Once at the 60m site, the initial position of the deployment (N 21.4739° and W 157.7544°) was too close to the A3 mooring leg. A new deployment location was agreed upon between the A3 and A2 mooring legs.

The deployment was aborted because the Sea Spider Hydrophone did not descend into the water fast enough. After approximately 30 seconds in the water, it had only reached a depth of 10ft. This indicates inadequate weight to anchor it to the bottom. There was also concern with the hydrophone breaking the winch line due to snap loading associated with the motion of the Huki Pono in the waves. The hydrophone was pulled back into the deck of the boat.

Additional modifications are required for the next deployment. Primarily, additional lead will be added to the sea spider base. Also, the deployment location has been changed to the following location (#1 SeaSpider). The location for the second SeaSpider is listed as well (#2 SeaSpider).

Name	Latitude	Longitude
#1 SeaSpider(proposed)	21.4736133 N	157.75371952 W
#2 SeaSpider(proposed)	21.4742969 N	157.75443898 W

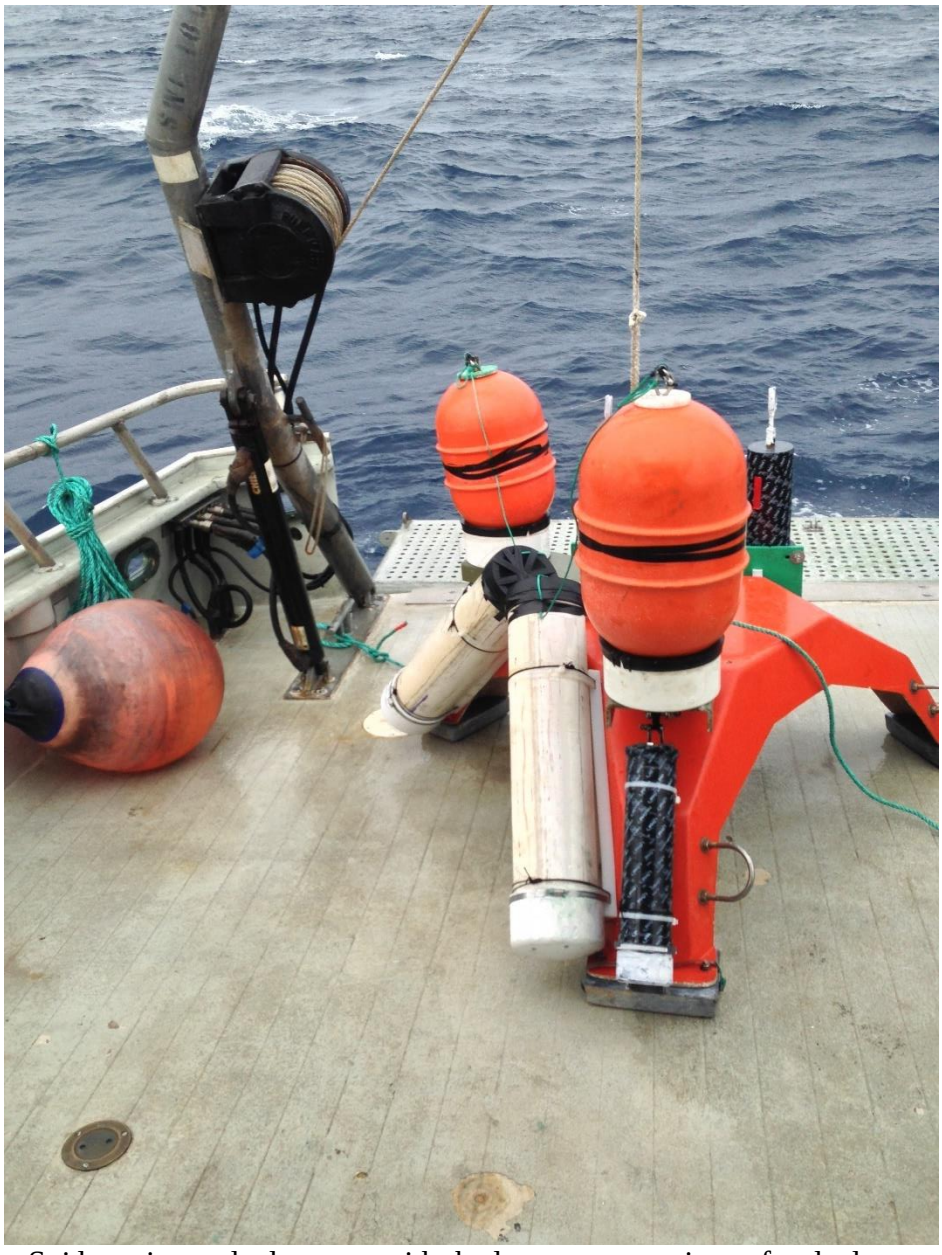

Figure 1 Sea Spider prior to deployment with the larger rope canisters for deployment at the 60m site.

