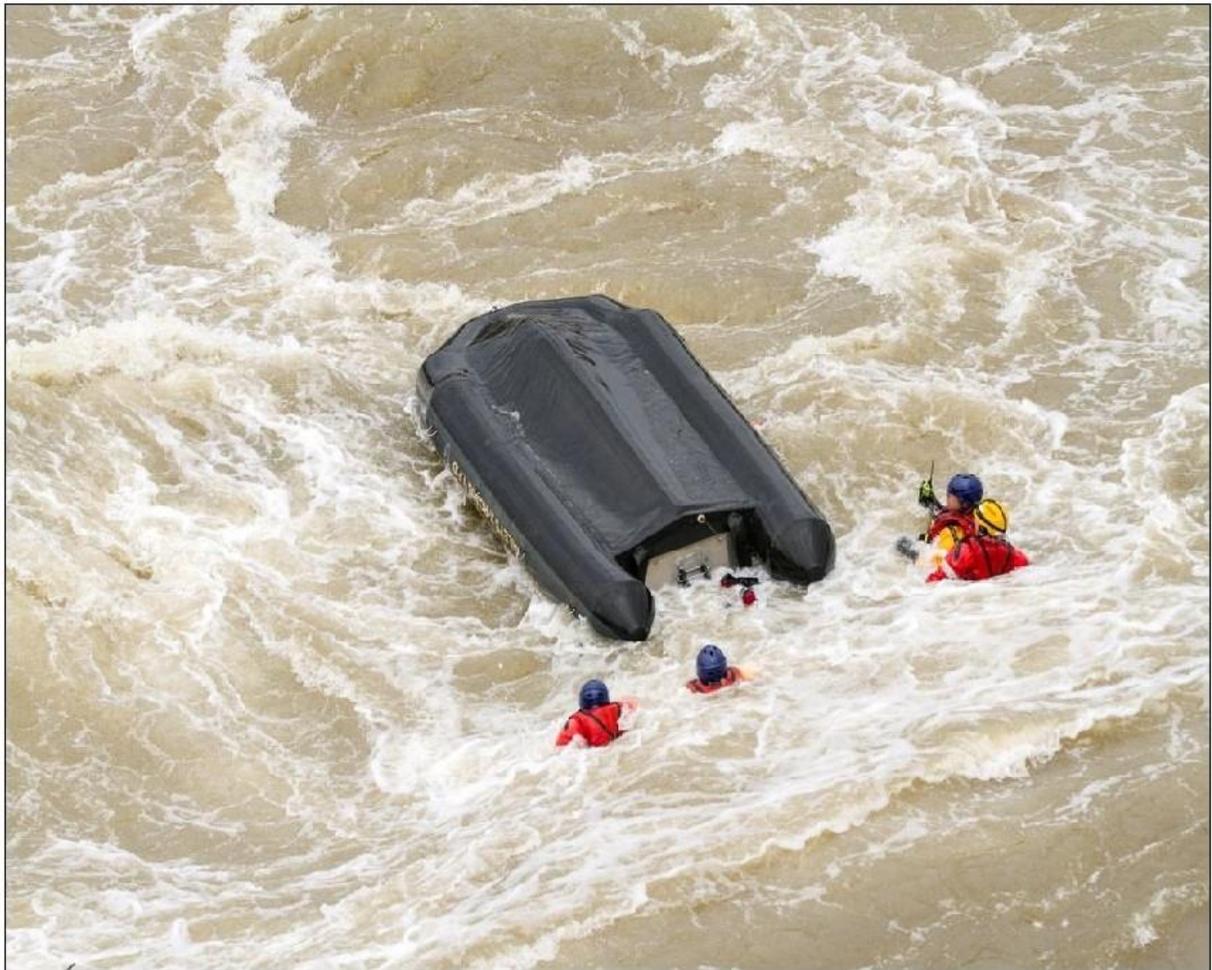




CLOSE CALL/HAZARD REPORT



Swift Water Rescue Training Incident
9200 Old Dominion Drive, Great Falls
April 2, 2014



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Executive Summary:

A swift water and boat drill was conducted on April 2-4, 2014 at Great Falls Park, on the upper Potomac River. Seven boats from the Fairfax County Fire and Rescue Department and two boats from the Fairfax City Fire Department participated. During the morning portion of the drill on April 2, 2014, a participant boat flipped, sending three personnel into the water. A second boat staffed with instructors retrieved one of the personnel from the water, but soon after it capsized as well, sending three instructors and the rescued participant into the water. Subsequently, one staff member traveled through a significant rapid and was drawn into a whirlpool. Based on numerous witness reports, cross referenced with map features, this victim resurfaced after traveling several hundred feet downriver, while submerged in violently turbulent water. Eventually, all personnel were rescued and most equipment was recovered from the river, but injuries to personnel required the transportation of staff to a local hospital for evaluation. There was also damage or loss to department equipment.

Following an investigation by a battalion chief and safety officer, the training was allowed to continue with the understanding that boats would not be allowed on the northern part of the river (above S-turn). While no incidents were reported on the second day of training, on the third day of the drill a participant suffered a significant injury, while operating in restricted areas. Following an initial review of both incidents, the department placed a moratorium on all swift water training and began a close call investigation.

Summary of Contributing Factors:

This incident exposed organizational deficiencies that allowed unnecessary risk-taking and concurrent disregard for personnel safety. The findings from this extensive investigation are detailed in the attached report.

A number of critical failures contributed to the jeopardy of personnel training in boats on the Potomac River:

- Inadequate swift water operational and training policies
- Failure of drill leaders and students to follow existing Fire & Rescue Department (FRD) policies
- A drill structure lacking adequate planning, safeguards, and accountability
- Complacency by staff who failed to treat the river as an IDLH environment
- Failure to incorporate a safety plan into the drill
- Failure to incorporate an adequate medical response plan into the drill

This investigation focused on the consequences of organizational failures specific to swift water training; however the issues examined in the attached report have implications that warrant department-wide consideration. In order to mitigate risks and protect personnel, those identified issues which are currently addressed by department and regional guidance documents may need to be reviewed and updated. Other issues may warrant fresh examination and development of new/additional policies.



Investigation Team:

The Firefighter Injury Investigation Team was activated on April 17, 2014, to investigate the circumstances that occurred during the incident. The team was assembled under the direction of Fire Chief Richard Bowers who appointed Deputy Fire Chief Andrew L. Duke as the Team Leader.

