

Inventive Resources, Inc. (IRI)

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December 5, 2023

Tahoe Regional Planning Agency
Attn: Emily Frey, Aquatic Invasive Species Projects Coordinator
128 Market Street
Stateline, NV 89410

UVC Light Aquatic Invasive Plant Control Pilot Project-Summary of Treatment Field Activities for the 2023 Treatment Season

Dear Emily:

Inventive Resources Inc. (IRI) is pleased to submit the following document summarizing a few projects related questions regarding the 2023 treatment season. This document is for your review and records. The questions that are being addressed are as follows.

1. A summary schedule showing the two UV boats actual treatment schedules by site for all of 2023 and major maintenance.
2. The durations of treatment and frequency of retreatment for exposures at each of the treatment sites.
3. Problems or challenges that may have prevented full treatments at the sites including a brief description of the challenges faced in treating the entire channel in low water conditions. Chronicling experiences and potential improvements in treatment and monitoring that may be helpful for future iterations.
4. Changes in treatment procedures or duration that may be more effective for Year 3 UV treatment (2024).
5. General UV Vessel information (dimensions, key design features, light array configuration and intensities (per sq cm or other unit), light wave range for each boat, and other specs/features such as maintenance).

Most segments and parts of the UVC treatment vessel were mobilized and assembled between June 5th through June 9th, 2023. Operational testing began at Lakeside Marina right before the May Memorial Day holiday, May 29, 2023. UVC treatment began for the 2023 season in early June 12th and continued through October 24th.

Schedule

Scheduling of both the UV treatment vessels at each of the treatment sites is summarized in Table 1 below. For additional information on treatment boundaries, calendar with dates of when areas were treated, and maps, see Attachment A. Boat III concentrated on center areas and Boat IV was better equipped to tackle nearshore areas as its smaller size allowed it to maneuver between docks and underneath parked boats.

Table 1
UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Treatment Dates and Sampling Comments

Site Location	1st UV Treatment	2nd UV Treatment	3rd UV Treatment	4th UV Treatment	Comments
Site 1	7/5/23- 7/7/23, 7/10/23	8/14/23, 8/21/23, 8/24/23	10/3/23, 10/13/23, 10/15/23,	10/18/23, 10/24/23	Areas treated are noted in treatment map. Treatment by Boat III and IV. Spot Treatment. Half Treatment
Site 2	7/7/23, 7/10/23, 7/11/23	8/17/23- 8/18/23, 8/25/23	9/19/23- 9/20/23	10/4/23, 10/17/23, 10/19/23, 10/23/23	Areas treated are noted in treatment map. Spot Treatment. Half Treatment
Site 3	7/6/23, 7/10/23, 7/12/23	8/15-8/16/23, 8/22/23- 8/23/23	9/13/23- 9/14/23	10/2/23, 10/16/23, 10/18/23	Areas treated are noted in treatment map. Spot Treatment. Half Treatment
Site 5	7/31/23	8/21/23	9/21/23	10/18/23	Areas treated are noted in treatment map. Spot Treatment. Half Treatment
Site 9	6/28/23- 6/29/23	7/13/23- 7/21/23	8/23-8/24/23, 8/28/23	9/25/23- 9/26/23, 10/4/23- 10/5/23, 10/16- 10/17/23	Areas treated are noted in treatment map. Spot Treatment. Half Treatment
Site 10	8/7/23- 8/11/23	8/28/23- 9/1/23			Areas treated are noted in treatment map.
Site 11	8/14/23- 8/18/23	9/5/23-9/8/23			Areas treated are noted in treatment map.
Site 13	6/14/23- 6/15/23	7/10/23- 7/13/23	9/25-9/27/23	10/19- 10/20/23	Areas treated are noted in treatment map.
Site 14	6/12/23- 6/16/23	7/13/23- 7/19/23	9/27/23- 9/29/23	10/23- 10/24/23	Areas treated are noted in treatment map.
Site 22	6/14/23- 6/21/23	8/29/23- 9/6/23	9/11/23- 9/14/23	9/27/23- 10/3/23, 10/6/23- 10/10/23	Areas treated are noted in treatment map.
Site 23	6/26/23- 6/28/23				Areas treated are noted in treatment map. .
Site 24	6/20/23- 6/27/23	7/31/23- 8/4/23	9/6/23- 9/12/23, 9/15/23- 9/20/23	10/4/23- 10/12/23	Areas treated are noted in treatment map.
Site 26	6/30/23, 7/5/23, 7/28/23	8/22/23, 8/25/23	9/21-9/22/23,	10/17/23	Areas treated are noted in treatment map. Spot Treatment. Half Treatment

Major UVC light cleaning was completed on Vessel III (16ft x 40ft) including sleeves (a protective covering for the lamp) on August 5th and 6th. An underwater inspection and UVC readings were also completed. Vessel IV (8ft x 40ft) UVC lights were cleaned August 6th-9th and repairs/replacement of

damaged ballasts/sleeve assemblies were also completed. There were daily maintenance and checklist items done each day of treatment which included fueling and inspection of all operating systems. Maintenance that required treatment vessel to remain stationary or off were reserved during non-treatment hour times, primarily weekends to minimize downtime. General maintenance performed during this time included but was not limited to the following.

1. Inspection of winch cables and replacement if needed.
2. Generator maintenance service
3. Bulb cleaning, as needed.
4. Underwater inspections
5. Dock maintenance and inspections.

Duration and Frequency of Retreatment at each of the treatment sites

Treatment times varied within a site. On average, each site was treated between 15-30 minutes with overlap. The larger vessel (16ftx40ft) focused on mid channel areas and moved positions every 7.5 minutes with a 50% overlap. The smaller vessel (8ftx40ft) focused on the nearshore and changed positions every 10-15 minutes with overlap. The UV only and spot treatment sites received four (4) half treatments throughout the season. Half treatments were 7.5 –15 minutes, with overlap. The combination sites were treated for 15-30 minutes with overlap.

Reefmaster and Biobase Hydroacoustic Scans

Reefmaster and Biobase Hydroacoustic scans were reviewed by IRI to track treatment. The link below has a video clip of the boat going through a treated site: <https://iriproducts.com/UV/cmt.html>. Image A illustrates the area. The video between time 0:14 and 0:20 depicts Site 26 at the mid channel spot treatment area and shows a clear drop of vegetation levels. The video between time 1:13- 1:40 depicts Site 23 entering a treated UV site also showing a drop of vegetation compared to the untreated areas that the vessel passes through. The video between time 1:58 shows the vessel entering a nearshore area within Site 24 that was UV treated with most of the vegetation greatly reduced, but there are still some small spots. Entering a harvest site (Site 24) at time lapse 2:15, at the harvested site you can see a height difference in the plants, plants are still present density wise, just height wise they are shorter. At video lapse time of approximately 2:28 the vessel is entering site

22 a treated UV area and the video depicts the difference between vegetation in the area near Site 22 having large plants before entering site 22 and after leaving site 22 at approximately 3:20.

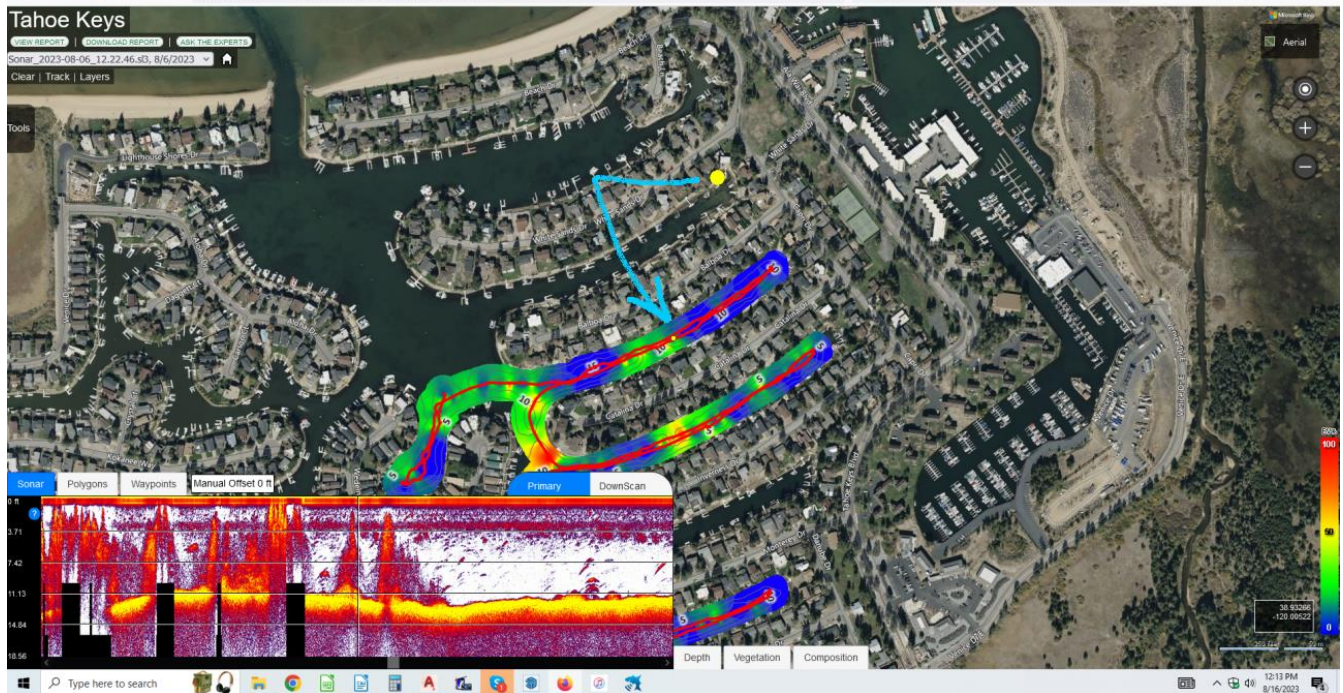


Image A - Video clip area. The area noted with the cyan colored array depicts the area on the bottom left of the scan. Notice the UV treated area and harvested area.

Furthermore, in CMT meetings it was explained that side scans are only spots directly under boat. After some research with the BioBase™ representative that is versed in hydroacoustic mapping it was explained that side scans widths are a function of the height, as noted in the equation in Image B.

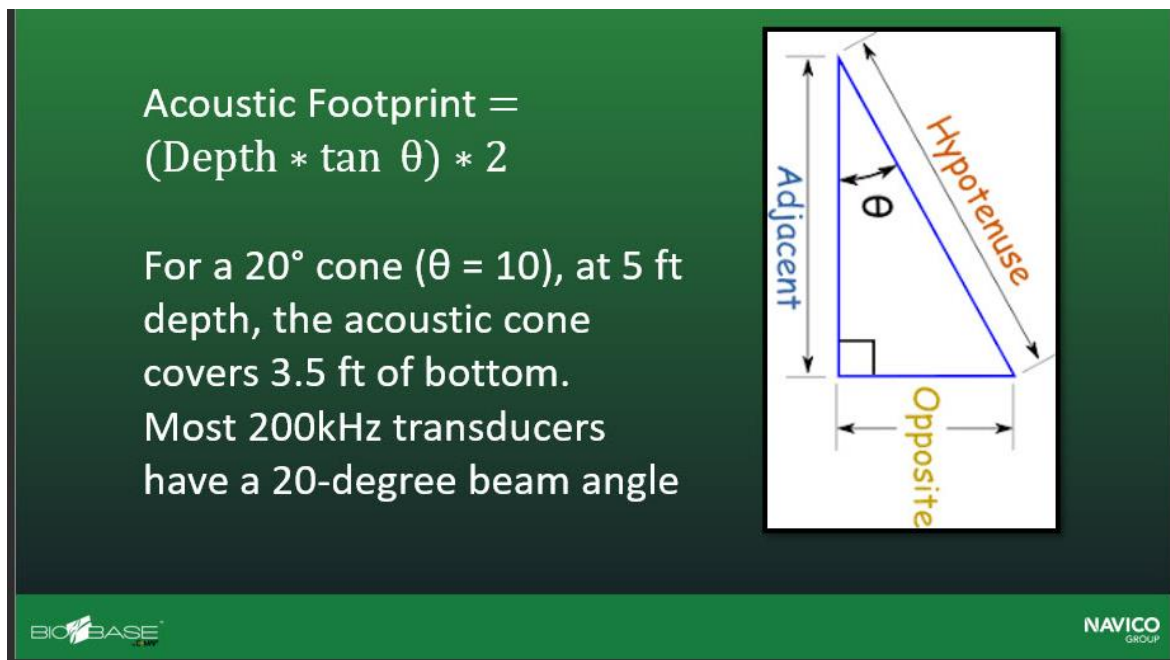


Image B - Hydroscan acoustical footprint calculation. At a 5ft water depth, the scan will show a 3.5 ft bottom. In most of the area, depths ranged from 5 to 12 feet. So, if an area is 10 ft (Site 24) then the width of the scan is 7ft.

For example, if the sonar is 5 feet from the lake bottom, then the width of the scan is about 3.5ft. Typically, the transducers have a 20° beam angle. In the case of the video clip, Site 24, the height of the sonar is approximately 10 feet from the sediment bottom, then, the side scan visual is approximately 7 feet. Side scans would depict more accurately plant height and volume, the more passes done in an area versus rake pulls that only represent a spot.

Problems, Challenges and Proposed Improvements for the 2024 UV Treatment Season

As with all treatment control strategies, nothing is perfect. Changes to procedure and modification to treatment vessel may improve effectiveness of treatment and allow for optimizing the use of time. Over the course of each season, improvements have been made based on field conditions. Challenges and, if applicable, suggested improvements are summarized in this section below.

Vessel speed was an issue, it was significant this year because treatment sites were far from the docking station that was dedicated to UV treatment. The operator spent a significant amount of time traveling back and forth each day to that treatment site and back to the UV docking station. This could have easily been mitigated by having dedicated docking stations at different locations of the project site or simply with the addition of onboard motors on the vessel to increase travel speed.

Despite increased water levels in 2023, shallow water areas still remained challenging, IRI had the inability to treat under parked boats with very little clearance underneath. The UV treatment vessel needs approximately three feet (3 ft) of clearance below the hull or dock for the array to be correctly positioned. For example, low water prevented being able to reach areas along the shoreline and under boats because of needed clearance to accommodate the treatment chamber underneath these areas. Image C illustrates a variable depth, areas close to the shoreline that are less than 3 feet in water depth (left side of image) or have a high elevation difference will likely not be able to be treated properly (center of image). IRI is currently brainstorming ideas and making additional modifications to the treatment vessel to better mitigate clearance issues such as this. When shallow water conditions exist, it may be best to treat from dock to dock and/or open areas between only.

First UV treatment should occur May-July and not later, early first treatment is imperative. UV light is more effective when plants are tender and turions are in the early stages of development. All sites should have a first treatment by mid-July when the plants are still young and before the turions mature. UV light is more effective in treating early forming turions. There were two (2) sites that did not receive first treatment until early August (Sites 10 and 11), however IRI purposely placed these later in the treatment schedule and concentrated early treatment efforts on more densely vegetated areas like Site 22 and 24, which also received multiple spot treatments later in the season. Second UV treatment should occur by August-October and any spot treatments thereafter. Site 23 was treated June 26-28; It was only treated once, the early treatment kept that site under control through the mid-season, however reviewing available hydroacoustic scans of the area, a second treatment in early September would have been beneficial.

Considerations should be made when designating additional treatment or spot treatment sites. Adding better sonar and having access to the TKPOA Biobase data (raw data) created monthly to better strategize the treatment approach in areas based on real-time infestation density. Also having access to the plant height data during the working season would be beneficial. Spot treatment sites were small enough to be treated in less than one day, but far apart enough that crews could not travel to and fully treat multiple sites in one day. To optimize staff and treatment time, spot treatment areas should be large enough to be treated fully in one day.

A fresh look and modification in the monitoring regimen. 1) Rake pulls for example are focused on plant health, where UV monitoring should look at evaluating plant height, volume, and density of plants. 2) Biovolume reduction is currently calculated as an average for the whole area. Treatment

polygons should be used to accurately represent treated areas from non-treated areas. A larger gap between treatment method types should be established in advance so treatment types do not overlap unintentionally.

Not all lake bottoms are equal. Lake morphology and the slope of the banks varied throughout. Some docks had significant clearance differentials from one end to the other. Areas where lake bottom is sloped or has bottom obstruction, a smaller treatment array would be more effective in better footprint coverage, or a more flexible treatment array that allows the bottom to be blanketed or hinged instead of a rigid treatment array that will not ‘hug’ the floor. Image C illustrates this issue that can explain very sloped bottom surfaces not getting adequate treatment.

Streamline modifications to treatment array to allow better maneuvering in tighter areas. Image D illustrates the planned configuration for the 2024 vessel that is currently being modified. UV boats need to work at different sites. This will speed up treatment and minimize unnecessary overlap.

Improving GPS tracking. IRI has been working with a local programmer who is assisting in designing our tracking system that will allow the operator to see more clearly where the treatment chamber has been. Currently, we use a dot located in the center of the vessel to determine direction and distance of how far the vessel has moved. Moving forward to 2024 and budget permitting, IRI will deploy a tracking system with heading to allow increased accuracy to display distance and direction of what the vessel has progressed. It will also leave a shaded rectangle of the treatment chamber. Image E illustrates the proposed vessel display.

Other issues and/or comments that IRI is currently trying to improve or mitigate that can improve treatment operations in the 2024 season include:

- Mapping in advance would be beneficial to plan travel time and designate docking areas.
- Corrosion of wires and connections was an issue, IRI is still looking into the cause to mitigate, including switching to marine grade wire and quality control on waterproofing all connections.
- Weather or other external issues impacted our ability to treat areas as scheduled, therefore a treatment plan with some flexibility to allow for boat swaps and maintenance without the need to confirm every change.
- Currently we are trying to modify the light chambers structural configuration to minimize UV light gaps in treatment.
- Obstacles in treatment areas. All unnecessary buoys and signs should be out of the UV treatment site during the days IRI is conducting treatment to have more complete treatment coverage. Often, operators had to stay at least 10ft to 20ft away from buoys and obstacles, for safety as buoy lines can become entangled in the UV array.
- Streamline maintenance procedures. For example, a complete treatment array swap would allow to simply disconnect the treatment chamber and replace/swap with a spare. Then, the used one will be refreshed with new or refurbished UV lights at the IRI facility and remain on hand for the next change.

Image C – Rigid Chamber

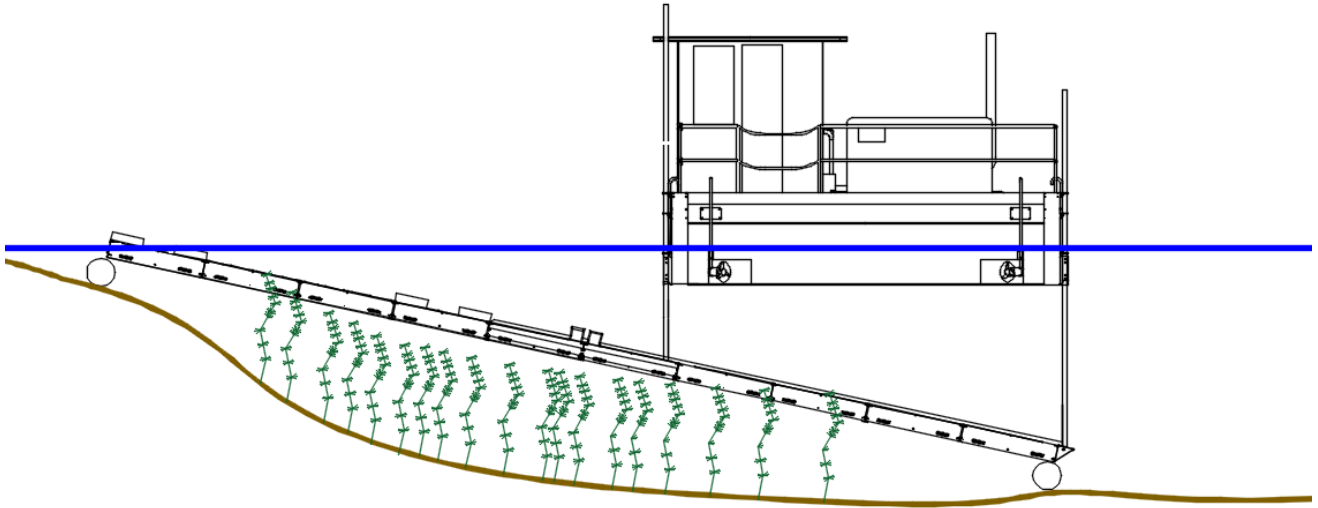


Image C – Rigid Chamber does not adequately treat areas with high slopes and leaves vegetation lines such as this image above.