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FIELD REPORT

DATE:	March 30, 2017	
TO:	Luis Vega	
FROM:	Patrick Anderson	
SUBJECT:	WETS Task 1L Field Report – Sea Spider Recovery	

Date: March 8, 2017
Locations & Activity: Recovery Sea Spider Hydrophone at the 60m site.
N 21.47364476° and W 157.75363838°
SEI Personnel: Patrick Anderson, Mike Napoli
HNEI Personnel: Dan Fitzgerald
Vessel: Huki Pono
Work Description:
The Sea Spider Hydrophone was deployed at WETS 60m mooring site on December 6, 2017, under Task 4E. Deployment coordinates are listed below:

Name	Latitude	Longitude
Sea Spider	21.47364476 N	157.75363838 W

The Sea Spider was recovered on March 8, 2017 using an acoustic release and the Huki Pono's pinch puller and A-frame to bring the hydrophone to the surface. The hydrophone is shown in Figure 1 after the recovery. The instruments were removed from the base and the base was taken with the Huki Pono to Honolulu Harbor. A summary of Sea Spider deployments is presented in Table 1.

Table 1 Sea Spider Hydrophone Task Schedule

Deployment Date	Task	Retrieval Date	Task	Comment
11/10/2014	1A	11/14/2014	1A	UH Deployment Hydrophone
1/21/2015	1D-1E	2/20/2015	1D-1E	UH Deployment Hydrophone
3/24/2015	1B	7/6/2015	1C	UW Sea Spider
1/13/2016	1F	8/3/2016	1H	Deployed two Sea Spiders and recovered one Sea Spider
10/10/2016	1K	-		Deployment was canceled
12/6/2016	4E	3/8/2017	1L	
	1M			Task remaining
	1N			Task remaining
	1O			Task remaining
	1P			Task remaining
	1Q			Task remaining
	1R			Task remaining

Figure 1 Hydrophone after recovery

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FIELD REPORT

DATE:	January 30, 2017	
TO:	Luis Vega	
FROM:	Patrick Anderson	
SUBJECT:	WETS Task 1S Field Report – Acoustic Measurements with University of Washington	

Date: December 1 – 3, 2016

Activity & Location: SWIFT Hydrophone Drifts at WETS

SEI Personnel: Don Bunnel

University of Washington Personnel: Brian Polagye, Paul Murphy

Vessel: 8m AMBAR

Sea conditions on December 1, 2017 were too hazardous for the SWIFT drifts at WETS. Instead the SWIFT hydrophones were deployed in sheltered areas of Kaneohe Bay. The modified SWIFTS have a heave plate and rubber tether to connect the surface float housing the GPS with the sub-surface hydrophone.

Work Activities:

- SEI and UW personnel boarded SEI's 8 m AMBAR at Heeia Kea small boat harbor, and transited out to WETS
- Multiple drifts of the SWIFT Hydrophones were conducted at WETS
- CTD casts were conducted by UW personnel to record the sound speed profile. The wave parameters reported by the Waverider buoy were recorded during each of the SWIFT drifts:

(HST)	Hs (ft)	Tp (s)	Dp (deg)
12/1/2016 8:39 AM HST	8.83	7.69	67
12/2/2016 6:39 AM HST	8.6	9.88	62
12/3/2016 7:39 AM HST	7.64	9.88	75

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FIELD REPORT

DATE:	January 30, 2017	
TO:	Luis Vega	
FROM:	Patrick Anderson	
SUBJECT:	WETS Task 1T Field Report – Acoustic Measurements with University of Washington	

Date: January 23 – 26, 2017

Activity & Location: SWIFT Hydrophone Drifts at WETS

SEI Personnel: Mike Napoli, Don Bunnel

University of Washington Personnel: Brian Polagye, Paul Murphy,

University of Hawaii/ Hawaii Natural Energy Institute: Pat Cross, Dan Fitzgerald

Vessel: 8m AMBAR

On January 23 – 26, 2017 SWIFT drifts were conducted at WETS. The modified SWIFTS have a heave plate and rubber tether to connect the surface float housing the GPS with the sub-surface hydrophone.

Work Activities:

- SEI and UW personnel boarded SEI's 8 m AMBAR at Heeia Kea small boat harbor, and transited out to WETS
- Multiple drifts of the SWIFT Hydrophones were conducted at WETS
- CTD casts were conducted by UW personnel to record the sound speed profile. The wave parameters reported by the Waverider buoy were recorded during each of the SWIFT drifts:

Time	Hs (ft)	Tp (s)	Dp (deg)
1/123/2017 12:09 PM HST	9.32	9.88	47
1/24/2017 8:09 AM HST	7.35	10.53	19
1/26/2017 8:39 AM HST	7.12	15.38	345

Figure 1 Modified SWIFT Deployment