Team Leader

Deputy Fire Chief Andrew L. Duke

Investigative Team Members

Battalion Chief Brian Rooney
Battalion Chief Ryland Kendrick
Captain I William Best
Captain I Matthew Cox
Captain I Michael Davis
Captain I Matthew Ryan
Lieutenant Andrew Devlin
Lieutenant Matthew Tamillow

Subject Matter Experts/Document Review

Captain II Mark Feaster, Retired



Investigative Tasks:

- Gather and review written statements from involved parties
- Gather and review pictures and videos
- Review radio traffic recording and develop radio traffic transcript
- Conduct follow-up interviews with 32 involved personnel
- Conduct research into swift water boat training best practices
- Review NFPA standards
- Review all relevant procedures, operational manuals and other pertinent documents
- Analyze relevant (current and historical) injury reports
- Analyze relevant (current and historical) property damage and loss reports
- Research capabilities of current swift water equipment
- Develop illustrations

Incident Information:

Date: April 2, 2014

Dispatch Time: 11:56:51

Incident number: 20140921541

Incident Address: 9200 Old Dominion Dr., Great Falls, Va.

Fire Box number: 1209

Weather (09:13 hrs.): Water Temperature: 47.66 F / 8.7C
Precipitation: None
Sky: Partly sunny, overcast
Gage Height: 5.83 (approx. 5.78 at time of incident)
Discharge: 34,400cfs

Units in attendance:

E414, E439, R414, R439, M412, RE433, SW433

Involved Watercraft:

SWB412A, SWB412B, SWB412C, SWB414A, SWB414B, SWB433A, SWB433B,
SWB439A, SWB439B

Accident/Injury Investigators:

BC401, SAF402



Background:

A swift water and boat drill was conducted April 2-4, 2014 at Great Falls Park on the upper Potomac River. During the morning portion of the drill on April 2, 2014, a student boat flipped, sending its personnel into the water. A second boat staffed with instructors attempted to retrieve one of the participants from the water. Soon after recovering the participant, that boat capsized as well, sending instructors and the rescued participant into the water. After traveling through significant water hazards, all personnel were rescued. Injuries to personnel required the transportation of staff to a local hospital for evaluation. Department equipment was also damaged and lost.

Following an investigation by a battalion chief and safety officer, the training was allowed to continue with the understanding that boats would not be allowed on the northern part of the river (above S-turn) (**Finding 12: Determining Close Call Event Status, Recommendations A, B**). While the second day of training was uneventful, on the third day of the drill, another participant suffered a significant injury while operating in a restricted area. Following an initial review of both incidents, the department placed a moratorium on all swift water training and began a close call investigation.

Historical Training-Related Injuries and Equipment Damage:

Research into swift water rescue training-related injuries and equipment damage (or loss) was completed for a 10-year period. Since 2003, there have been 82 injuries related to swift water training. The majority of the injuries were sprains and strains or lacerations and contusions. These injuries resulted in medical treatment expenses in excess of \$262,000. In addition, there were a total of 667 days of missed work. With associated backfill costs, swift water related injury and equipment damage costs are likely approaching \$1 million over the last decade (Attachment 1).

During the same 10-year period, 51 injuries occurred in IDLH training at live burns. These injuries resulted in approximately \$87,000 in medical expenses and 226 days of missed work with a total cost exceeding \$500,000.

A review of documentation (filed Risk-03 forms) related to damaged and lost equipment over the last decade revealed loss or damage to portable radios, GPS units, boats, outboard motors, and a large number of propellers. Since September 1999 the Fire and Rescue Department has spent \$32,744.69 to repair or replace equipment lost and/or damaged while conducting swift water training operations. This does not include “expendable equipment” (helmets, personal floatation devices, ropes, etc.) which are replaced without documentation with a Risk-03. Equipment repaired by Fire and Rescue Department Special Operations Staff, Apparatus Section staff (boats & motors), or the Department of Vehicle Services (trailers) is not likely to be included in this figure.



Timeline of Events:

Events preceding the April 2014 Swift Water Rescue Drills

In February 2014, a plan was developed for a series of swift water drills to be held in the first quarter of 2014. These drills were originally scheduled for March 18, 19, 20 and April 2, 3, 4 (GO 2014-007). The first three drill dates were canceled due to inclement weather. As a result, the swift water rescue drills scheduled on April 2, 3, and 4 were reformatted to follow a half-day schedule and were redesigned to focus solely on swift water boat operator skills.

Events of April 2, 2014 (date of close call incident)

On the morning of April 2, prior to the arrival of attending students, drill instructors scouted the river and assessed the conditions of the river at the locations designated for boat operator training. The water level during the early morning of April 2, 2014 was 5.83 (see “River Conditions” for an explanation of United States Geological Survey (USGS) river gage readings). An area of concern was the wave train at Last Chance which had grown in size to the point that it blocked access to Fisherman’s Eddy (normally a safe haven), subsequently creating a large pillow of water on the vertical face of the nearby rock wall. In addition to the wave train at Last Chance, a large whirlpool that opened up at the bottom of “S” turn on river left was identified as a hazard (**Finding 5: Developing Appropriate Drill Structure and Maintaining Personnel Accountability, Recommendations B, F, G**).

After the instructors completed their assessment of the river, the originally planned locations for the evolutions were adjusted in consideration of river conditions. The drill leader determined that the operational limitations would be:

- Up-river cutoff point: The Last Chance rapid
- Down-river cutoff point: Old Anglers Inn boat ramp

Before the drill commenced, a briefing was held in the upper parking lot. Drill objectives were generic and included spending time practicing maneuvering through wave trains, holding station, and getting more familiar with the boats. The drill leader held a second briefing at Sandy Landing to emphasize safety concerns.