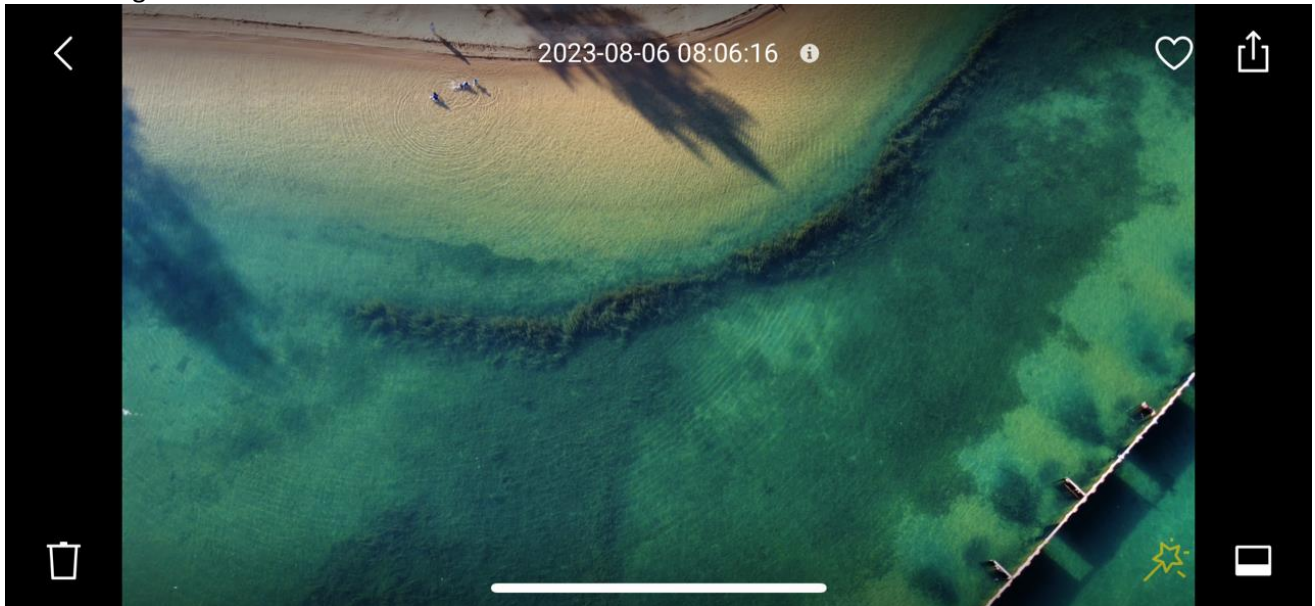


Image C - Rigid and semi rigid treatment chamber does not allow for more flexible wrapping of surface, therefore creates larger gaps in heavily sloped area and these areas may not receive the same treatment as areas that have the chamber closer, creating a line of vegetation that was not treated adequately (Image is from 2023 Lakeside Beach).

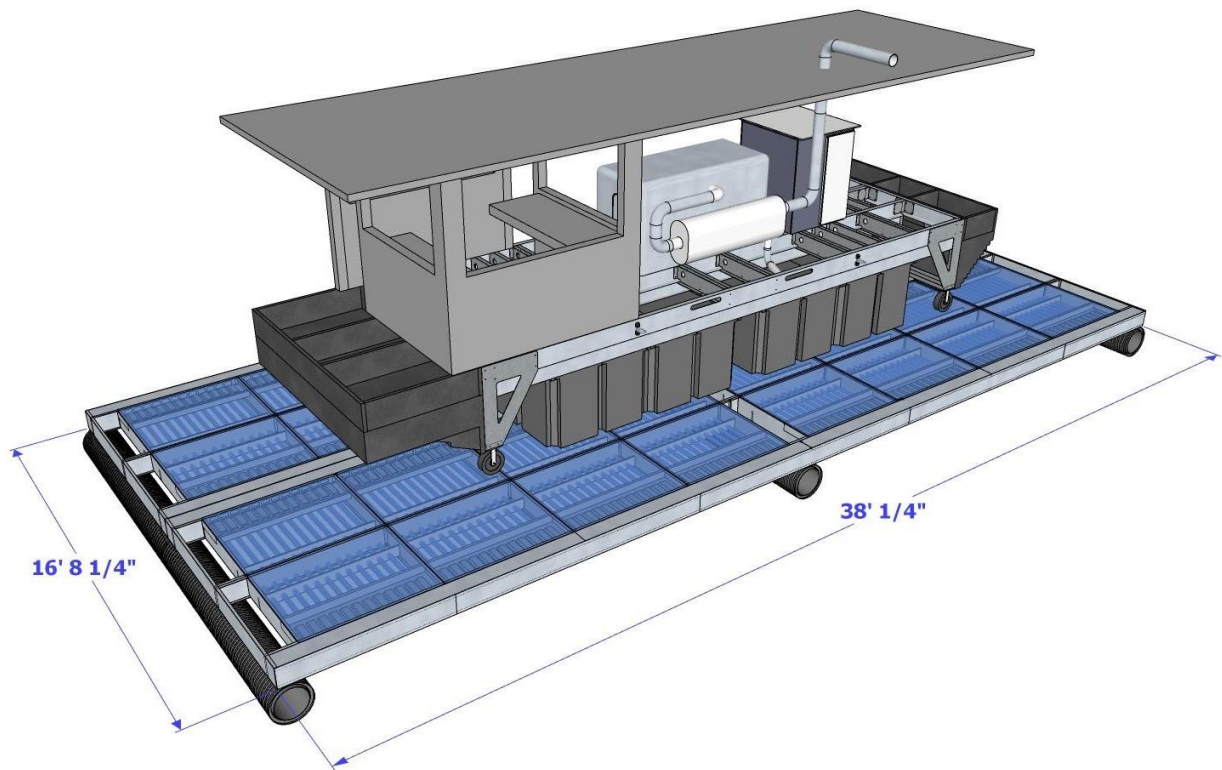


Image D - 2024 Vessel will have a slightly different configuration to allow for improved maneuverability. The 2023 vessel is being modified to this version.

UV Treatment Tracker Report

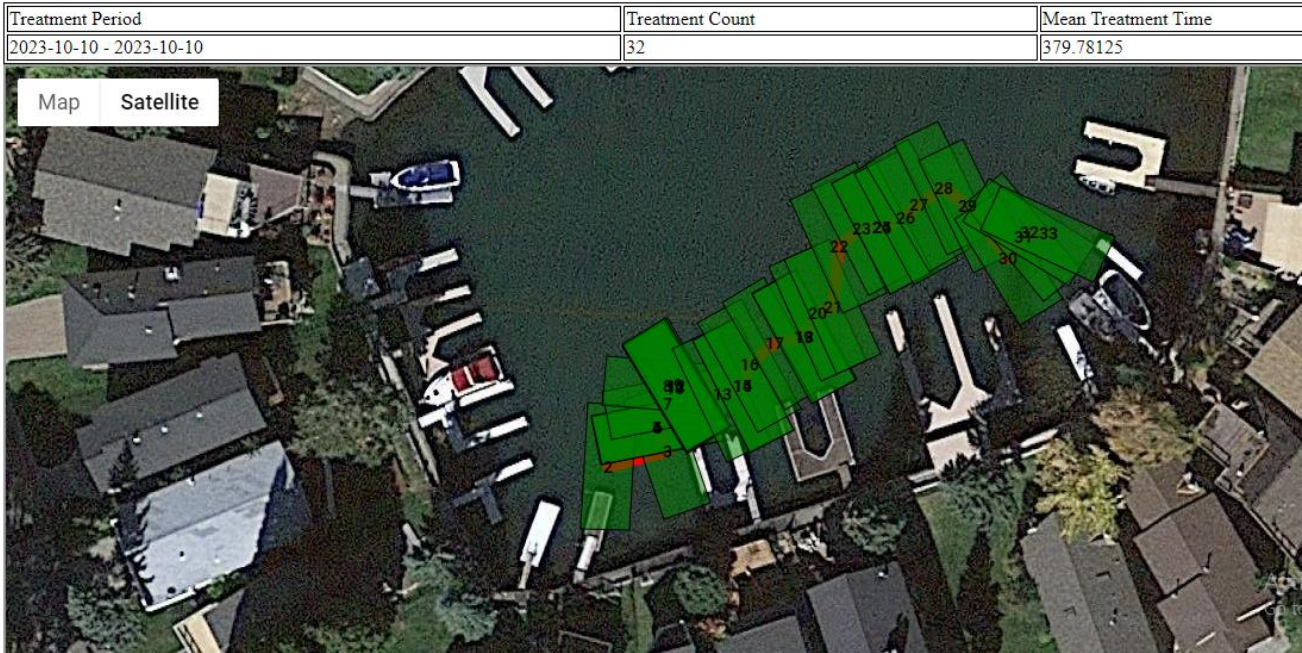


Image E - Proposed GPS tracking system. Demonstration shows when treatment vessel is making turns, how IRI may achieve uneven treatment. In this area the vessel operator was moving the vessel every 7.5 minutes, averaging 15 minutes per area.

General UV Vessel information

IRI had two UV treatment vessels in operation during the season. The vessels have a light chamber attached and equipped with multiple skids of UV light that operate in the germicidal range (254nm -

275nm). The chamber can provide a lethal dose of radiation to damage the DNA of plant cells, thus preventing replication. Vessel III has a 16ft by 40ft light chamber and is powered by a 99kW generator. Vessel IV has an 8ft by 40ft light chamber and is powered by a 65kW generator. A power barge provides electrical power to a grid of UV-C lamps in the light chamber that is lowered over the plants. As with all treatment devices, maintenance should be conducted at intervals that the manufacturer recommends as well as provide general safety and service inspections to optimize treatment and minimize downtime. Whenever feasible, major maintenance should be done on weekends or when the vessel is not in operation.

Attachment B has some general UV treatment vessel specifications and illustrates a schematic of each of the treatment vessels used at Tahoe Keys. Other UV-C pilot tools that can result in faster and more effective treatment, especially in hard to access and shallow areas are being consistently improved upon. Other tools that allow for remote and unmanned operation, faster travel and other features that result in less treatment cost are also being pursued.

Some features on the UV vessel include:

- Each UV treatment vessel has a slow-moving power barge with a floatation system to support the UV-C light chamber with adjustable winch cables. The winch cables assist in moving the light chamber up or down.
- A marine diesel-powered electric generator supplies all the electric power requirements for the vessel and UV-C light chamber.
- A programable controls system with timers automates repetitious operations and remote cameras allow an operator to make more visual observations on plant conditions underneath the chamber.
- Current models have 99 kW and 65 kW generators. Several smaller vessels have propane generators, and some include gasoline conversion.
- UV-C lamps and LED-UVC products are becoming more mainstream because of increased use and demand due to COVID. These products, including UV-C lamps, are rapidly undergoing changes to make them more effective. We are conducting on-going in-house testing on many improved types available.
- As manufacturers improve UV-C light output the exposure time and distance between lamps and thus plants can be improved greatly.

The video clip at <https://iriproducts.com/UV/cmt.html> is of Site 13 before and after UV treatment. The images in attachment C are mostly of Coontail, as confirmed from rake pulls during the season. An image taken on 6/10/23 illustrates healthy and thriving plants with dense plant growth before UV treatment. That same area was treated after the image was taken, 8 days later approximately 6/18/23, plants collapsed, and decomposition started. Additional images are available upon request. Attachment D and <https://iriproducts.com/UV/photos.html> has project images of both treatment vessels in operation around the Tahoe Keys area. All project and video images from the UVC project are available upon request. If you need additional information, images, or have any questions or concerns, please do not hesitate to call IRI at 209-545-1663 or by email at john@IRIproducts.com.

Sincerely,

Inventive Resources Inc.



John J. Paoluccio
President, Inventive Resources Inc.



Evangelina Paoluccio P.E.
Project Engineer, Inventive Resources Inc.

Attachment A
UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Treatment Boundary Maps, Treatment Map and Treatment Calendar

Boat III (16'x40')

May						
Sun	Mon	Tues	Weds	Thur	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

June

Sun	Mon	Tues	Weds	Thur	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
	Site 14	Site 14	Site 13	Site 13	Site 14	
18	19	20	21	22	23	24
	Site 22	Site 22	Site 22,24	Site 24	Site 24	
25	26	27	28	29	30	
	Site 23	Site 23	Site 23	Site 9	Site 26	

July

Sun	Mon	Tues	Weds	Thur	Fri	Sat
						1
2	3	4	5	6	7	8
		Holiday	Site 1	Site 3	Site 1,2	
9	10	11	12	13	14	15
	Site 3,13	Site 13	Site 13	Site 13,14	Site 14	
16	17	18	19	20	21	22
		Site 14	Site 14	Site 9	Site 9	
23	24	25	26	27	28	29
	Site 22	Site 22	Site 22	Site 22	Site 26	
30	31					
	Site 5					

August

Sun	Mon	Tues	Weds	Thur	Fri	Sat
		1	2	3	4	5
		Site 24	Site 24	Site 24	Site 24	
6	7	8	9	10	11	12
	Site 10	Site 10	Site 10	Site 10	Site 10	
13	14	15	16	17	18	19
	Site 11	Site 11	Site 11	Site 11	Site 11	
20	21	22	23	24	25	26
	Site 5	Site 3	Site 3	Site 1	Site 2	
27	28	29	30	31		
	Site 10	Site 10	Site 10	Site 10		

September

Sun	Mon	Tues	Weds	Thur	Fri	Sat
					1	2
					Site 10	
3	4	5	6	7	8	9
	Holiday	Site 11	Site 11	Site 11	Site 11	
10	11	12	13	14	15	16
	Site 22	Site 22	Site 22	Site 22	Site 24	
17	18	19	20	21	22	23
	Site 24	Site 24	Site 24	Site 5	Site 26	
24	25	26	27	28	29	30
	Site 13	Site 13	Site 13,14	Site 14	Site 14	

October

Sun	Mon	Tues	Weds	Thur	Fri	Sat
1	2	3	4	5	6	7
	Site 3	Site 1	Site 2,9	Site 9	Site 22	
8	9	10	11	12	13	14
	Site 22	Site 22	Site 24	Site 24	Site 24	
15	16	17	18	19	20	21
	Site 9	Site 9,26	Site 5	Site 13	Site 13	
22	23	24	25	26	27	28
	Site 14	Site 14				
29	30	31				
		Holiday				

November

Sun	Mon	Tues	Weds	Thur	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

Boat IV (8'x40')

May						
Sun	Mon	Tues	Weds	Thur	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
				Lakeside	Lakeside	
28	29	30	31			
	Lakeside	Lakeside	Lakeside			

June

Sun	Mon	Tues	Weds	Thur	Fri	Sat
				1	2	3
				Lakeside	Lakeside	
4	5	6	7	8	9	10
	Lakeside	Lakeside	Lakeside	Lakeside	Lakeside	
11	12	13	14	15	16	17
	Lakeside	Lakeside	Site 22	Site 22	Site 22	
18	19	20	21	22	23	24
	Site 22	Site 24	Site 24	Site 24	Site 24	
25	26	27	28	29	30	
	Site 24	Site 24	Site 9	Site 9	Site 26	

July

Sun	Mon	Tues	Weds	Thur	Fri	Sat
						1
2	3	4	5	6	7	8
		Holiday	Site 26	Site 1	Site 1	
9	10	11	12	13	14	15
	Site 1,2	Site 2	Site 3	Site 9		
16	17	18	19	20	21	22
	Site 9	Site 9	Site 3	Site 9	Site 9	
23	24	25	26	27	28	29
	Site 22	Site 22	Site 22	Site 22	Site 26	
30	31					
	Site 24					

August

Sun	Mon	Tues	Weds	Thur	Fri	Sat
		1	2	3	4	5
		Site 24	Site 24	Site 24	Site 24	Lakeside
6	7	8	9	10	11	12
Lakeside	Lakeside	Lakeside	Lakeside	Lakeside	Lakeside	Lakeside
13	14	15	16	17	18	19
Lakeside	Site 1	Site 3	Site 3	Site 2	Site 2	
20	21	22	23	24	25	26
	Site 1	Site 26	Site 9	Site 9	Site 26	
27	28	29	30	31		
	Site 9	Site 22	Site 22	Site 22		

September

Sun	Mon	Tues	Weds	Thur	Fri	Sat
					1	2
					Site 22	
3	4	5	6	7	8	9
	Holiday	Site 22	Site 22,24	Site 24	Site 24	
10	11	12	13	14	15	16
	Site 24	Site 24	Site 3	Site 3	Site 1	
17	18	19	20	21	22	23
	Site 1	Site 2	Site 2	Site 26	Site 26	
24	25	26	27	28	29	30
	Site 9	Site 9	Site 22	Site 22	Site 22	

October

Sun	Mon	Tues	Weds	Thur	Fri	Sat
1	2	3	4	5	6	7
	Site 22	Site 22	Site 24	Site 24		
8	9	10	11	12	13	14
	Site 24	Site 24	Site 24	Site 24	Site 1	
15	16	17	18	19	20	21
	Site 3	Site 2	Site 3	Site 2		
22	23	24	25	26	27	28
	Site 2	Site 1				
29	30	31				
		Holiday				

November

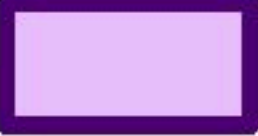
Sun	Mon	Tues	Weds	Thur	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