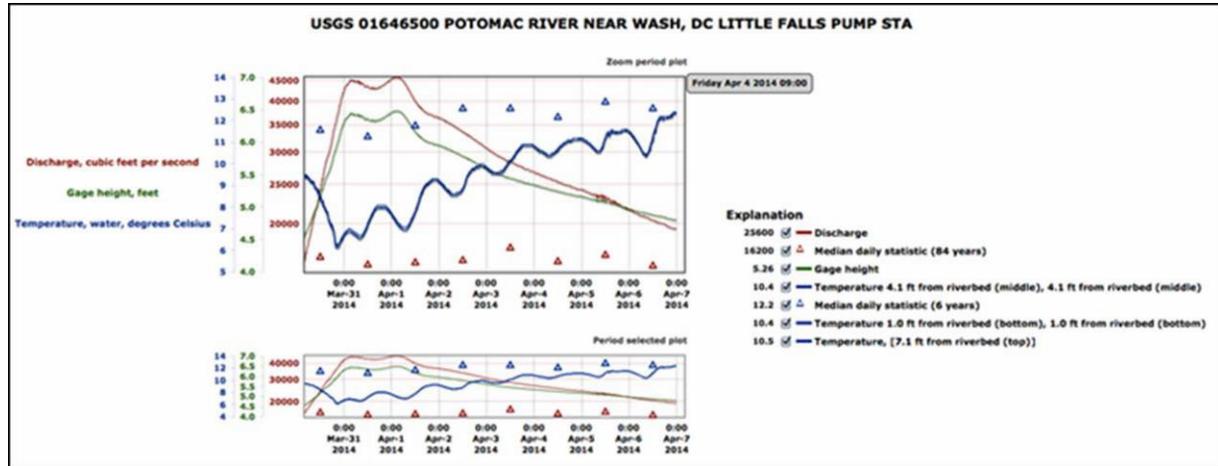
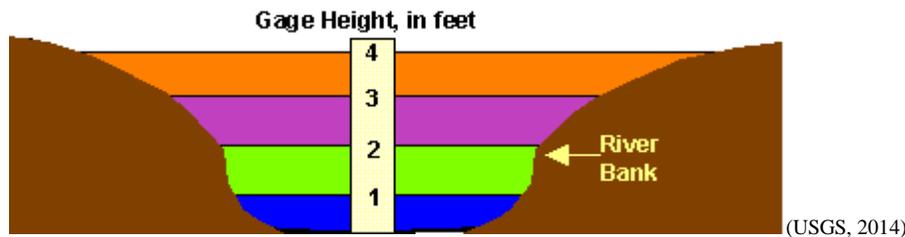
Crews were then sent out on the river to train. While some training goals were discussed (getting “stick time”), no specific skill stations were established by the drill instructors. Each of the boat teams were allowed to create their own training agenda for the day. Four boats from Fairfax County Fire and Rescue Department and two boats from Fairfax City Fire Department were considered “participants,” with three staff in each boat. Student boats were supposed to operate in pairs, each assisting the other in the event of an emergency. Three additional boats were deployed with “Instructor/Safety personnel.” The personnel in these boats varied in number and capability, due to the practice of “hot-switching,” which means that personnel moved from boat to boat, while on the water. Each “instructor/safety” boat was initially assigned to a pair of training boats, but this subsequently changed to zone-type coverage, with one instructor/safety boat functioning above S-turn, while a second one functioned below the S-turn. During the course of the drill, the third boat experienced



maintenance issues and was, at times, incapable of operating in its assigned role (**Finding 5: Developing Appropriate Drill Structure and Maintaining Personnel Accountability, Recommendations B, C, E; Finding 6: Adhering to Established Safety Practices, Recommendation E; Finding 10, Boat Performance, Maintenance, and Damage Reporting, Recommendations A, D).**

River Conditions:

On April 2, 2014, The U.S. Geological Survey (USGS) reported Potomac River conditions including a water temperature of 47.66 degrees Fahrenheit, a discharge (flow) of 34,400 cubic feet/second, and a water gage height of 5.83. The Geological Survey (USGS) uses gage height to measure the height of water flowing in a river (USGS, 2014). This is because river beds are asymmetrical resulting in a disproportionate relationship between the gage height and the river’s flow. Consequently, when a river’s gage height doubles in size (in linear feet), the flow can more than just double.



(USGS, 2014)

Training (Student) Boat Capsizes

At the end of the April 2, 2014 morning session, the drill leader instructed SWB412C (with a crew of three instructors) to travel up river and inform the remaining boats (who’s location was unknown) of drill completion and that all boats must return to Sandy Landing.

SWB412C found SWB439A, SWB439B and SWB414B in the Last Chance / Fisherman’s Eddy area of the river. While SWB439B and SWB414B were floating in an eddy (river-left)



just below Last Chance, SWB439A was across from these boats, river-right, in Fisherman's Eddy.

At SWB412C's signal, SWB414B began traveling downstream to return to Sandy Landing. This trip was quick due to the fact that they were traveling downstream in high-velocity water. SWB412C directed SWB439B to return to Sandy Landing and signaled across the river to SWB439A to communicate the drill's completion. SWB412C waited for SWB439A to exit Fisherman's Eddy, prior to departing. At this point, only SWB439A, SWB439B, and SWB412C remained on the river above S-turn. SWB414B was already in Mather Gorge in transit to Sandy Landing. No other boats were on the river (Map #1).

Initial Boat Flip

As SWB439A moved across the eddy fence and entered the wave train, the boat's bow dropped into the trough of a wave, raising the stern of the craft high overhead. As the power of the current pushed the bow under, the boat's motor came out of water and the boat capsized (starboard stern over port bow). SWB439A's three personnel were pitched into the river. Two crew members (victim #1 & #2) were thrown in the main current, while the boat operator (victim #3) was thrown in the direction of river-right, into Fisherman's Eddy. The capsized SWB439A floated down the river's main channel with victims #1 & 2. Personnel on boats SWB412C (instructor boat) and SWB439B witnessed SWB439A capsize (Map #2).

Victim#1 resurfaced upstream of SWB439A and grabbed the boat's rope handles (Victim #1 later reported that his life jacket was not providing enough buoyancy to keep him at the surface in the aerated water conditions). Victim #2 resurfaced underneath the boat, swam under the pontoon, and ended up on the downstream side of the capsized boat. The boat rapidly moved downstream, pushing victim #2 into the shoreline (rock face), causing a shoulder injury and helmet strike against the rock. Immediately after the collision, victim #1 mounted the boat and pulled victim #2 onto the overturned boat's hull. Both victim #1 & #2 were unable to locate victim #3 (Map #3).

Victim #3 resurfaced in Fisherman's Eddy. When staff on SWB412C and SWB439B witnessed SWB439A capsize, they immediately moved in to assist. SWB439B moved towards capsized SWB439A (with victim #1 & #2 on top), which was rapidly approaching S-turn (Map #3). SWB412C moved towards Fisherman's Eddy where staff observed victim #3 circulating in the current while performing the backstroke (self-rescue position). Determining that victim #3 was unable to self-rescue, SWB412C crossed the rapid, entered Fisherman's Eddy and rescued victim #3, by lifting the victim into the boat (Map #4).

Victim #1 and #2, still on overturned SWB439A, navigated through the S-turn rapid by shifting their weight, while SWB439B followed close behind. After exiting the S-turn rapid, SWB439B positioned alongside SWB439A, providing assistance and support. The two boats continued downstream together towards Mather Gorge.



The Second Boat Flip

Meanwhile, attempting to exit Fisherman's Eddy, SWB412C overturned in the same eddy fence which capsized SWB439A (Map #4). All four personnel (including victim #3, the rescued member of SWB439A) were thrown into the river. The three crewmembers from SWB412C (victims #4 & #5) climbed out of the water, on top of their overturned boat. The third crewmember (victim #6) was significantly delayed as ropes were tangled around his legs (**Finding 10: Boat Performance, Maintenance, and Damage Reporting, Recommendation E**). In the process of disentangling the rope from his legs an attempt was made to transfer the only portable radio in SWB412C crew's possession to the other crewmembers (who were on top of SWB412C). The radio fell overboard and was lost. Consequently, even as they watched victim #3 rush down river toward the S-turn rapid they couldn't report the capsizes or the need for rescue (Map #5).

Victim #3 (wearing the radio from SWB439A) entered the S-turn rapid, with the current pushing him towards river-left into the previously identified hazardous whirlpool at the terminal end of the S-turn rapid. Victim #3 submerged in the whirlpool to the point where he couldn't see any daylight for an extended period of time. While moving (underwater) downstream, victim #3 reports that his radio's "out of range alarm" activated. Based on numerous witness reports, cross referenced with map features, victim #3 resurfaced approximately 300-400 feet down from the terminal end of S-Turn. While data does not exist to determine an exact duration of submersion or distance traveled, it is clearly evident that victim #3 was submerged for a considerable amount of time in violently turbulent water (Map #6).

Concurrently, while heading down-river through Mather Gorge, SWB439A (capsized with victim #1 & #2 on top) was in contact with SWB439B. The crew of SWB412B (dispatched by the drill leader to replace SWB412A who was returning to Sandy Landing due to mechanical issues) noticed the overturned boat and spotted victim #3 floating downstream from Rocky Islands. A crew member of SWB412B made the following transmission, "Hey, 39's boat flipped, two are on top, we got one looks like he's in the water and we're headed up now to get him, copy?" This transmission is significant, as it documents the delay in notification of a capsized boat to the drill leader. Notification occurred after victim #3 had been ejected from two separate boats and had also travelled through S-turn and past Rocky Islands. The drill leader acknowledged this transmission, but was not clear who it was from (**Finding 4: Transitioning from 'Training' to 'Incident,' Recommendations A, C, D; Finding 5: Developing Appropriate Drill Structure and Maintaining Personnel Accountability, Recommendations E, H, I, K**).

Moments later, after retrieving victim #3 from the water, SWB412B notified the drill leader that they had the victim on board and they were almost back to Sandy Landing. Traveling down river at a high rate of speed with victim #3, SWB412B again passed SWB439A & SWB439B (Map#7). The drill leader directed an Instructor/Safety Boat (SWB412A) to bring all boats back to Sandy Landing. At this point, the drill leader had no knowledge that the second boat had also capsized.



When SWB412B arrived back at Sandy Landing, victim #3 was assisted from the boat and walked half-way up the ramp where he sat down on the rocks in an exhausted condition. Several staff evaluated his condition, but there was no medical equipment at Sandy Landing. Staff ultimately decided to transport victim #3 (in J412) to Medic 412, which was parked remote from Sandy Landing in the quarry parking lot. The medical assessment of victim #3 continued in the back of Medic 412, but transport was not immediately possible due to the fact that the keys for the unit were taken to the drill site by a participant. Locating the keys took approximately 20 to 30 minutes which further delayed transport to the hospital (Personal communication, September 2014).

Due to the perceived severity of victim #3's injuries, a higher ranking officer requested that the drill leader initiate an emergency incident, establish command, and begin the notification process. The drill leader denied that request and directed the officer to perform a welfare check on his personnel, which he did. Meanwhile, another officer at the training site independently contacted BC401 to notify him of the fact that an employee was injured at the drill (**Finding 3: Assigning an Incident Safety Officer, Recommendation A; Finding 4: Transitioning from 'Training' to 'Incident,' Recommendation B; Finding 13: Organizational Culture, Recommendation A**). The FRD's rank structure was superseded when the drill leader, a lower ranking officer, countermanded an order from a higher authority on scene.

While the majority of personnel at Sandy Landing were focusing on the arrival of SWB412B and the evaluation of victim #3, SWB439A (overturned with victim #1 & #2 still on top) and SWB439B floated past Sandy Landing, lacking the ability to navigate back to shore. As there were no staff positioned downstream, nor any safety boats in sight, personnel on SWB439A and SWB439B made the decision to transfer all staff to SWB439B, cutting loose SWB439A, so all five (including victims #1 & #2) could navigate against the current to Sandy Landing (Map #8) (**Finding 5: Developing Appropriate Drill Structure and Maintaining Personnel Accountability, Recommendations C, H, I**).

Staff at Sandy Landing jumped in FS414's boats and travelled downstream in an attempt to retrieve the unstaffed and overturned boat. They were able to locate and get a line on the overturned boat, but they didn't have enough power to navigate back upstream with the overturned boat in tow. Realizing that they had left shore without a portable radio and that they were operating out of sight from other staff, the crew pulled into an eddy and tied their boats to a tree. Additional crews later arrived and provided assistance. With the help of crews riding in boats from 414, 433, and 412, the overturned boat was flipped back over and towed back to Sandy Landing (Map #9).

Meanwhile, the crew of capsized SWB412C (victims #4, #5, & #6) returned to Sandy Landing with some assistance from the crew of SWB412A. Victim #5 immediately reported suffering a knee injury during the capsizing of SWB412C. In response to this injury, the drill leader called for a second EMS unit, a safety officer, and requested an alternate channel. M431 was dispatched, but victim #5 ultimately signed a refusal and was not transported. After locating the keys to M412, victim #3 was transported to the Reston Hospital Center's Emergency Department (Reston ED).



While victim #2 initially denied treatment, they continued to suffer from a worsening and persistent cough, shoulder pain, and back stiffness. Staff from E439 eventually persuaded victim #2 to be transported to Reston ED in the bucket of E439. No medical care (including lung sounds or vital signs) was performed prior to the care initiated by Reston ED staff. Victim #2 was released from the hospital two hours later with a medical status report which indicated an ability to return to duty after a time period of four days. Later that day, victim #2 returned to the hospital to have the medical status report changed, making victim #2 eligible for an immediate urban search and rescue deployment (**Finding 7: Implementing an Emergency Medical Services Plan; Finding 8: Following Departmental Medical Protocols; Finding 9: Following Personnel Rehabilitation Practices; Finding 15: Medical Clearance Processes**).

SAF402 and BC401 arrived and conferred with drill participants and the drill leader. BC401 agreed to let the drill continue, once staff agreed that the upstream boundary of all training operations would be the S-turn rapid. Company officers were advised to complete an injury package if members of their crew felt any pain after returning to their stations.

The swift water drill continued through April 4, 2014.

Significant Event on April 4, 2014

The drill continued through April 4, 2014 in the same format, with the exception that boats were prohibited from going above S-turn rapids (**Finding 5: Developing Appropriate drill structure and maintaining personnel accountability, Recommendation G**). SWB414 spent the first few hours practicing holding station, approaches, and maneuvering in and out of wave trains. Seeing that the crew was doing well, an instructor (in a separate safety boat) encouraged the boat crew to “try something a little more challenging (Personal communication, August 2014).” When staff on SWB414 agreed, the instructor had them follow his boat to the wave train up river from the S-turn rapid. This location was described as being “out-of-bounds” in the pre-drill safety briefing. During these maneuvers (negotiating the wave trains), a crew member injured his shoulder. The crew member didn’t want to stop training to receive treatment, so the crew continued training despite the injury. This injury was later determined to be significant and possibly career ending.