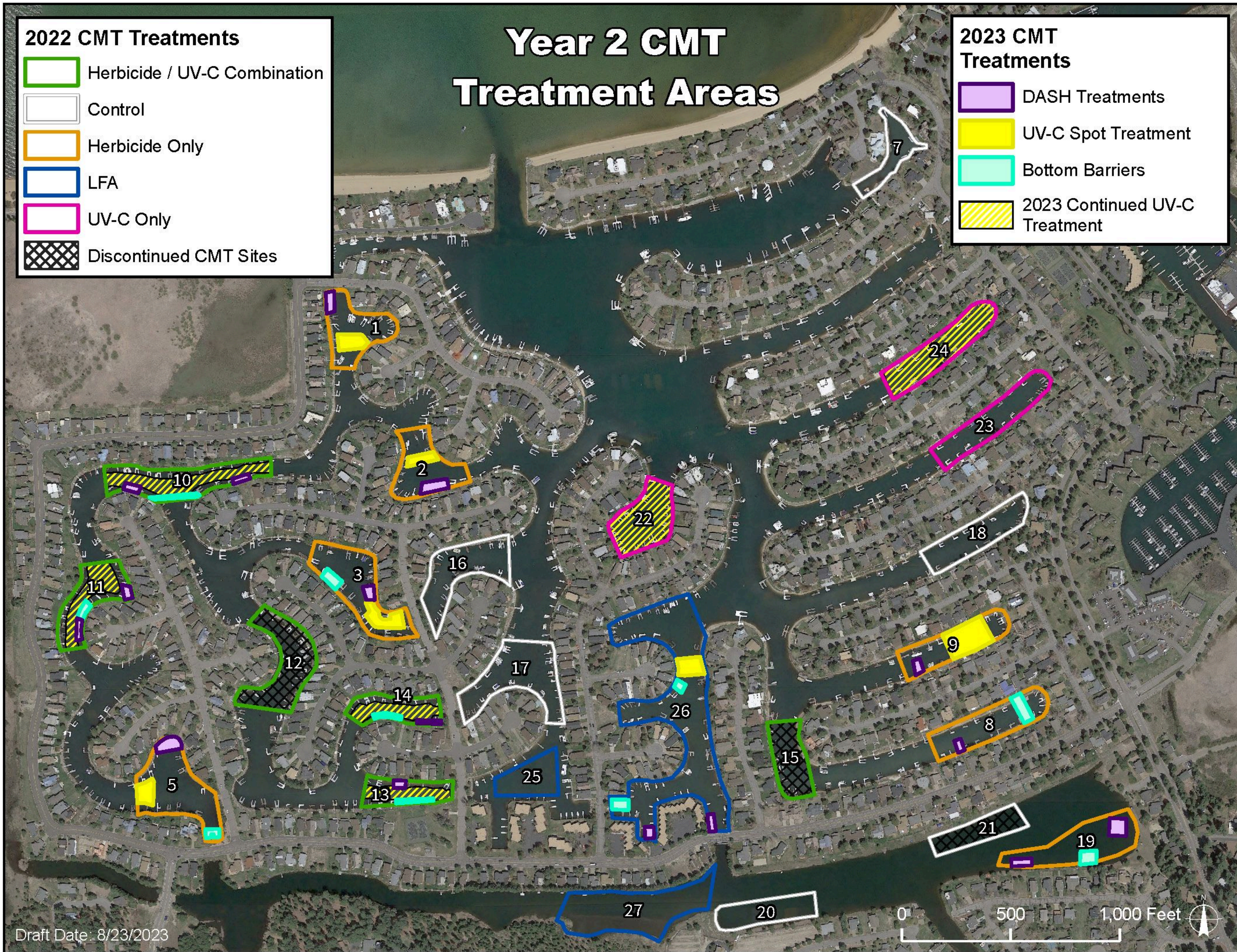
2022 CMT Treatments

-  Herbicide / UV-C Combination
-  Control
-  Herbicide Only
-  LFA
-  UV-C Only
-  Discontinued CMT Sites

Year 2 CMT Treatment Areas

2023 CMT Treatments

-  DASH Treatments
-  UV-C Spot Treatment
-  Bottom Barriers
-  2023 Continued UV-C Treatment



Site 1

UVC Treatment Map

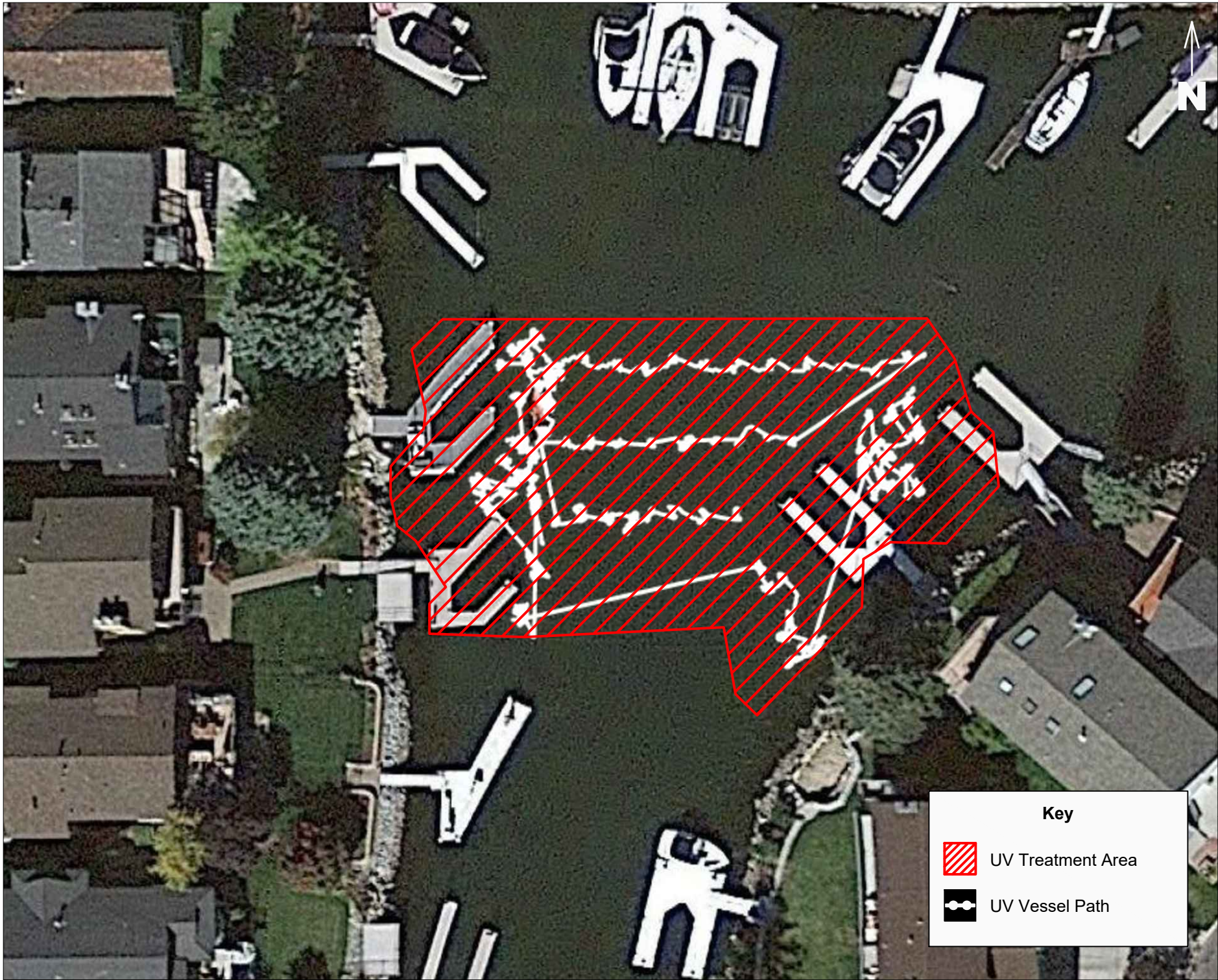
Spot Treatment



Key

-  UV Treatment Area
-  UV Vessel Path
-  Rake Sampling Location

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	07-01-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	9



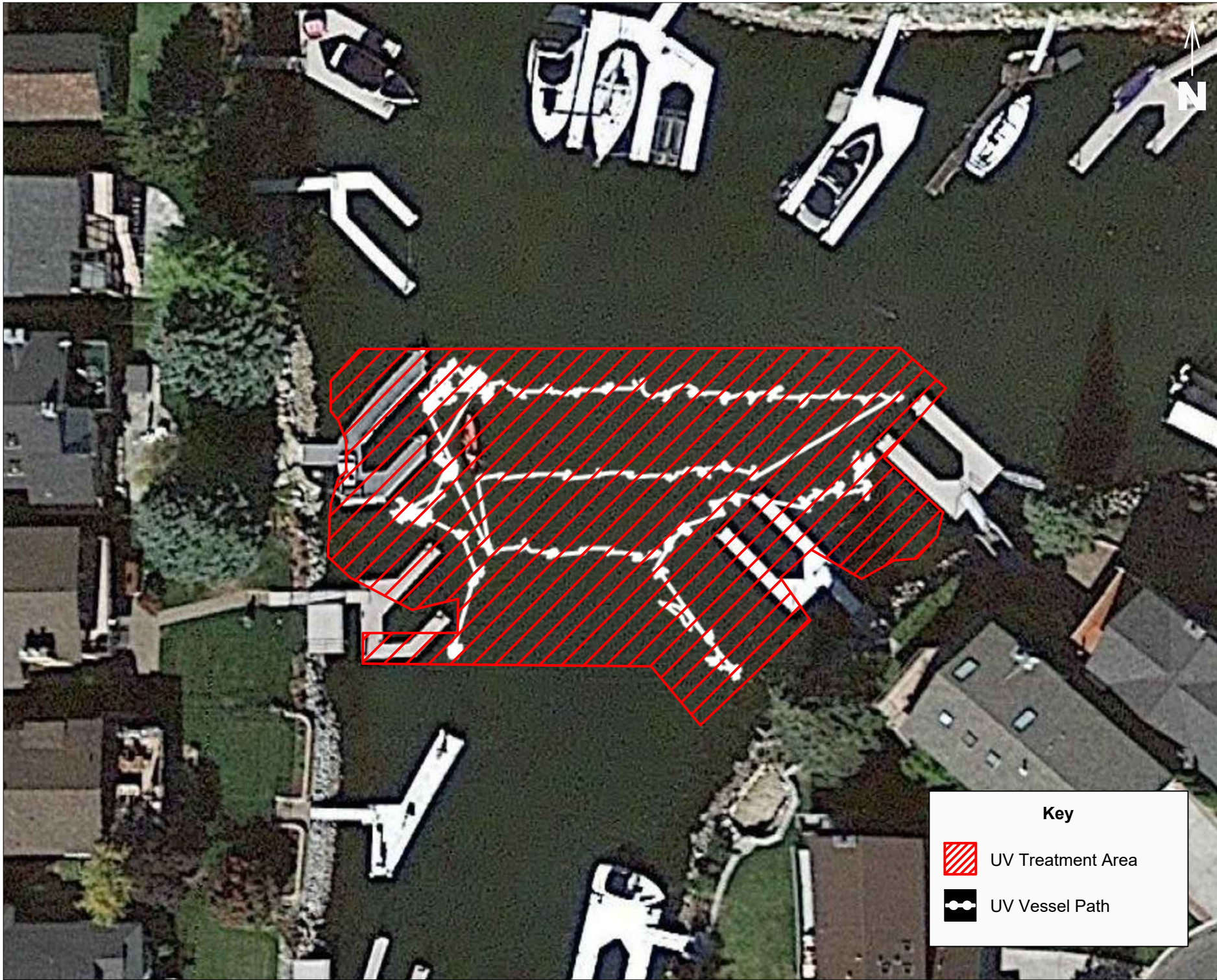
Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	08-24-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	25

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 1 - UV Spot - Second Treatment



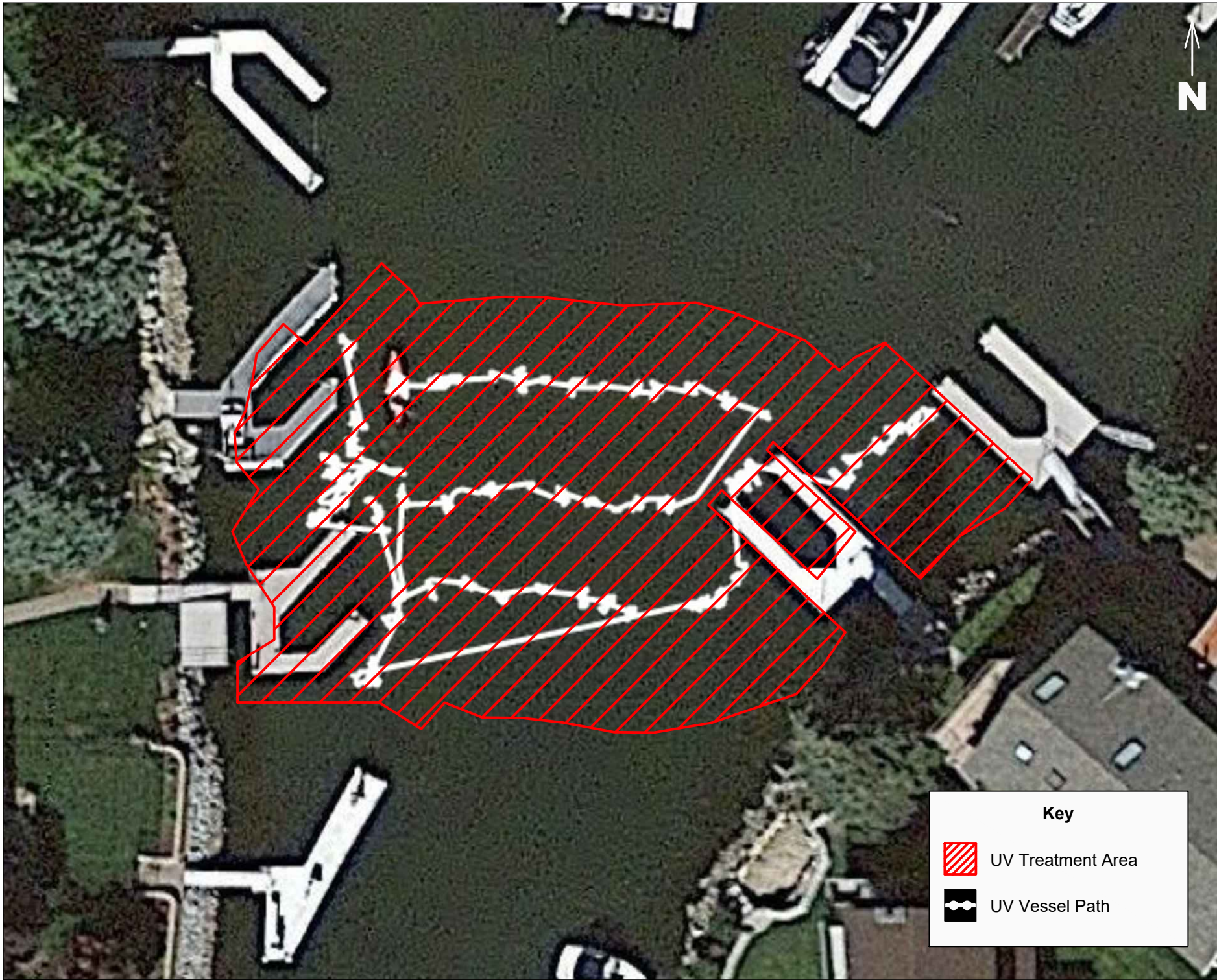
Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	10-03-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	36

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 1 - UV Spot - Third Treatment



Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	10-24-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	48

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 1 - UV Spot - Fourth Treatment

Site 2

UVC Treatment Map
Spot Treatment



Key

-  UV Treatment Area
-  UV Vessel Path
-  Rake Sampling Location

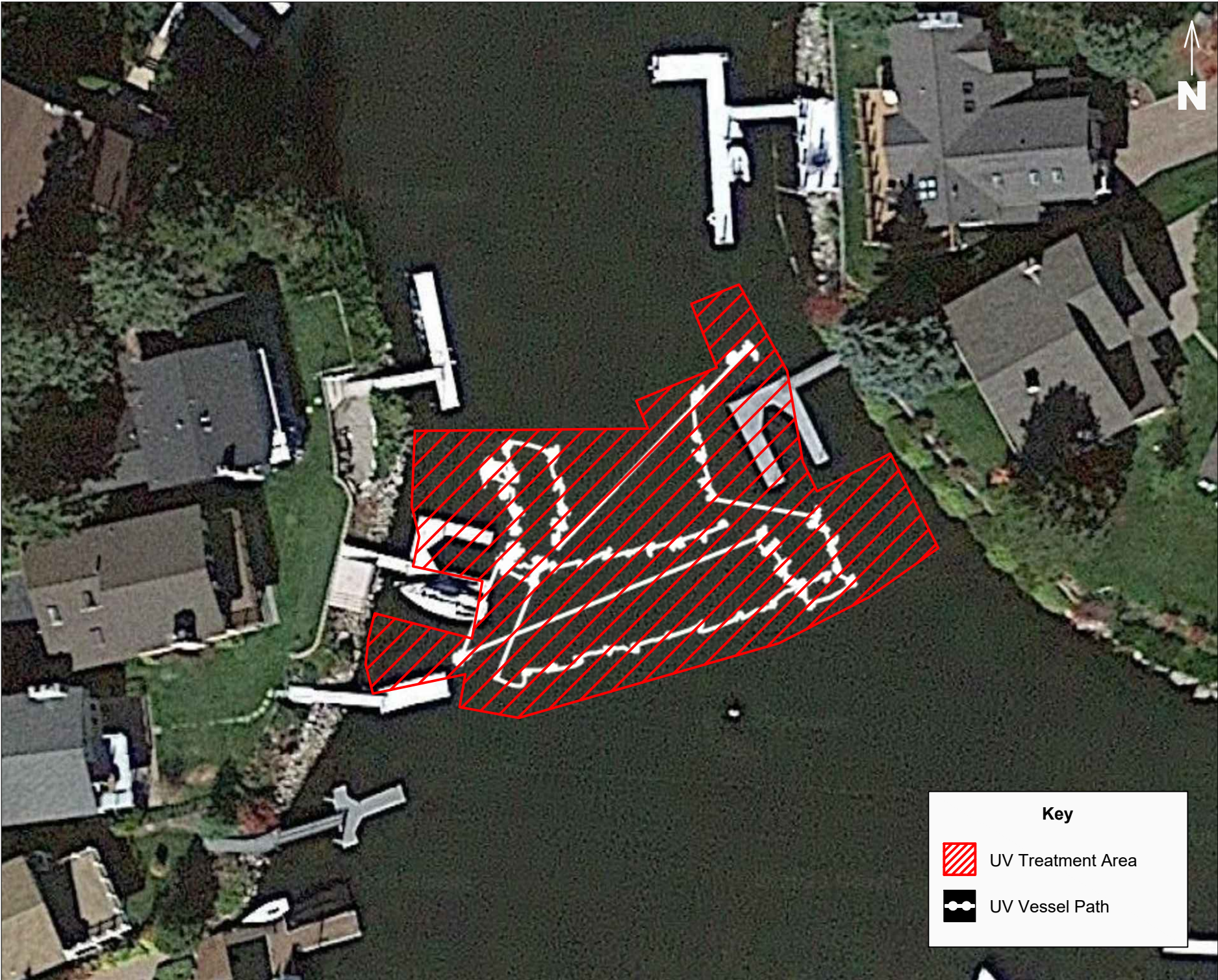
UVC Light Aquatic Invasive Plant Control Pilot Project 2023

Tahoe Keys

Site 2 - UV Spot - First Treatment

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	07-11-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	11



Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	08-25-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	26

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 2 - UV Spot - Second Treatment