*It is noteworthy that boat assignments were not static during the drill, nor were initial or subsequent boat assignments documented. All information regarding boat assignments, positioning in boats, and boat locations had to be gleaned from statements and interviews (**Finding 1: Recognizing moving water as IDLH, Recommendations B, D; Finding 2: Utilizing the ICS; Finding 5: Developing appropriate drill structure and maintaining personnel accountability, Recommendations C, E; Finding 6: Adhering to established safety practices, Recommendation D**).



Findings, Contributing Factors, and Recommendations:

1. Recognizing Immediately Dangerous to Life and Health (IDLH) Environments

Findings:

During student and instructor interviews, several personnel indicated that they did not believe that swimming in flooded river conditions (on April 2, 2014) was hazardous, providing personal floatation device were worn by staff. On the other hand, some students admitted they were apprehensive about the water conditions during the training. Concurrently, almost all staff indicated that this was the highest water level in which they had ever operated (at Great Falls). In spite of instructional staff delineating some areas of the river as “off limits,” it is evident that students were taken into these “off limits” areas, in order to “gain experience.”

According to the Inland Water Rescue and Emergencies Manual (2010, p. 13), “any time a rescuer is placed in the water to affect rescue, it is considered to be a dangerous operation and there is extreme risk for all involved.”

Contributing Factors:

Involved staff lacked experience in high river conditions. Many of the drill’s instructors had less than one year of experience as certified swift water boat instructors.

Recommendations:

The department shall follow NFPA 1670 which states that “hazards that are immediately dangerous to life and health (IDLH) include swift water with currents exceeding those in which a person or watercraft can safely and effectively operate (NFPA, 2014, p. 47).” The department shall take all reasonable measures to protect personnel exposed to IDLH environments. These measures shall be consistent for both actual and simulated emergency events, as the IDLH remains the same regardless of the reason personnel are exposed to the environment.

Specifically, when training in the swift water environment:

- a. All personnel operating in the water, as well as those within 10 feet of the water’s edge, shall consider themselves inside the IDLH and act accordingly.
- b. The Incident Command System shall be applied to drills, exercises, and other situations involving hazards similar to those encountered at actual incidents (see Finding 2: Utilizing the Incident Command System).
- c. On-scene training resources (command, communications, medical care, and resources dedicated to the rehabilitation of staff) shall be consistent with those dispatched to actual events.
- d. Accountability of personnel shall be closely monitored with a personnel accountability system.
- e. The department shall research and consider re-implementing past station policies from Fire Station 12 (Great Falls), which include specific “go/no-go” training criteria including:



- i. No training at S turn or above, when river levels are higher than 5.5 feet, due to danger to personnel.
- ii. No training below Difficult Run at 2.5 feet or below due to danger to equipment.
- iii. No training at O-Deck, due to the high risk for damage or injuries.
- iv. No boat smaller than 16 feet in length or with less than a 40 HP motor shall go above S-turn (insufficient power and size for river conditions).
- v. When river conditions are muddy, extra spotters shall be placed upriver to constantly monitor for trees and debris going down stream toward drill site.

2. Utilizing the Incident Command System (ICS)

Findings:

The Incident Command System (ICS) was not effectively used to manage the swift water drill or the subsequent rescue of victims exposed to the IDLH environment. The command structure was universally described as only a drill leader (incident commander), with no other expansion or delegation of roles or duties. The incident commander's effectiveness during training and on the incident scene will become ineffective by taking on too many roles and not expanding the organizational structure of the incident, ensuring adequate span of control. On this drill, there was no safety officer, no staff assigned to handle medical needs, staging, logistics, communications, accountability of personnel, etc. As such, the span of control was not managed, resulting in an excessive staff reporting directly to the incident commander.

Contributing Factors:

- Staff had limited experience; five of the drill's instructors possessed less than one year of experience as certified swift water instructors.
- Staff failed to recognize moving water as an environment that was Immediately Dangerous to Life and Health (IDLH).
- Staff failed to assign ICS roles during the planning of the drill. For example, the ICS forms filed as part of the drill planning utilized generic roles or units (Safety, Medic Unit, etc.), but personnel were never assigned to these roles in reality. Furthermore, when planning the event, a staff member signed the medical plan as the "Medic Unit Leader," when he was clearly not performing that role at the drill site.
- While the Fire and Rescue Department has adopted the use of ICS (in compliance with NFPA 1201 8.2 & 1710 6.2) and routinely uses it to manage planned events and emergency incidents, regardless of size, it does not currently require a specific management structure for training activities.



Recommendations:

- a. The department shall comply with NFPA 1651 4.4.8 which mandates the application of ICS, not only during incident simulations (where it may intuitively be employed in context), but also in “drills, exercises, and other situations that involve hazards similar to those encountered at actual emergency incidents.” While it is true that not all training activities involve such hazards, it is also true that the water environment meets the definition of the IDLH per NFPA 1500, and swift water in particular is an immediate danger per NFPA 1670 A9.2.3.(6)(5). From an operations perspective, training in swift water is not only similar to running a call in swift water, it is identical, and arguably more hazardous (as currently practiced). The safeguards in place during incidents are not in place during training, and less experienced personnel are in critical positions they might not occupy during real responses.

The swift water environment is resistant to risk management, as the hazardous condition can neither be suppressed nor reduced. An exercise can become an incident without warning, requiring an immediate transition from training to response. The ICS system must be used when training is conducted in such environments, enabling staff to make a seamless transition from training to rescue. The variables that can be controlled (e.g. scene management) must be controlled, so operations are conducted in a system that is both appropriate and familiar. The ICS shall include resource and personnel accountability tracking, formal radio communication practices, requesting additional resources when needed, and staffing necessary ICS functional positions.

- b. Staff shall strongly consider the recommendations of the Northern Virginia Inland Water Rescue and Emergencies Manual (2010), which states that effective incident command is critical on an inland water rescue incident. The actions of the first arriving units form the foundation on which the incident will be built. The first arriving units shall consider the following as priority actions which need to be completed as soon as practical:
 - i. Communicate an on-scene report
 - ii. Complete an effective size-up
 - iii. Perform a risk benefit analysis
 - iv. Communicate a situation report
 - v. Establish command or transfer command
 - vi. Request additional resources as needed to complete the objectives
 - vii. Maintain accountability by effectively tracking units and personnel
 - viii. Prepare for transition of command upon the arrival of a chief officer



3. Assigning an Incident Safety Officer

Findings:

During this drill, the drill leader acted as both the incident commander and the safety officer (as that role was not delegated). The drill leader was located at Sandy Landing, remote from where the boats were operating. He was not in a position to effectively evaluate safety concerns associated with river conditions and personnel actions, nor could he immediately react in the event of an emergency.

While some staff referred to some boats as “safety boats,” it was universally reported that these were “instructor boats” and that the personnel in them were “instructors,” who would serve as “downstream safeties” in the event of an emergency. They were not assigned as incident safety officers, nor did they function in that capacity. It is also clear that these vessels did not remain downstream from other participants.

Contributing Factors:

- An independent safety officer was not assigned or identified in the pre-drill planning activities
- Limited staff experience level
- Inadequate safety briefings

Recommendations:

- a. Whenever personnel are training in a hazardous environment, an independent safety officer function shall be staffed as outlined in the Command Officer Operations Manual, 3rd Edition. The safety officer function falls within the command staff and under the incident commander. While the incident commander is responsible for the overall management of all incident operations, the safety officer is delegated the following tasks:
 - i. Reviewing the incident action plan for safety concerns
 - ii. Working in conjunction with specialty branches (e.g. Marine) to develop the safety plan
 - iii. Assessing hazardous and unsafe situations
 - iv. Developing ways to reduce or eliminate threats to personnel safety
 - v. Halting situations involving immediate and/or unnecessary danger to personnel (Fire and Rescue Departments of Northern Virginia, 2013)
- b. The department shall comply with NFPA 1500 4.2.2(3) which requires risk management planning for training activities.
- c. The department shall comply with NFPA 1670 4.5.2 which mandates the establishment of a safety officer during special operations training and outlines specific responsibilities.



4. Transitioning from 'training' to 'incident'

Findings:

Two boats capsized, sending six personnel (victims) into an IDLH environment. A Mayday was never called by the drill participants or instructional staff. In response to the notification that a boat had capsized with crews in the water, command was not formally established, rather instructors were sent with instructions to "bring everybody in (Personal communication, August 2014)." There was also not an additional request for resources, despite the fact that six personnel were reported to be in the water. The difference in perceptions of "risk" at the drill site led to confusion and friction between staff. The subsequent rescue of personnel from the IDLH and recovery of County equipment was disorganized and significantly delayed.

Contributing Factors:

- Failure to recognize moving water as an IDLH environment
- Lack of a formal incident command structure while crews were operating in the IDLH
- Topography - no line of sight view and no spotters to provide information to the incident commander
- Poor communications – some crews did not have or did not use radios
- The lack of a predetermined rescue plan, reviewed at the safety briefing
- Inadequate command structure - the span of control of the drill staff was saturated

Recommendations:

- a. The department shall utilize the Incident Command System when personnel are operating in an IDLH.
- b. On-scene training resources shall be consistent with dispatched emergency events where staff are expected to operate in an IDLH.
- c. The department shall follow the RIT Command and Operational Procedures manual which clearly states that, "the procedures outlined in this manual will apply to all Fire and Rescue Department operations where personnel are required to enter hazardous environments that present an immediate danger to life and health (IDLH). Although the procedures have been developed primarily for structural fire events, they also apply to hazardous materials incidents and technical rescue incidents (Fire and Rescue Departments of Northern Virginia, 2013, p.4)."
 - i. The word "mayday" shall be used to prompt the incident commander and those working at an incident scene that a person operating in an IDLH is in need of immediate assistance.
 - ii. Individual firefighters must not delay reporting to command if they become lost, trapped, or are otherwise in need of assistance (e.g. an unexpected water entry).
 - iii. Personnel must not delay reporting to command that they cannot account for members of their crew.



- iv. Personnel shall declare a mayday over the radio when in a life threatening situation.
 - v. While training inside an IDLH environment, practice or mock mayday transmissions shall never be practiced. All mayday transmissions during training must be considered real.
 - vi. The use of mayday terminology and practices shall be formally included in Technical Rescue Drill Plans and shall be reviewed during all safety briefings (to include non-radio alerts such as with whistles or other signaling devices).
- d. Rapid Intervention Team (RIT) terminology and practices shall be applied in the swift water environment. Whenever personnel train on the water, a dedicated rescue team shall be standing by and equipped to render immediate assistance if a mayday situation occurs. The capabilities of the RIT boat shall be greater than or equal to those of the other boats in the training environment (Fire and Rescue Departments of Northern Virginia, 2013).
 - e. Size-up of water rescue incidents must strongly consider the number of victims in the water, when requesting resources and planning rescue efforts (Fire and Rescue Departments of Northern Virginia, 2013).

5. Developing appropriate drill structure and maintaining personnel accountability

Findings:

Interviews of involved staff made it clear that the drill was conducted in an informal environment, lacking the structure and discipline essential to safe training in an IDLH environment. Several issues were raised which led to confusion when boats overturned and a training exercise became a rescue incident:

- Unclear lines of authority
- Failure to utilize the Incident Command System
- Instructors operated remotely from students
- Training objectives were unclear
- Lack of accountability – there was no formal attempt to track the location of boats or personnel at the drill site
- No monitoring of “off-limit” areas
- Informal communications (first names were used on radios, rather than unit identifiers or functional roles)
- Uncertain certification status - staff not listed as swift water certified in Telestaff were allowed to participate in the drill
- Boats operated remotely and out of sight of other resources
- Horseplay - units used monikers, such as “Merlin” and “Jester,” on the radio
- Boats were deployed without being equipped with a radio
- The drill was not terminated when a real emergency occurred

Contributing Factors:

- Failure to recognize moving water as an IDLH environment
- Lack of a formal incident command while crews were operating in the IDLH



- Experience level of instructors (numerous instructors had been certified as swift water boat instructors for less than a year)

Recommendations:

The department shall formalize all training in live hazard environments to ensure that staff are protected. In some cases, this may require an extensive investment in resources and/or a limitation in the number of drill participants.

- a. A student/instructor ratio shall be established for training in the IDLH environment. The Pennsylvania Fish and Boat Commission recommends a minimum of one instructor for every six students in their guidelines for Emergency Boat Operations and Rescue courses. They also recommend additional staff for on-site safety, medical, and logistical needs (Pennsylvania Fish and Boat Commission, 2014).
- b. Training shall be progressive and shall build upon foundation skills. Staff shall accumulate considerable experience operating watercraft while gradually increasing exposure to more challenging conditions. Staff shall also avoid areas where it is not realistic to perform a rescue. For example, a victim will not be waiting to be rescued in a wave train with 5 foot waves, as they would wash out of the area. Boats shall avoid wave trains. The river levels on April 2-4, 2014 were challenging, providing staff with an excellent opportunity to gain experience. In this type of environment, it is highly recommended that each boat operate with an experienced instructor on board. At lower river levels, it may be safe for each pair of boats operating in tandem to be assigned one instructor, as long as both boats have experienced operators on board.
- c. Drill planning shall include the development of an Incident Action Plan. This plan shall include:
 - i. Training goals
 - ii. Organization list with ICS chart showing primary roles and relationships
 - iii. Assignment list with specific tasks
 - iv. Resources status
 - v. Health and safety plan (ICS-206) with environmental assessment that instructors will follow to provide a consistent safety briefing prior to training
 - vi. Communications plan (ICS-205), with special emphasis on non-radio communications due to poor coverage and ambient motor noise
 - vii. Logistics plan (procedures to support operations with equipment, supplies, etc.)
 - viii. Responder medical plan (providing direction for care to responders).
 - ix. Incident map with river landmarks and important locations (medical unit, staging, etc.)
 - x. Additional component plans, as indicated
- d. Formal onsite medical care, including transportation and rehabilitation shall be provided with staged medical equipment, fluids, heated or cooled (shade) rehab areas for personnel to take breaks or when emergencies occur. Onsite



medical care shall be in a location to provide immediate care and have PPE for their protection from the environment as well.