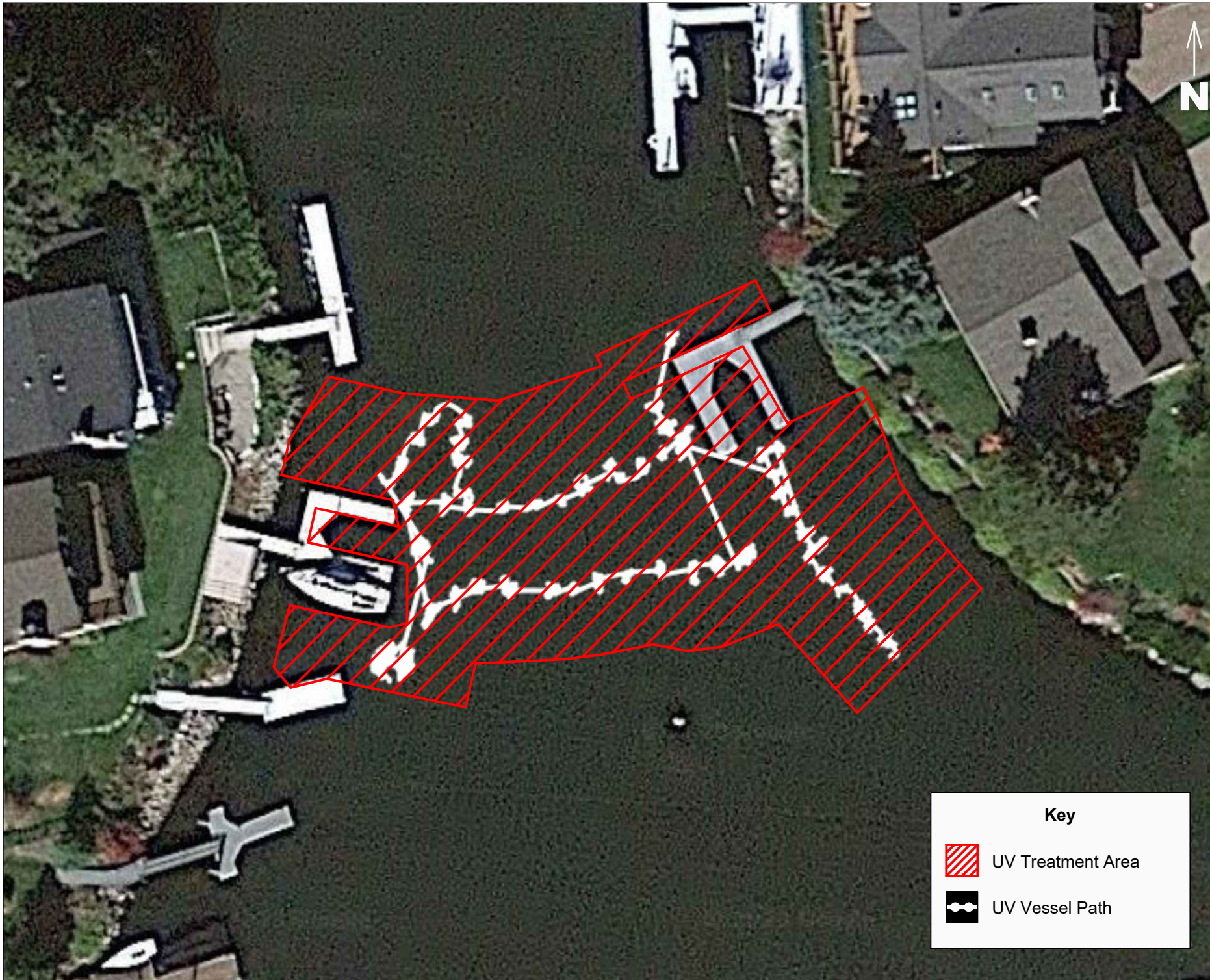
Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	10-04-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	37

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 2 - UV Spot - Third Treatment



Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	10-23-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	

Site 3

UVC Treatment Map

Spot Treatment



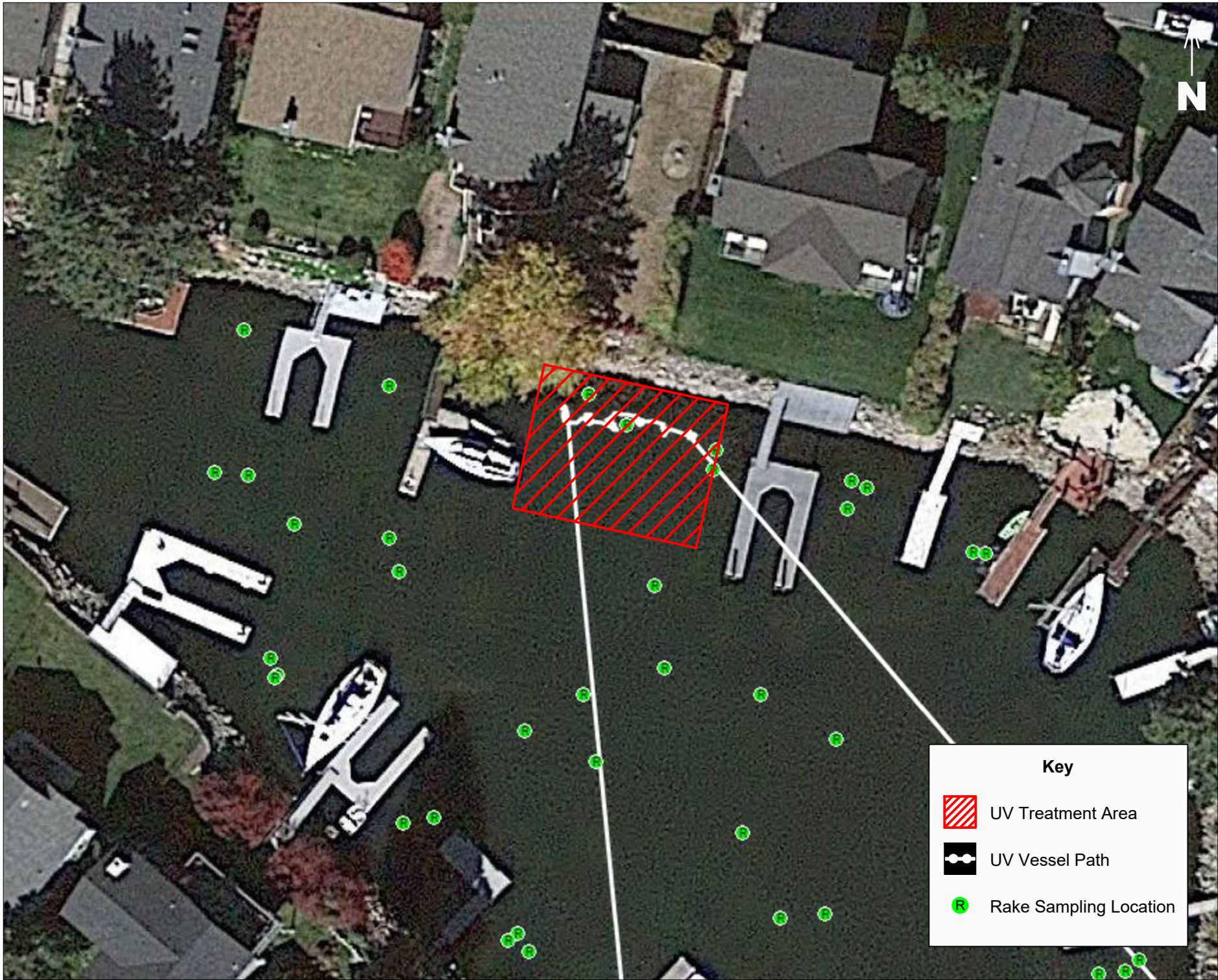
Key

-  UV Treatment Area
-  UV Vessel Path
-  Rake Sampling Location

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

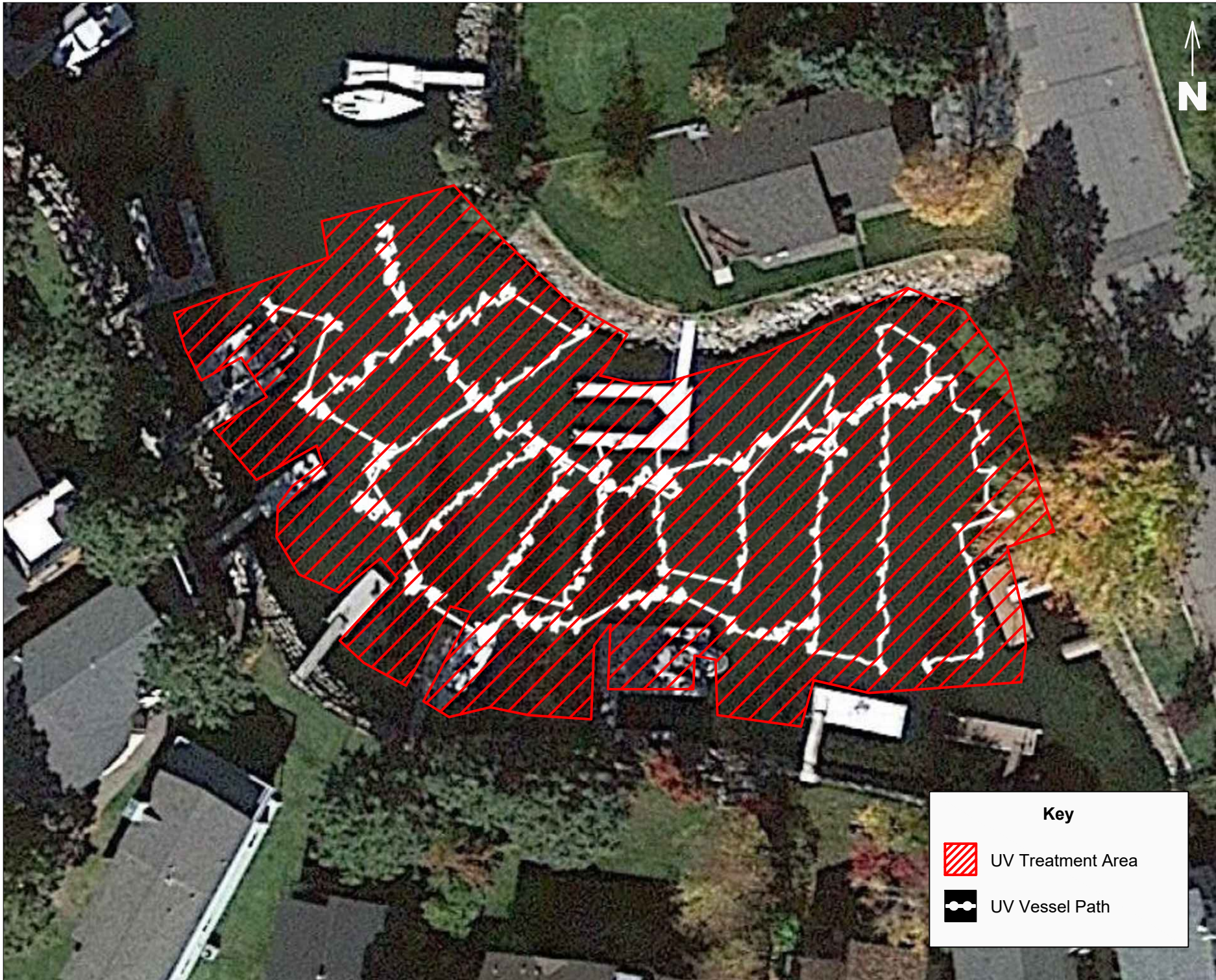
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SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	15

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 3 South - UV Spot - First Treatment



Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	07-11-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP



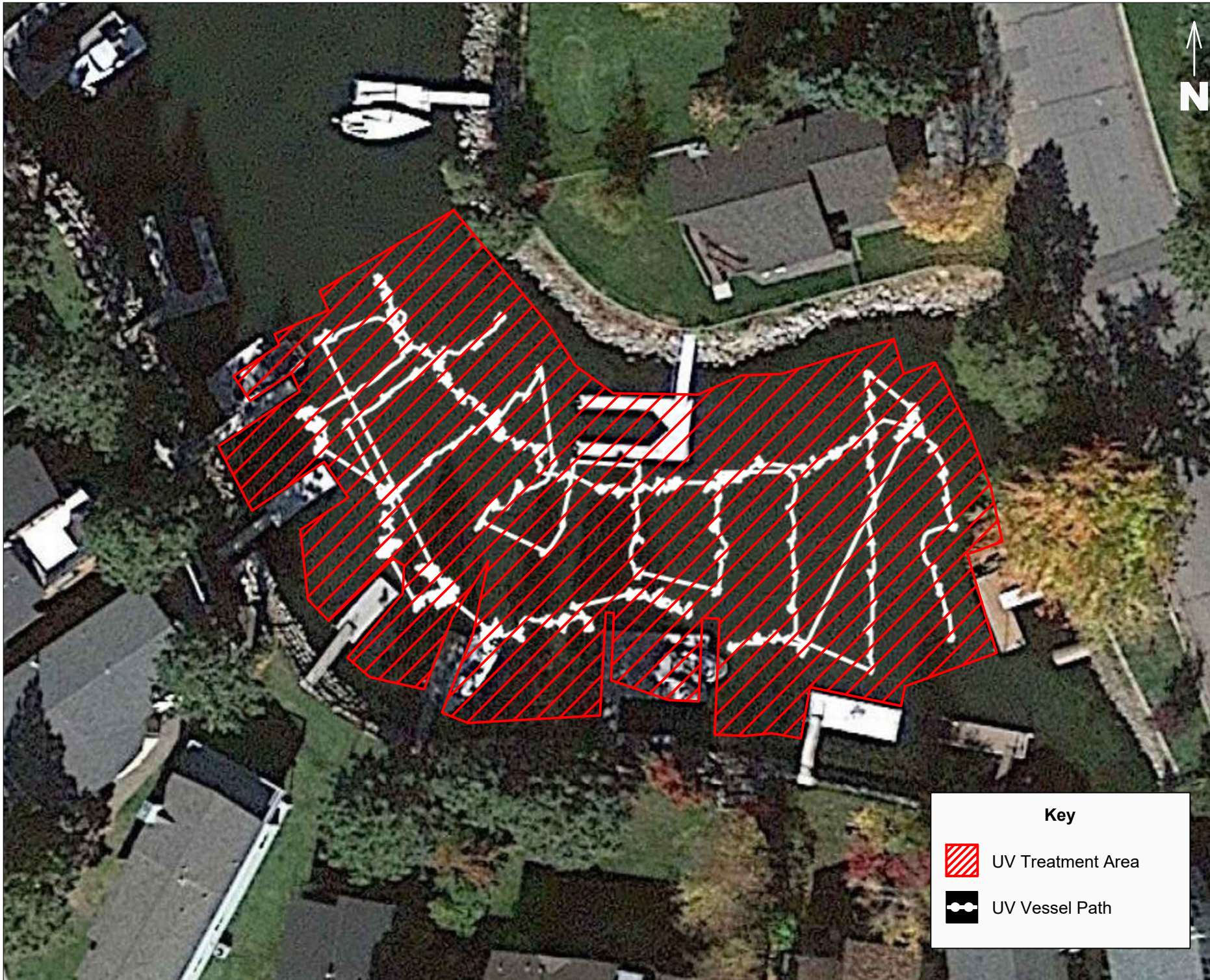
Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	08-23-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	24

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 3 - UV Spot - Second Treatment



Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	10-02-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP

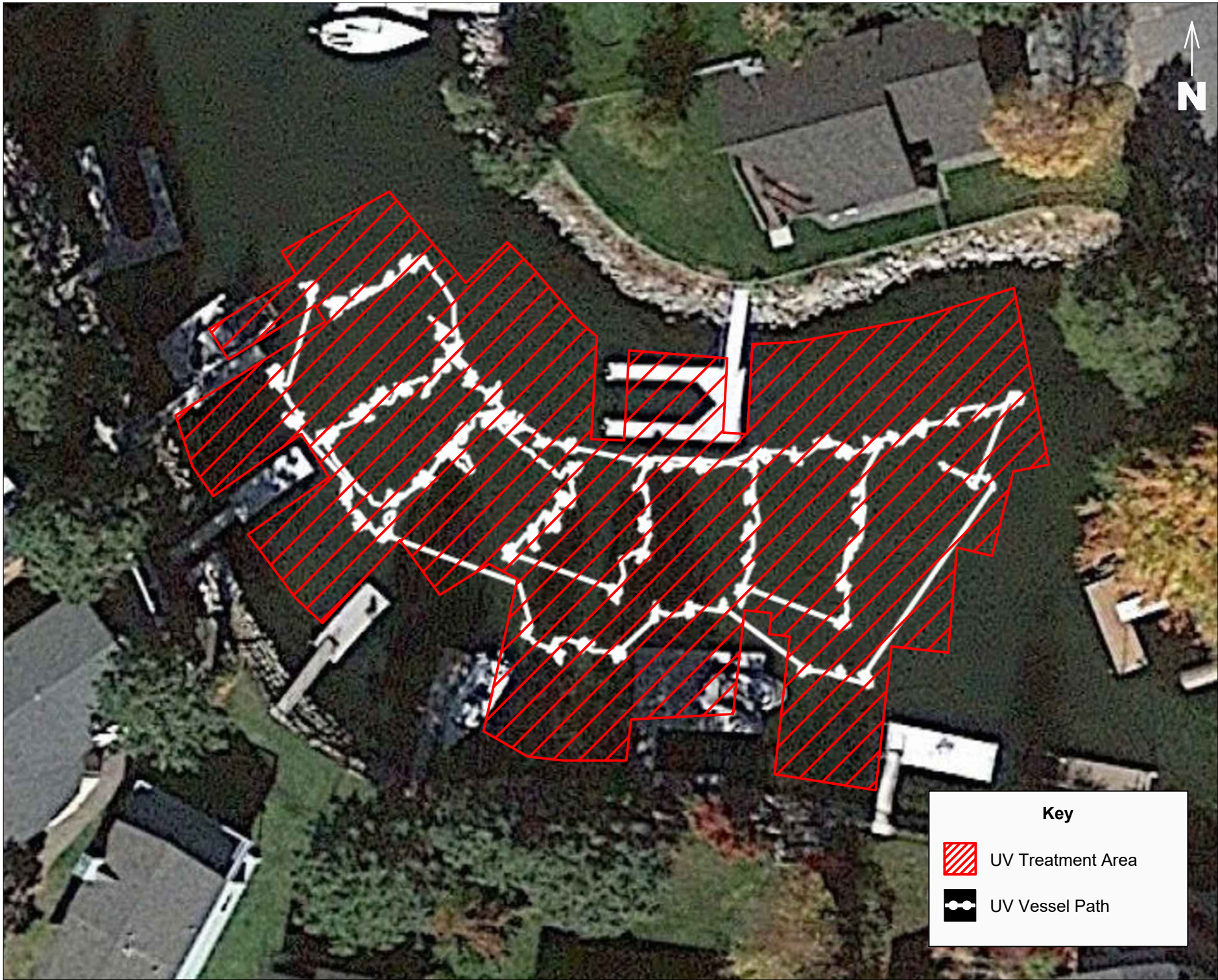
EXHIBIT

35

UVC Light Aquatic Invasive Plant Control Pilot Project 2023

Tahoe Keys

Site 3 - UV Spot - Third Treatment



Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	10-18-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	46

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 3 - UV Spot - Fourth Treatment