- e. The personnel accountability system shall be used at all drills. All staff, whether participating in the drill or standing by (non-TROT) shall continually be accounted for during all training, using command boards. It is further recommended that staff not participating in training, be used to manage logistical, accountability, medical, and the rehabilitation needs of personnel.
- f. Only FRD-certified TROT/swift water personnel shall be authorized to participate in the water during training.
- g. Decisions on when to halt training due to high or low water levels are challenging. While these decisions shall remain in the hands of our highest trained personnel and instructors, it is evident that having specific criteria in place helps make the decision making process easier. In order to achieve this, the department shall establish minimum and maximum water levels for all types of swift water training and for all training locations (use USGS or local gage reading stations). This could vary based upon certification and experience levels, but general guidelines shall be researched and published.
- h. The department shall research and consider re-implementing past station policies from Fire Station 12 (Great Falls), which included:
 - i. No training at S turn or above, when river levels are higher than 5.5 feet, due to danger to personnel.
 - ii. No training below Difficult Run at 2.5 feet or below due to danger to equipment.
 - iii. No training at O-Deck, due to the high risk for damage or injuries.
 - iv. No boat smaller than 16 feet in length or with less than a 40 HP motor shall go above S-turn (insufficient power and size for river conditions).
 - v. When river conditions are muddy, extra spotters shall be placed upriver to constantly monitor for trees and debris going down stream toward drill site.
- i. Effective communication while operating in an IDLH is paramount. Staff must use formal radio practices, referring to their functional roles (command, safety, medical unit, etc.), rather than personal names, nick names, etc. The department shall provide sufficient water-protected communications equipment to allow all personnel to carry a portable radio at all times. Personnel shall be required to carry a portable radio whenever they are operating in an IDLH environment.
- j. The department shall consider supplying marine radios for boats. These would enhance internal communications and increase interoperability with other jurisdictions (Montgomery County).
- k. The North American Fire Training Directors and the International Association of Fire Chief's Safety Health and Survival Section recently released a document entitled the "Rules of Engagement for Safe Fire Service Training." These simple concepts could help eliminate LODDs during all types of department training (Attachment 3).



6. Adhering to established safety practices

Findings:

Department and industry established safety practices were not followed during all three training days. Prior to commencing river operations, a briefing was held by the lead instructor, but several students and most instructors reported that they did not attend the briefings and were unaware of the information that was given to the drill participants. In addition, the training objectives and boundary limitations were not clearly communicated or understood by all participants and instructors. On April 4, boundary limitations were not adhered to by instructors, who encouraged students to go into restricted areas, in order to “try something a little more challenging (Personal communication, August 2014).” This training in restricted areas resulted in a significant injury.

There was much confusion regarding the use of the terms “instructor boat” and “safety boat.” The functions of vessels and of staff were not identified during the pre-drill (incident) briefing. Confusion was exacerbated as staff switched roles from student to instructor, or when personnel changed from boat to boat on the water. Several participants reported that sufficient safety boats (if any) were not maintained on the water at all times. Staff also reported that they operated in remote areas, independently of any other boats. For example, when B412C capsized, there were no other boats or spotters on the river above Mather’s Gorge to either assist them or report the emergency situation.

Personnel serving as upstream spotters and downstream safeties are normally assigned during swift water rescue emergencies to perform vital tasks, as required in the Inland Water Rescue Emergencies Manual. Upstream spotters identify hazards and persons traveling downstream and alert downstream safety personnel to attempt and coordinate rescue. These positions were not staffed on April 2, 2014. If they had been, they could have also alerted the incident commander and land-based staff of the two capsized boats and personnel in distress (Fire and Rescue Departments of Northern Virginia, 2013).

Personnel used personal flotation devices that were not equipped with their required throw ropes.

Personnel relayed that they traveled in motor vehicles without wearing seatbelts and also relayed that this is a standard practice at TROT drills.

Contributing Factors:

- Significant occurrences of excessive risk taking with little-to-no risk/benefit analysis completed
- Several staff indicated that they were afraid to voice safety concerns out of fear of being ostracized (Other staff spoke up and were taunted or mocked)



with insults in order to get them to take additional risks beyond their comfort zone (Personal communication, September 2014)

- Policies regarding the repair or replacement of damaged equipment were not followed and it was reported that this is routine
- Failure to utilize Crew Resource Management

Recommendations:

- a. The department shall research and consider re-implementing past station policies from Fire Station 12 (Great Falls), which included:
 - i. No training at S turn or above, when river levels are higher than 5.5 feet, due to danger to personnel.
 - ii. No training below Difficult Run at 2.5 feet or below due to danger to equipment.
 - iii. No training at O-Deck, due to the high risk for damage or injuries.
 - iv. No boat smaller than 16 feet in length or with less than a 40 HP motor shall go above S-turn (insufficient power and size for river conditions).
 - v. When river conditions are muddy, extra spotters shall be placed upriver to constantly monitor for trees and debris going down stream toward drill site.
- b. A formal IAP shall be developed and distributed for any drill occurring in an IDLH.
- c. Formal safety briefings shall take place prior to all drills, with all personnel (including instructors) required to attend.
- d. Safety and instructional personnel shall be identified before personnel enter the water.
- e. Swift water boats shall be labeled or marked to immediately identify their role.
- f. Swift water boats shall operate in pairs at all times, with one boat standing by as a “safety boat” to assist the other boat in the case of an emergency.
- g. A sufficient number of safety boats shall remain on the water and be properly positioned when students are operating in an IDLH.
- h. The IAP/IC shall staff additional safety positions, including upstream spotters and downstream safeties, any time a rescuer or a victim is in the water (Fire and Rescue Departments of Northern Virginia, 2013).
- i. Personnel shall utilize all provided personal protective equipment as well as safety restraints (e.g. seat belts).
- j. Above and beyond the “safety boats,” a RIT Crew shall be established and maintained at all times, when personnel are operating in the IDLH (Fire and Rescue Departments of Northern Virginia, 2013).
- k. Accountability of all personnel is paramount.
- l. Mayday terminology shall be utilized.



7. Implementing an Emergency Medical Services plan

Findings:

The drill's ICS-206 (Medical Plan) denotes that a medic unit would be assigned to the incident and available for patient transports, but it was out-of-service, while assigned staff attended the drill. The medic unit was parked a considerable distance from the drill site. It was locked and the keys were in the pocket of a training participant who was in a boat on the river. This caused a considerable reflex time when it was needed to treat and transport a patient. EMS equipment was not staged at Sandy Landing, for the treatment of injured firefighters and staff was not identified to provide care.