Site 5

UVC Treatment Map
Spot Treatment



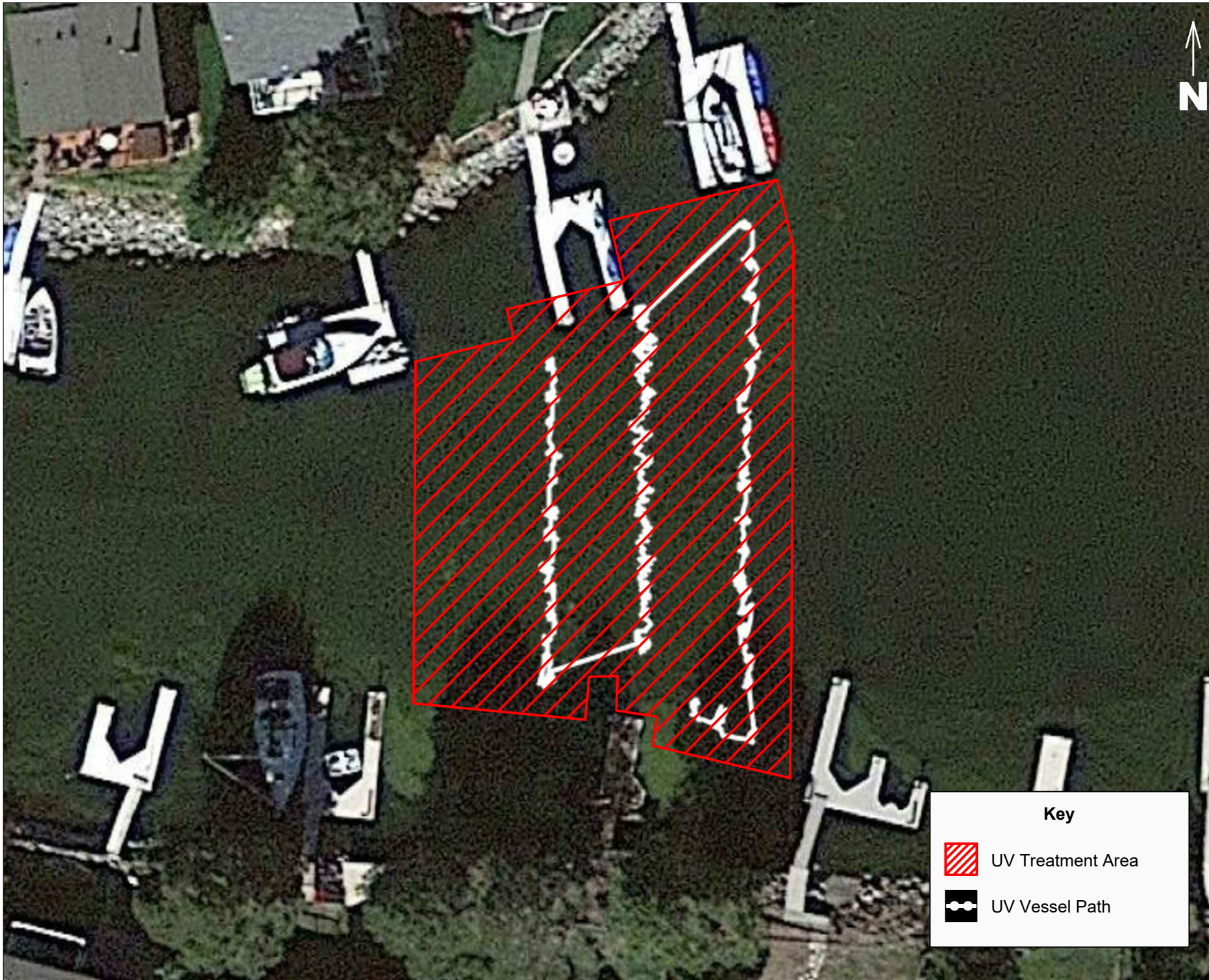
Key

-  UV Treatment Area
-  UV Vessel Path
-  Rake Sampling Location

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	07-31-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	23

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site Five - UV Spot - First Treatment



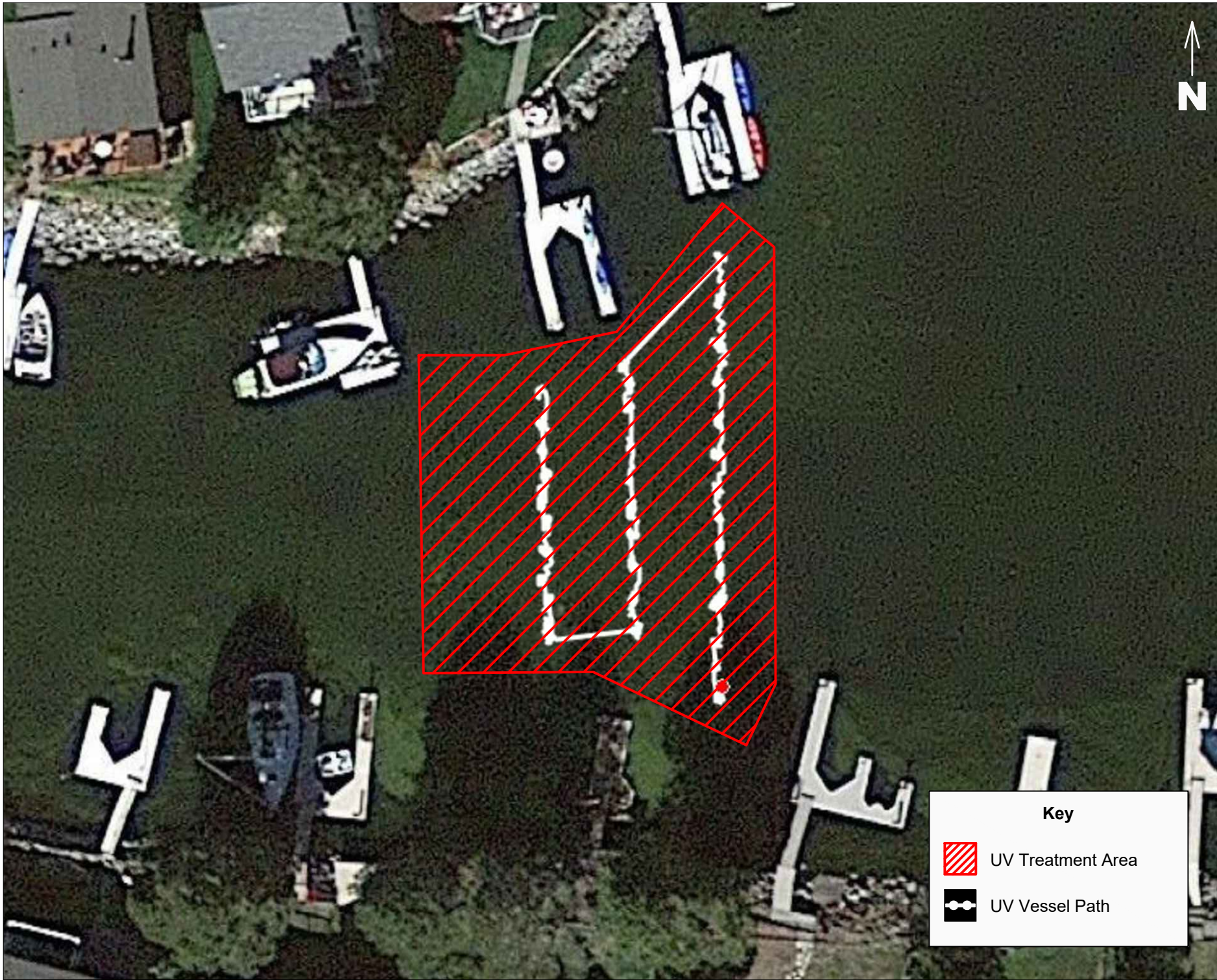
Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	08-22-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	23

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 5 - UV Spot - Second Treatment



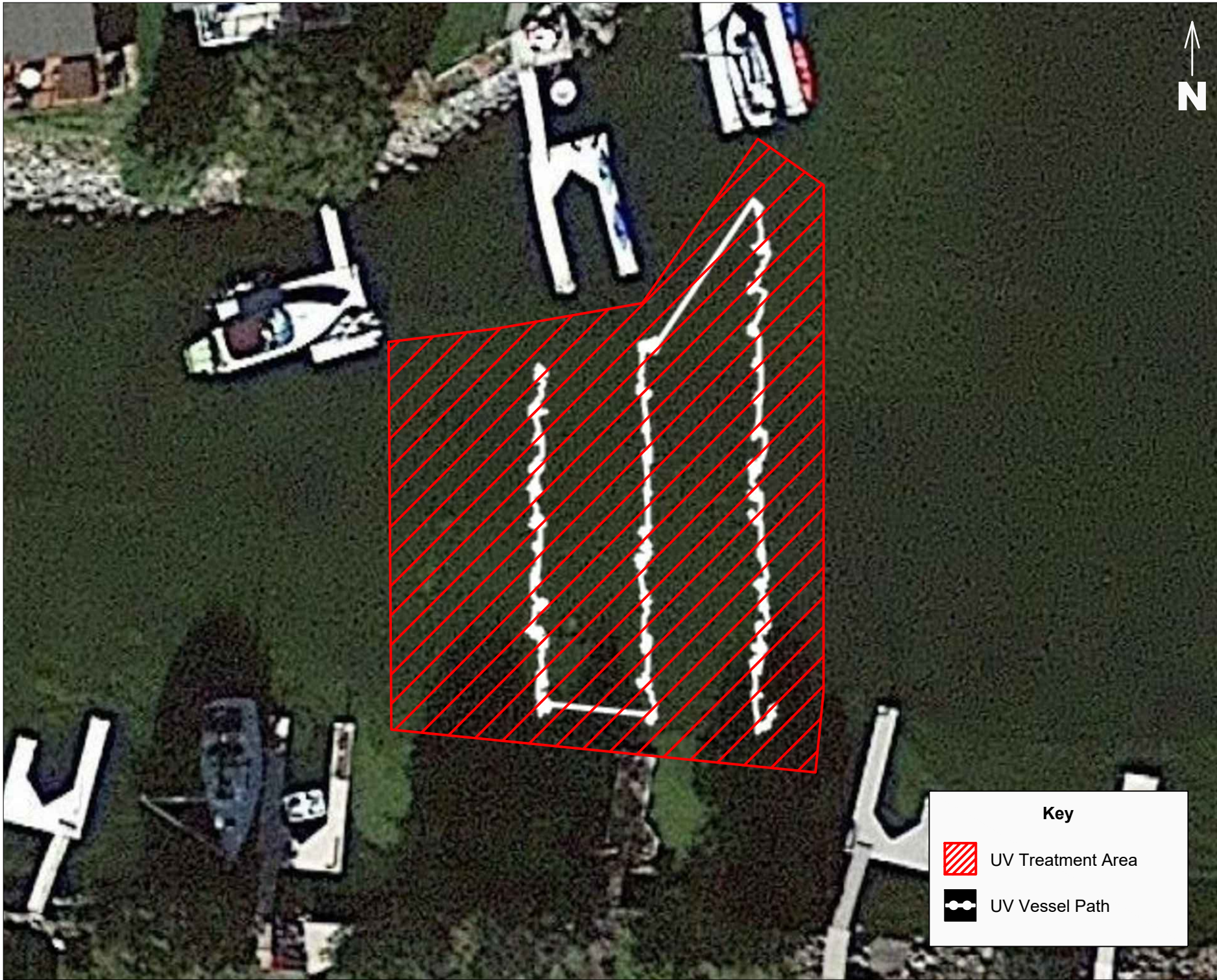
Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	09-21-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	31

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 5 - UV Spot - Third Treatment



Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	10-18-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	43

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 5 - UV Spot - Fourth Treatment

Site 9

UVC Treatment Map
Spot Treatment



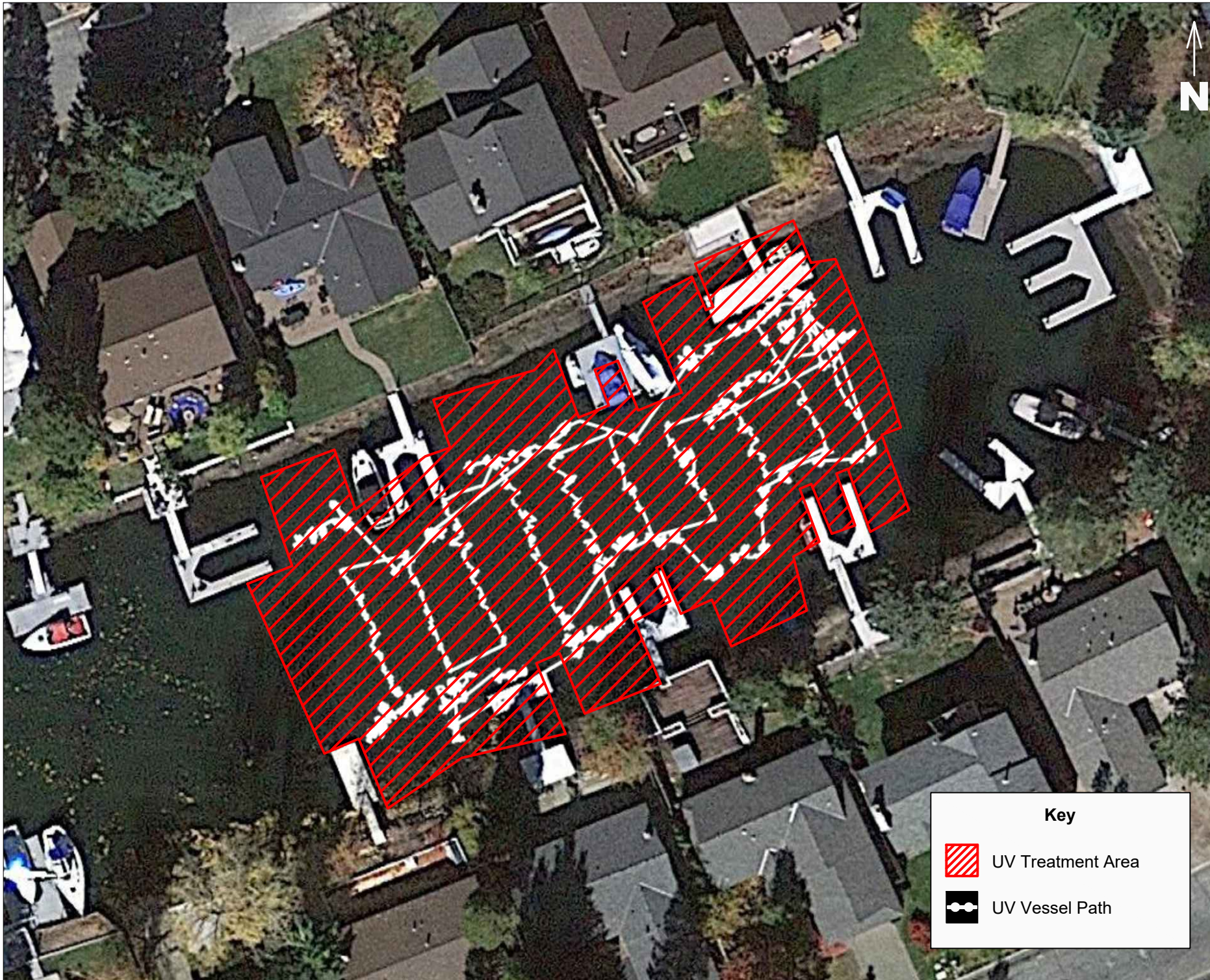
Key

-  UV Treatment Area
-  UV Vessel Path
-  Rake Sampling Location

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	06-29-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	3

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 9 - UV Spot - First Treatment



Key

 UV Treatment Area

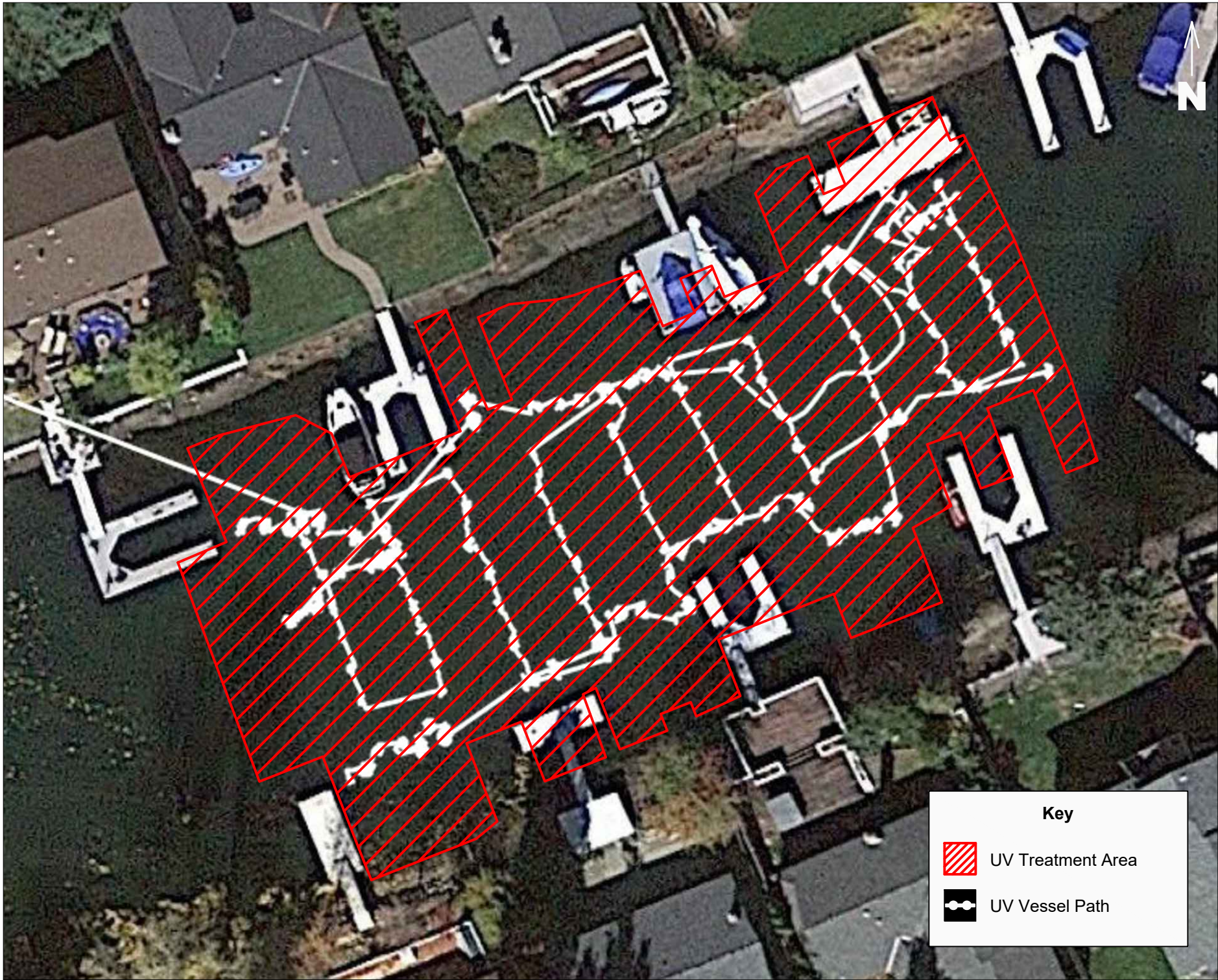
 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	07-21-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	

UVC Light Aquatic Invasive Plant Control Pilot Project 2023

Tahoe Keys

Site 9 - UV Spot - Second Treatment



Key

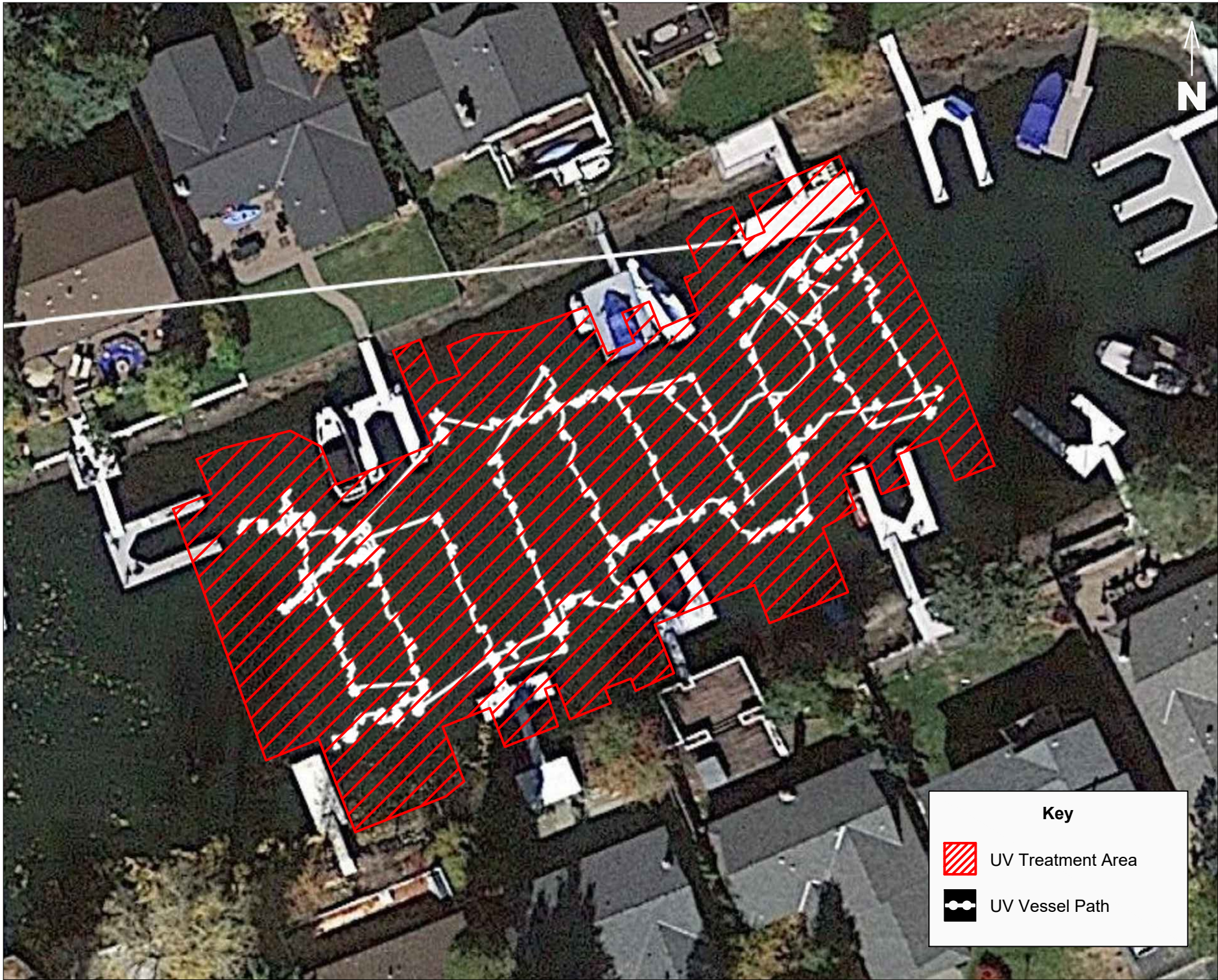
 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	10-05-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	38

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 9 - UV Spot - Third Treatment



Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	10-17-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	41

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 9 - UV Spot - Fourth Treatment

Site 10

UVC Treatment Map



Key

-  UV Treatment Area
-  UV Vessel Path
-  Rake Sampling Location

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	08-11-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	

UVC Light Aquatic Invasive Plant Control Pilot Project 2023

Tahoe Keys

Site 10 - UV Combo - First Treatment



Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	09-01-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	

Site 11

UVC Treatment Map



Key

-  UV Treatment Area
-  UV Vessel Path
-  Rake Sampling Location

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	08-18-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	26

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 11 - UV Combo - First Treatment



Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	09-08-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	28

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 11 - UV Combo - Second Treatment

Site 13

UVC Treatment Map



Key

 UV Treatment Area

 UV Vessel Path

 Rake Sampling Location

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	06-15-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	1

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 13 - UV Combo - First Treatment



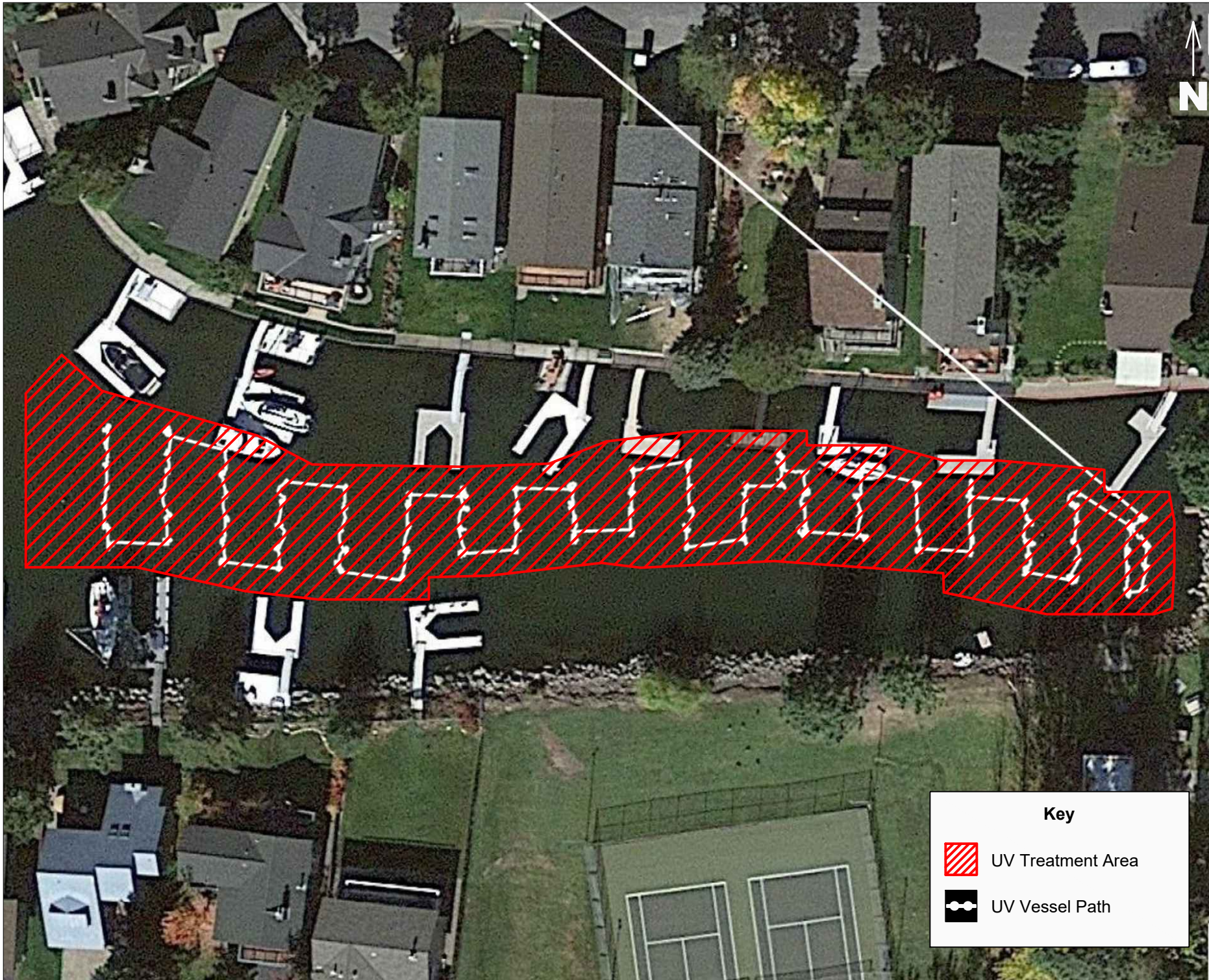
Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	07-13-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	13

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 13 - UV Combo - Second Treatment



Key

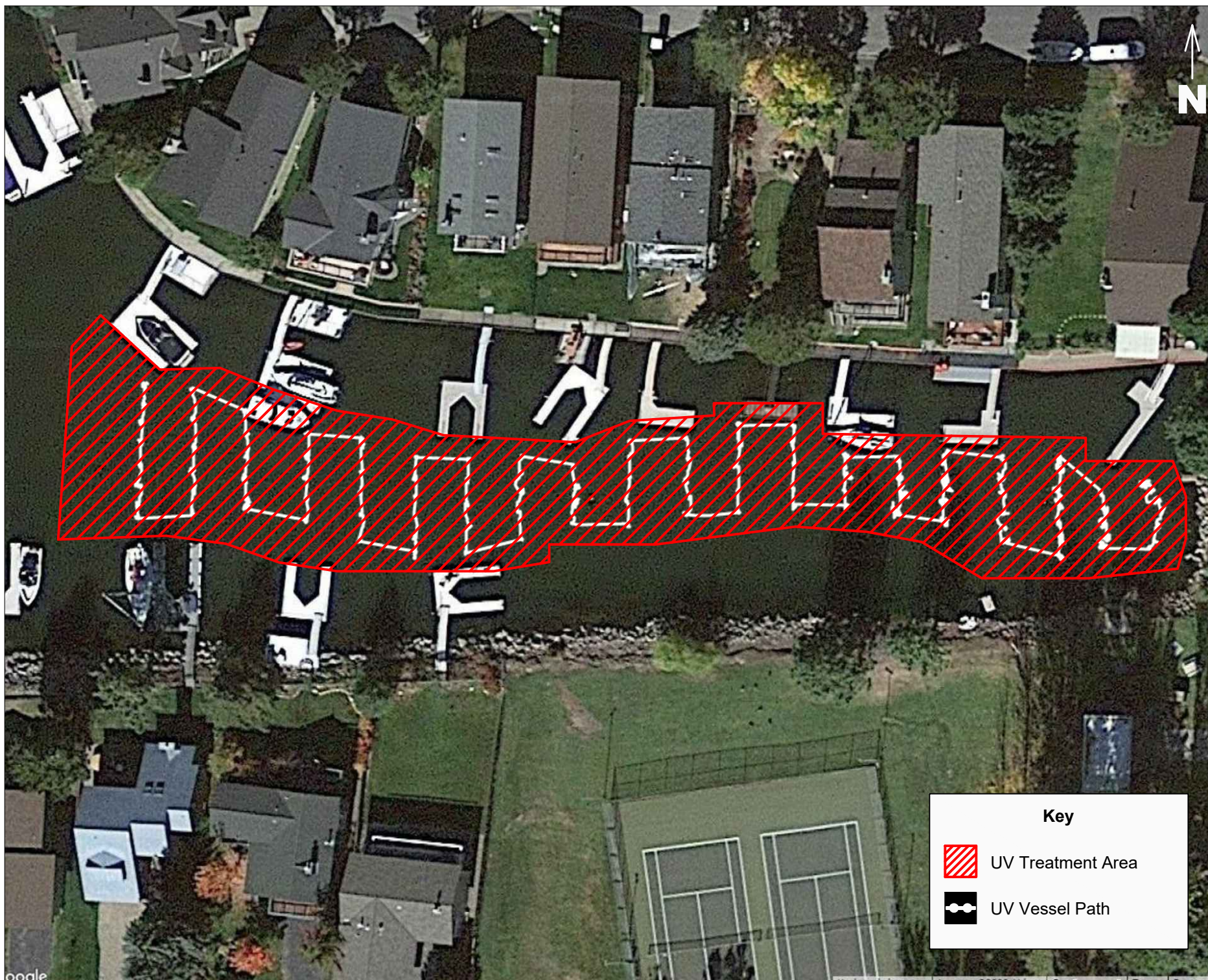
 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	09-27-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 13 - UV Combo - Third Treatment



UVC Light Aquatic Invasive Plant Control Pilot Project 2023

Tahoe Keys

Site 13 - UV Combo - Fourth Treatment

Inventive Resources, Inc.

5038 Salida Blvd / PO Box 1316

Salida, California 95368

Salida, California 95368
General Information: 209.545.1663

DATE 10-20-23

SCALE NTS

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CHECKED BY FP

REVIEWED BY JAP

EXHIBIT

44

Key



UV Treatment Area



UV Vessel Path

Site 14

UVC Treatment Map



Key

-  UV Treatment Area
-  UV Vessel Path
-  Rake Sampling Location

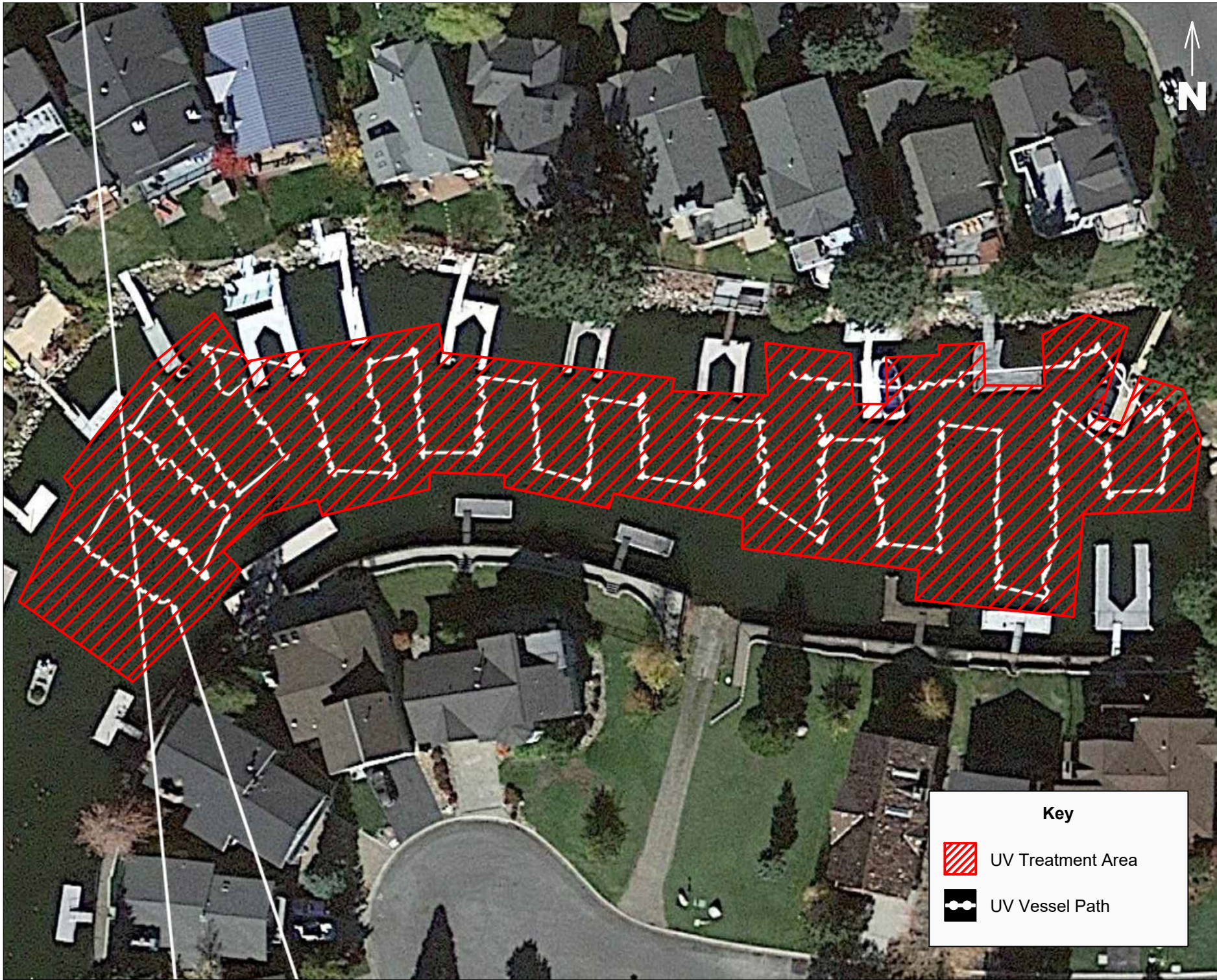
Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	06-16-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	2

UVC Light Aquatic Invasive Plant Control Pilot Project 2023

Tahoe Keys

Site 14 - UV Combo - First Treatment



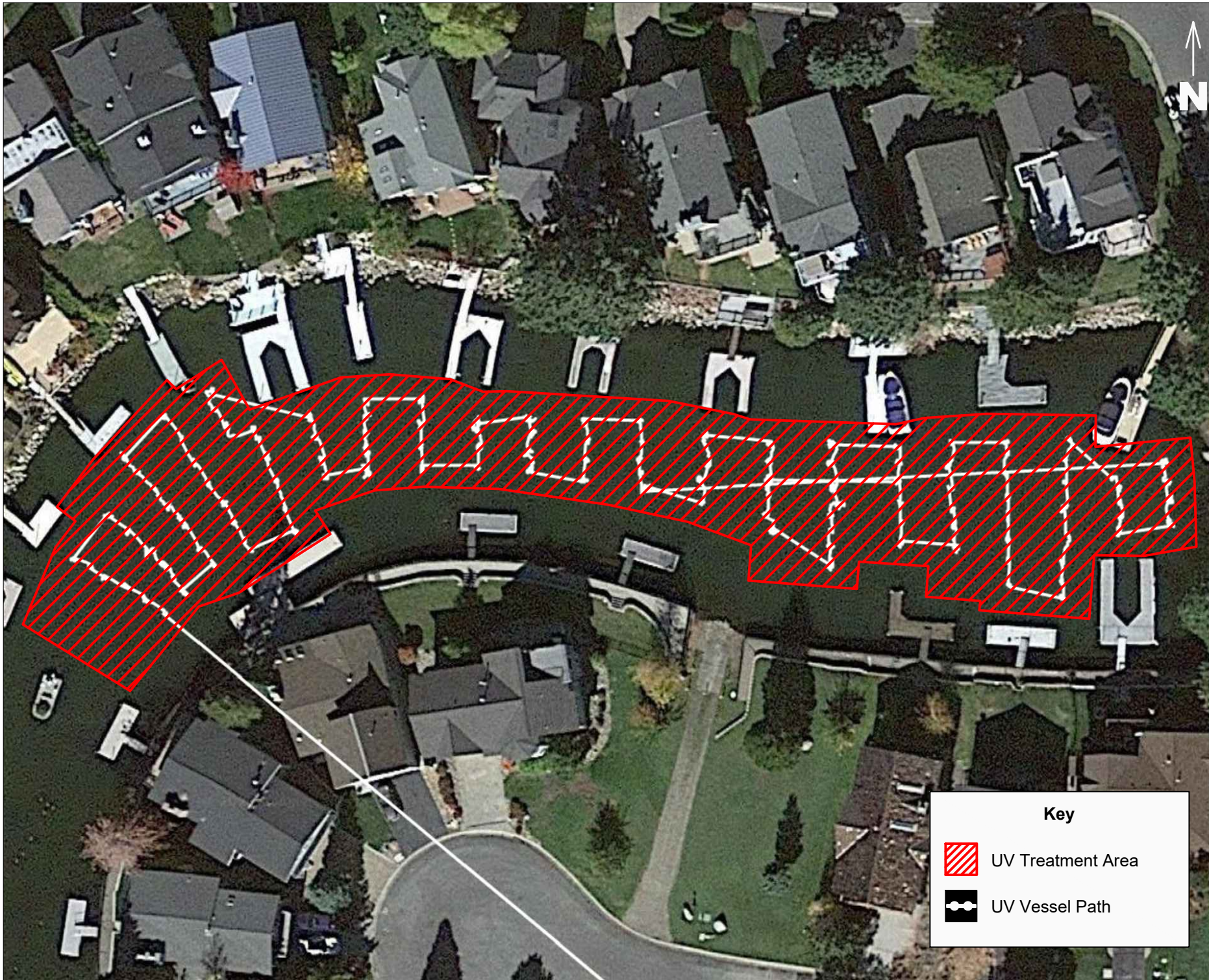
Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	07-19-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	17

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 14 - UV Combo - Second Treatment



Key

 UV Treatment Area

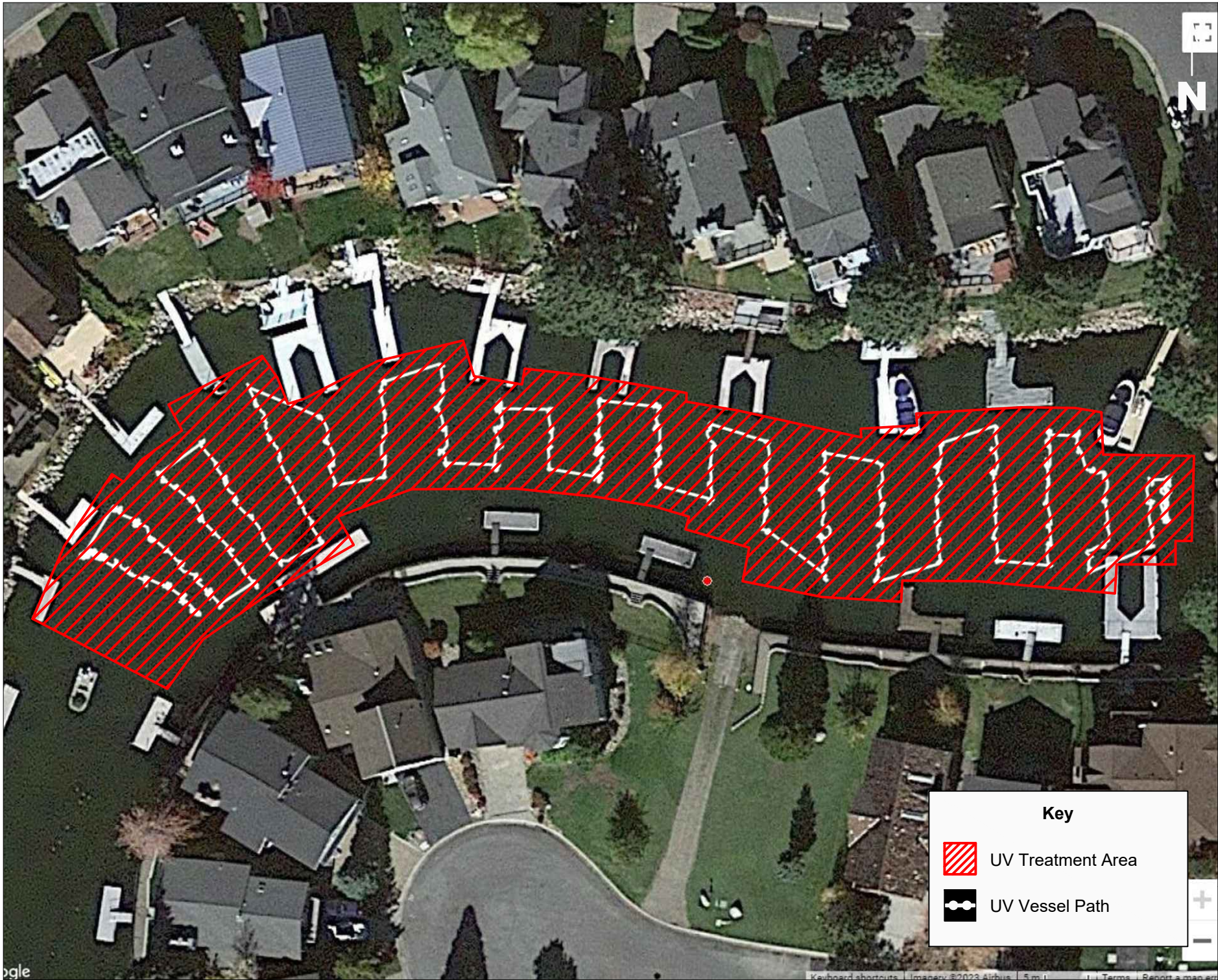
 UV Vessel Path

Inventive Resources, Inc.	
5038 Salida Blvd / PO Box 1316	
Salida, California 95368	
General Information: 209.545.1663	
DATE	09-29-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	

UVC Light Aquatic Invasive Plant Control Pilot Project 2023

Tahoe Keys

Site 14 - UV Combo - Third Treatment



Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	10-24-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	45

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 14 - UV Combo - Fourth Treatment

Site 22

UVC Treatment Map



Key

-  UV Treatment Area
-  UV Vessel Path
-  Rake Sampling Location

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	06-21-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	6

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 22 - UV Only - First Treatment



UV Treatment Area

UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	07-27-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	21

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
 Tahoe Keys
 Site 22 - UV Only - Second Treatment



Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	09-14-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	29

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 22 - UV Only - Third Treatment



Google

Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	10-10-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	39

UV Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 22 - UV Only - Fourth Treatment

Site 23

UVC Treatment Map



Key

-  UV Treatment Area
-  UV Vessel Path
-  Rake Sampling Location

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	06-28-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	7

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 23 - UV Only - First Treatment

Site 24

UVC Treatment Map



Key

-  UV Treatment Area
-  UV Vessel Path
-  Rake Sampling Location

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	06-23-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	8

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 24 - UV Only - First Treatment



Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	08-04-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	24

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 24 - UV Only - Second Treatment



Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	09-20-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	30

UVC Light Aquatic Invasive Plant Control Pilot Project 2023

Tahoe Keys

Site 24 - UV Only - Third Treatment



Key

 UV Treatment Area

 UV Vessel Path

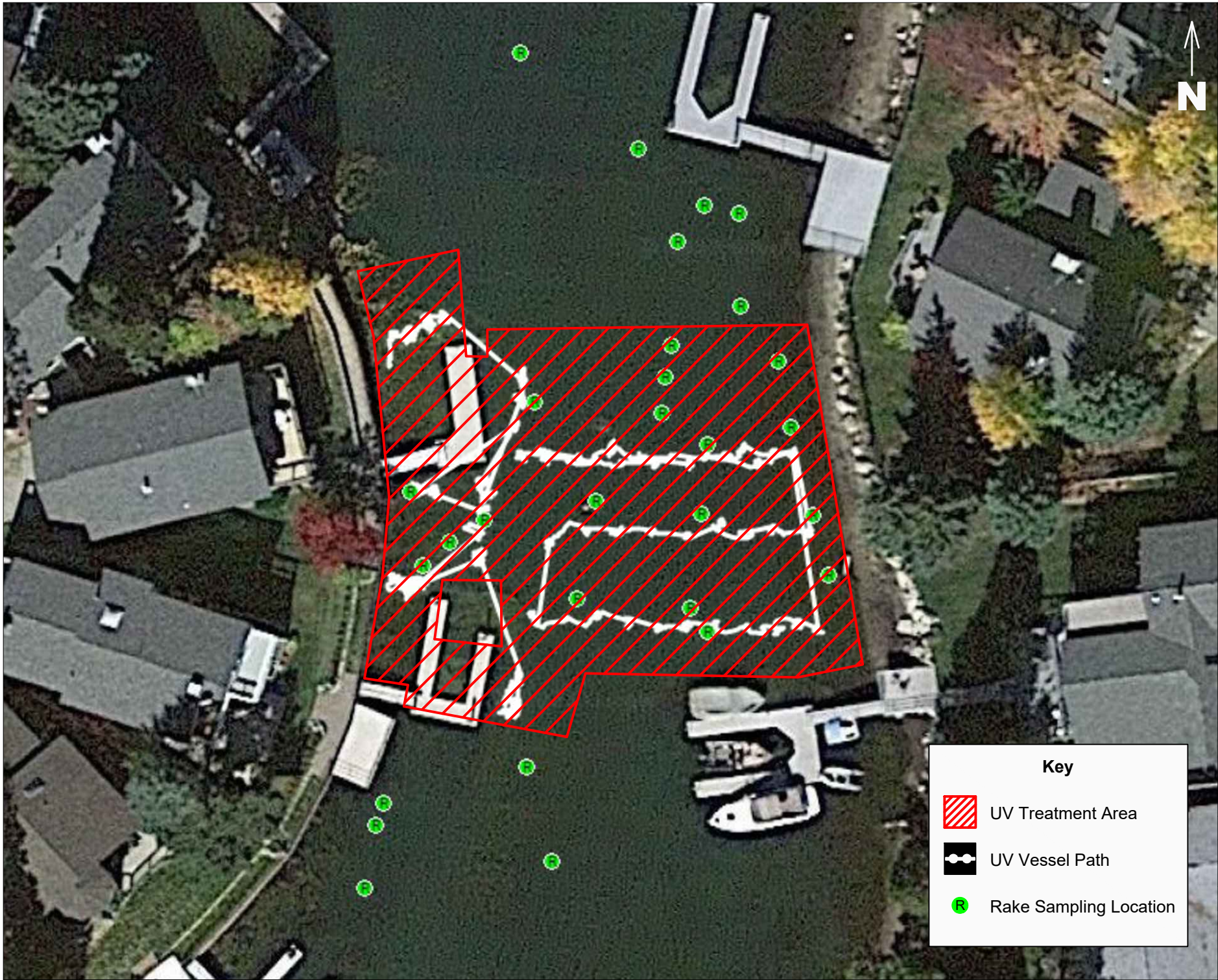
Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	10-13-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	40

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 24 - UV Only - Fourth Treatment

Site 26

UVC Treatment Map

Spot Treatment

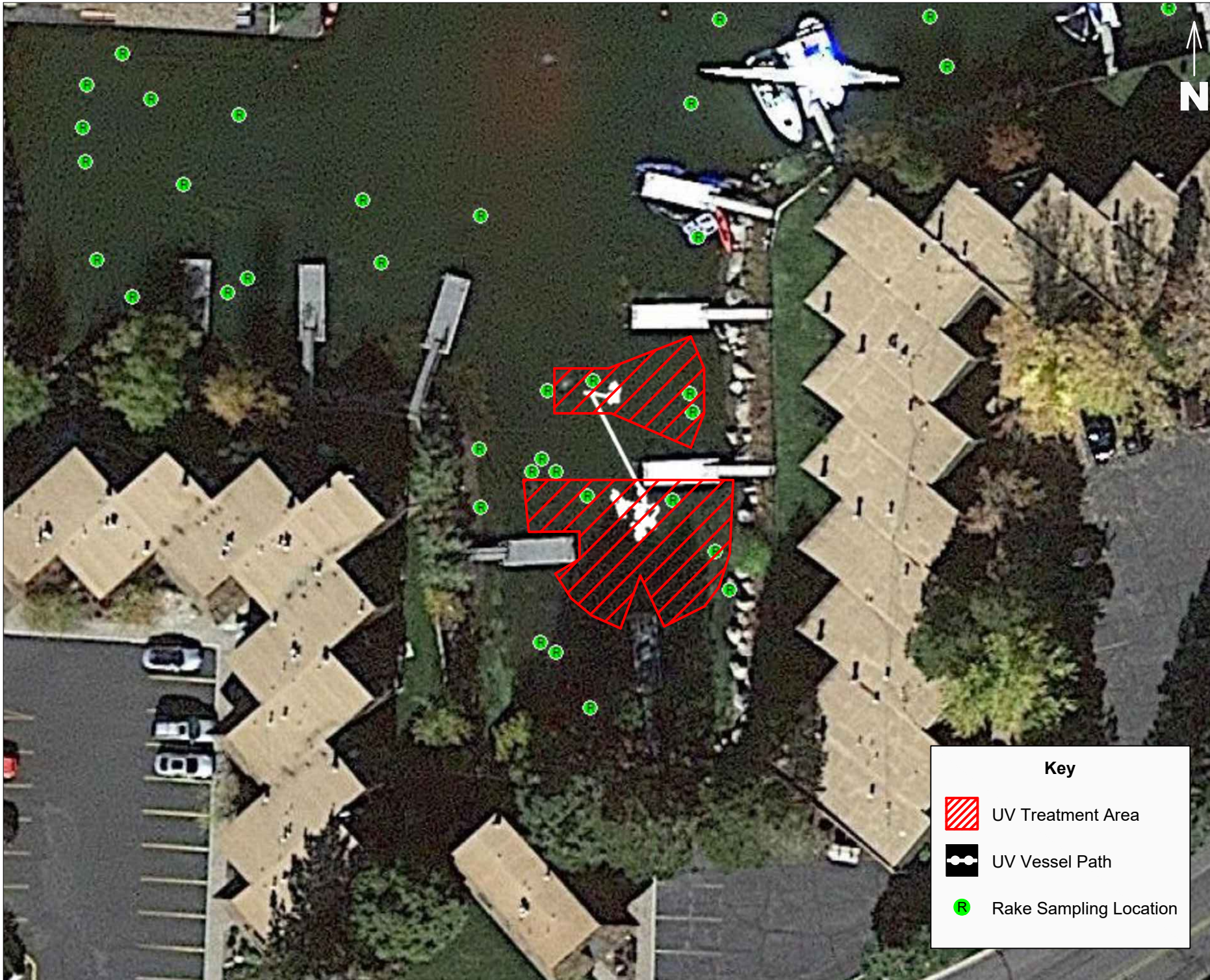


Key

-  UV Treatment Area
-  UV Vessel Path
-  Rake Sampling Location

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	06-30-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	



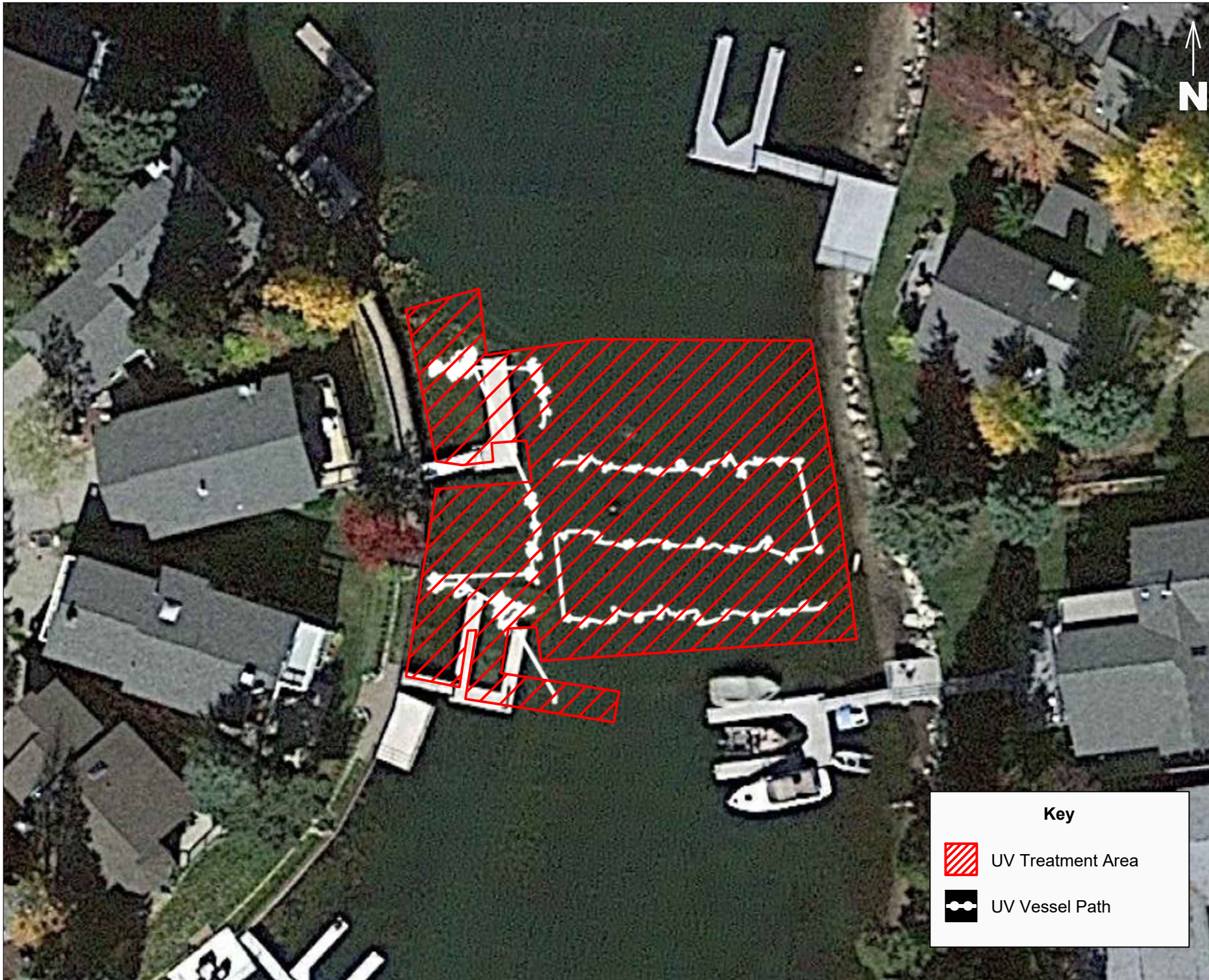
Key

-  UV Treatment Area
-  UV Vessel Path
-  Rake Sampling Location

Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	07-05-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 26 South - UV Spot - First Treatment



Key

 UV Treatment Area

 UV Vessel Path

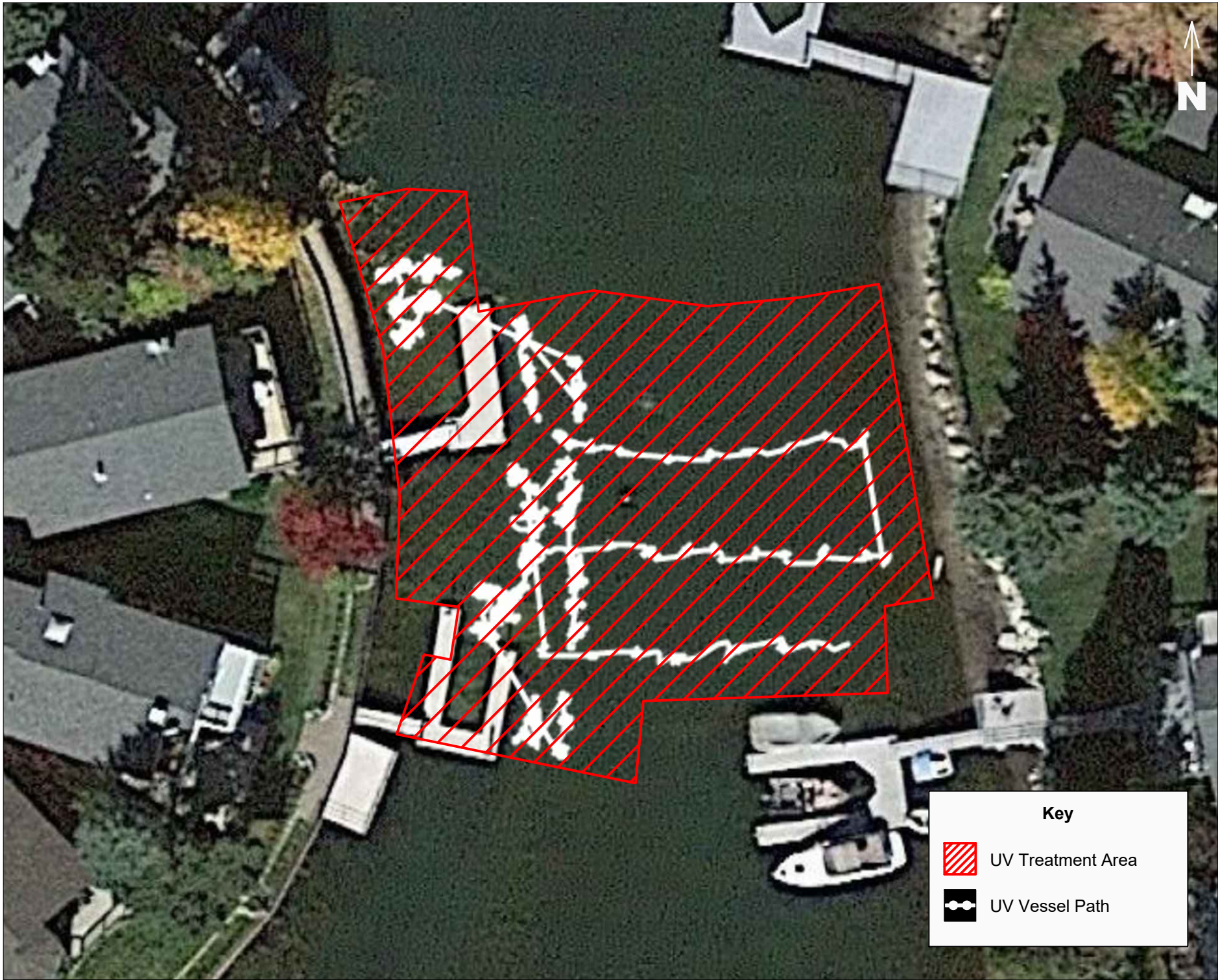
Inventive Resources, Inc.
5038 Salida Blvd / PO Box 1316
Salida, California 95368
General Information: 209.545.1663

DATE	07-28-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	

UVC Light Aquatic Invasive Plant Control Pilot Project 2023

Tahoe Keys

Site 26 - UV Spot - Second Treatment



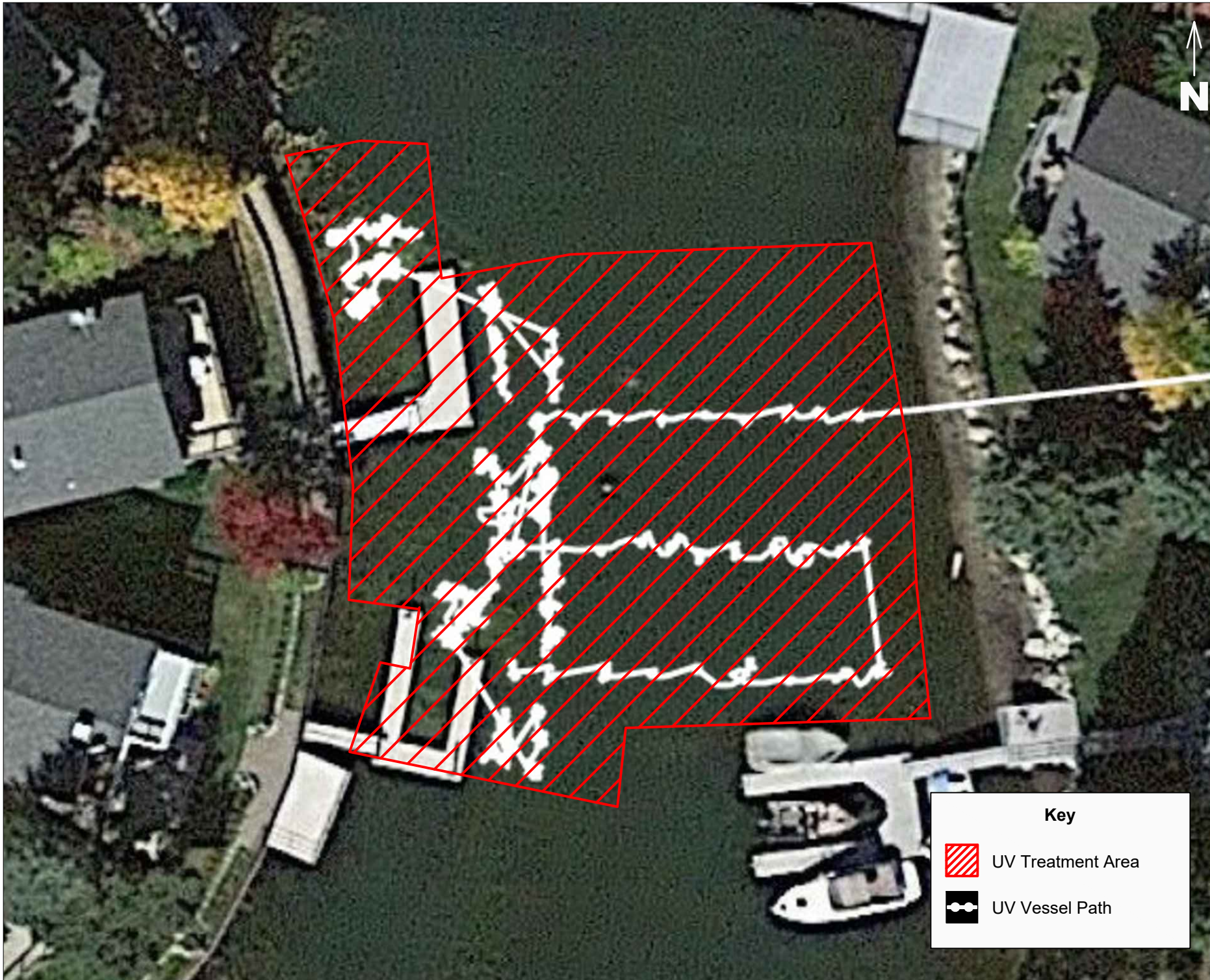
Key

 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	09-22-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	32

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 26 - UV Spot - Third Treatment



Key

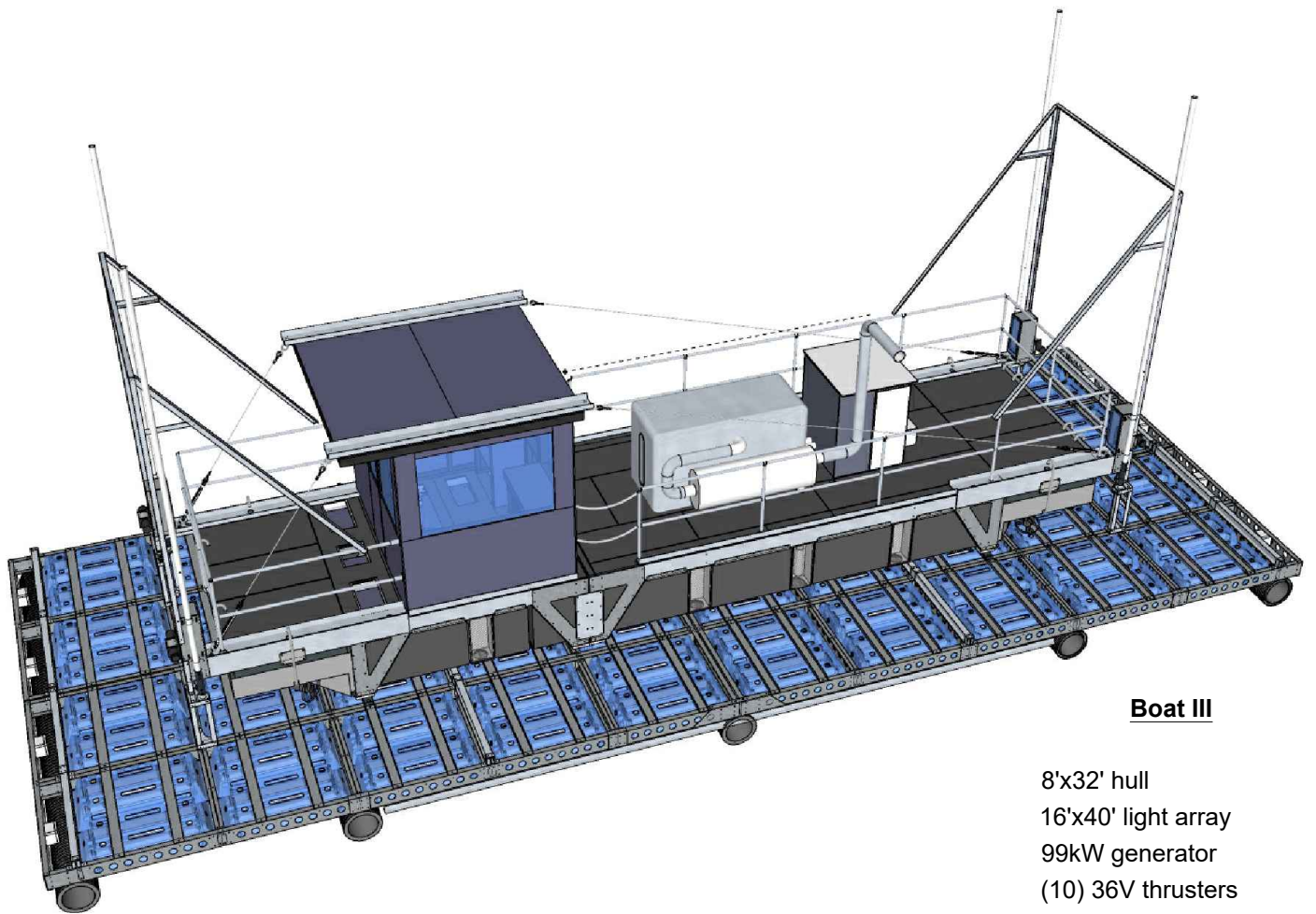
 UV Treatment Area

 UV Vessel Path

Inventive Resources, Inc. 5038 Salida Blvd / PO Box 1316 Salida, California 95368 General Information: 209.545.1663	
DATE	10-17-23
SCALE	NTS
DRAWN BY	DS
CHECKED BY	EP
REVIEWED BY	JAP
EXHIBIT	

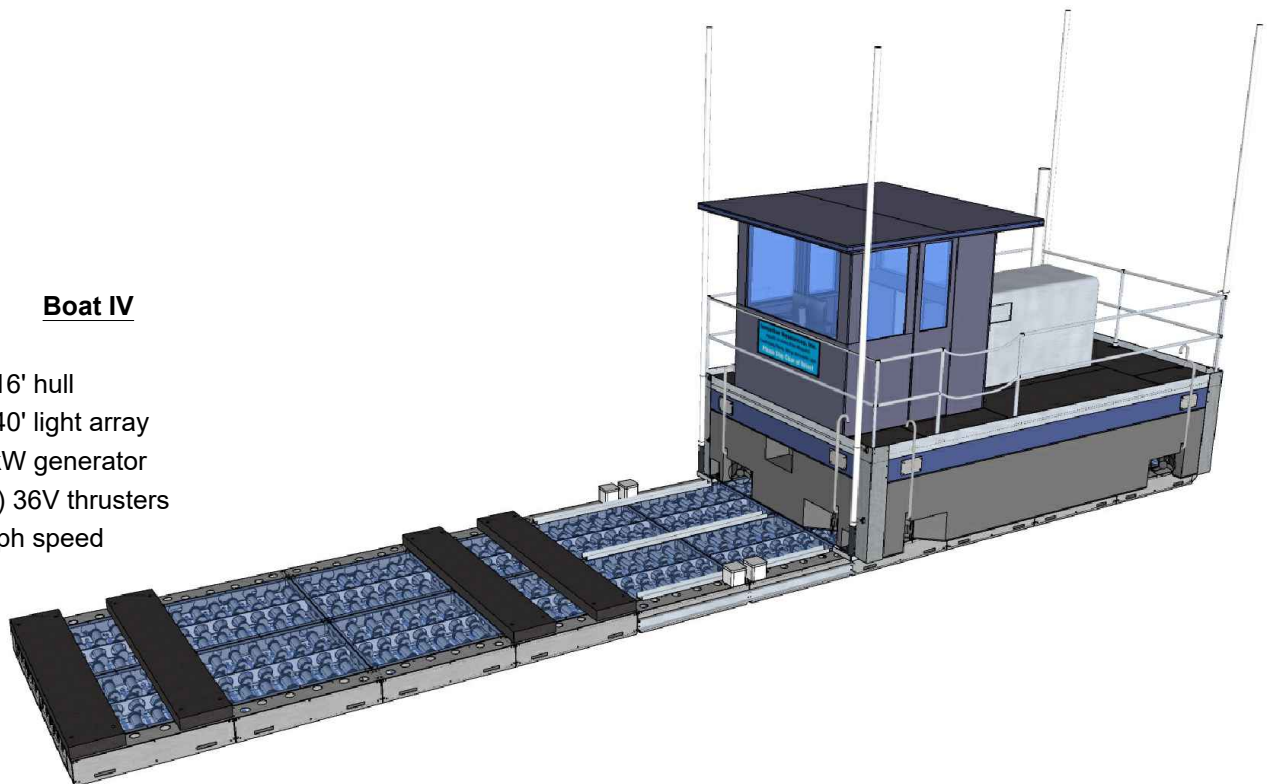
UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Tahoe Keys
Site 26 - UV Spot - Fourth Treatment

Attachment B
UVC Light Aquatic Invasive Plant Control Pilot Project 2023
UV Treatment Vessel General Information



Boat III

8'x32' hull
 16'x40' light array
 99kW generator
 (10) 36V thrusters
 0.8mph speed



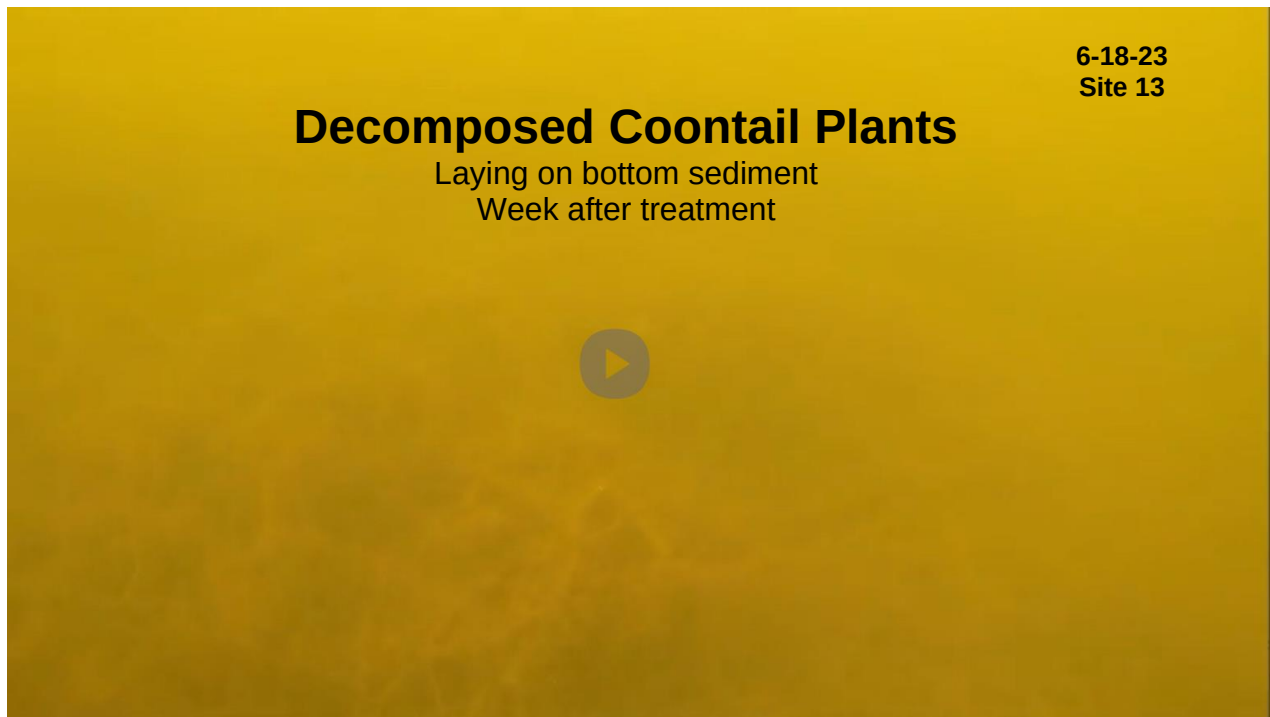
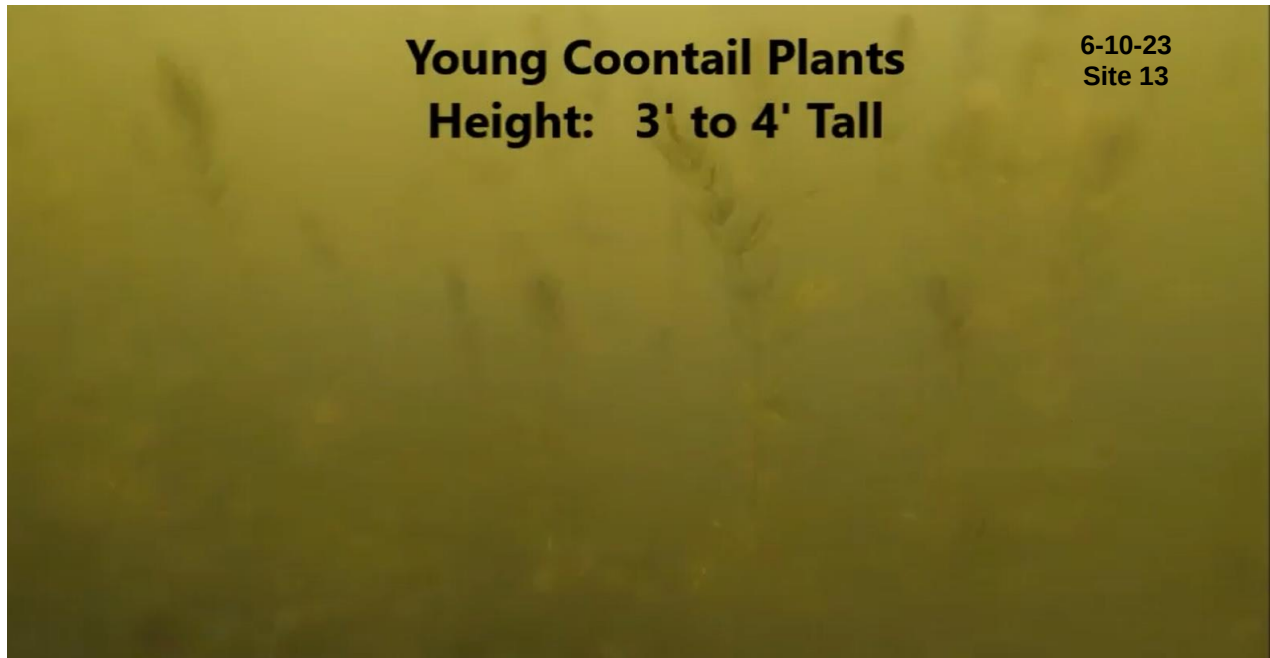
Boat IV

9'x16' hull
 8'x40' light array
 65kW generator
 (12) 36V thrusters
 2mph speed

EXHIBIT	REVIEWED BY	CHECKED BY	DRAWN BY	SCALE	DATE	Inventive Resources, Inc.
JAP	EP	DS	DS	NTS	01-18-23	5038 Salida Blvd / PO Box 1316
						Salida, California 95368
						General Information: 209.545.1663

UVC Light Aquatic Invasive Plant Control Pilot Project 2023
 Tahoe Keys
 Boat Specifications

Attachment C
UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Before vs After



Attachment D
UVC Light Aquatic Invasive Plant Control Pilot Project 2023
Various UV treatment vessel in operation

UVC TREATMENT VESSEL III



UVC TREATMENT VESSEL IV