Contributing Factors:

Dedicated medic units are often not available due to limitations placed on Operations by Standard Operating Procedure 05.04.01, Resource Deployment, which limits out of service medic units to six at a time.

Recommendations:

- a. An in-service medic unit(s) shall be assigned to any drill where staff are expected to operate in an IDLH environment. This medic unit shall not participate in the drill in any manner that prevents them from rapidly treating and transporting injured personnel. It would be preferable for the unit to be located in the vicinity of the command post, while maintaining egress if transport become necessary. If this unit becomes actively involved in patient care, an additional unit shall be summoned to the scene of the drill.

8. Following departmental medical protocols

Findings:

Six Fire and Rescue Department personnel were ejected out of their boats and reported being submerged in the river. One person reported being under water for "approximately 30 seconds (Personal communication, September 2014)." When they were rescued, at least two of the victims exhibited signs of asphyxiation, respiratory distress, and hypoxia. While one patient was assessed and transported to the hospital by medic unit, other personnel did not receive any medical assessment. Another employee was transported to the hospital on a suppression vehicle, with assessment delayed until it was performed by hospital staff.

Contributing Factors:

- There was not a dedicated in-service medic unit at the drill.
- Officers failed to enforce policy and take appropriate actions.

Recommendations:

- a. All injured employees shall be fully assessed, with their assessment documented as a patient encounter and a workplace injury, in a fashion consistent with policy.



- b. All near-drowning patients shall be assessed and treated following the drowning/near-drowning protocol. This protocol specifically requires the transport of all symptomatic near-drowning patients, including those who had symptoms at any time. The protocol further dictates that near-drowning patients refusing transport require Physician OLMD consultation prior to completing the patient refusal form.
- c. Injured personnel requiring transport shall be transported in transport units (Fairfax County Fire & Rescue Department, 2012, p. 176).

9. Following personnel rehabilitation practices

Findings:

Drill participants trained in an IDLH environment for four hours, while instructors were in the environment for approximately eight hours. Some staff reported functioning as a boat operator for the entire drill period. No rehabilitation or medical evaluation was provided. Some participants complained of fatigue prior to their boat capsizing. This fatigue may have affected performance in the boat, but certainly played a role in staff's ability to self-rescue.

Contributing Factors:

- A rehabilitation process was not identified within the drill plan.
- There was no dedicated medic unit at the drill site.

Recommendations:

- a. The department shall follow NFPA 1584, Standard on the Rehabilitation Process for Members during Emergency Operations and Training Exercises, which provides recommendations during actual emergency incidents as well as training exercises when personnel are engaged in strenuous physical activity, mental stress, or when exposed to heat or cold temperature extremes (Fire and Rescue Departments of Northern Virginia, 2012). During all training operations in potentially IDLH scenarios or simulated IDLH environments, pre-entry screening shall be performed on all participants, including instructors. As the training evolution progresses, ongoing screening as well as a rehab period shall be provided after each two evolutions are completed.
- b. The department shall follow the Emergency Incident Rehabilitation Manual, 2ed, which provides recommendations to the incident commander regarding rehabilitation. It states that the incident commander shall consider medical evaluation, treatment and monitoring, relief from extreme climatic conditions, and mental rest for personnel. The manual also states that, on all events and at all times, the incident commander will ensure that ALS resources are on scene and available to be committed to rehab (Fire and Rescue Departments of Northern Virginia, 2012). Finally, the IC "shall be cautious when rehab duties are assigned to the only EMS transport unit on the incident. In the event of firefighter or civilian injury, the loss of that single unit will end rehab operations until replaced and disrupt the continuity of care and assessment of



the other personnel in rehab (Fire and Rescue Departments of Northern Virginia, 2012, p. 4).”

10. Boat performance, maintenance, and damage reporting

Findings:

Several boats suffered from mechanical and performance issues during the drill. These issues included “being sluggish,” “steering continually lock(ing) up,” “overheating,” and needing trim adjustments. Most staff reported that mechanical failures with outboard motors are very common. While there was no logistical staff or mechanics at the drill site, these boats were repaired on-scene and allowed to continue operations. Several of them even returned as instructor/safety boats. One of the repaired boats eventually capsized.

During the safety briefing it was recommended that each boat was to have a minimum of three personnel on board. These boats were also to serve as safety boats while other boats were operating. However, a review of boat capacities reveals that the smaller Fairfax County boats (13 IERB) are extremely close to their 1200 pound working load while operating with a three person crew. With a 172 pound motor, 36 pounds of fuel, 33 pounds of equipment, and three rescuers (675 pounds); there is 284 pounds of capacity left for the victim load (Attachment 2).

After SWB412C overturned, one crew member (Victim #6) was initially unable to climb out of the water and onto the overturned boat because his legs were entangled by the boat’s “flip ropes.” This caused a significant delay in his exit from the water and a lower leg injury.

Contributing Factors:

Logistical support was not defined in drill plan.

Recommendations:

- a. When operating equipment inside the IDLH, equipment must be in top mechanical condition. When problems are identified, specifically to the motor or steering, units shall be placed out-of-service and/or evaluated by a certified mechanic.
- b. In order to maintain efficiency in swift water training, the department shall evaluate the number of spare boats, motors, replacement parts, and the availability of certified mechanics.
- c. The department shall evaluate the capacity, motor size, and the configuration (staffing) of the current swift water rescue boats. Safety boats and the RIT boat in particular need to be equipped and configured for rescue, not training.
- d. The department shall consider adopting the equipment check and maintenance guidelines published in the Inland Water Rescue and Emergencies manual (2010).
- e. Boat and boat trailer incidents involving damage to vessels from striking objects or capsizing shall be handled as vehicle accidents. Propeller damage due to striking objects in the water shall be initially investigated as an accident



(due to the potential of capsizing as a result of loss of power), but could be handled as property damage with the concurrence of the safety officer and battalion chief investigating the accident.

- f. The department shall evaluate methods of reducing the possibility of staff becoming entangled in “flip ropes”.

11. Critical Incident Stress Debriefing (CISD) considerations

Findings:

Three personnel were injured as a result of swift water rescue training on April 2, 2014 and one on April 4, 2014. Several students involved in the drill and rescue reported that they believed at least one of the injured persons was dead, as a result of the prolonged underwater submersion. Staff also reported feeling that their own lives were in danger. The Department’s Crisis Response Team (CRT) was not activated or even consulted.

Contributing Factors:

Failure of officers to take appropriate actions

Recommendations:

The serious injury or death of a department employee or other emergency personnel working at or en route to an incident shall prompt consideration of CRT assistance. The FRD and Behavioral Health provides several types of traumatic stress management support programs, including informal discussion and support, defusing sessions, and formal debriefings. Incident commanders shall consult with the CRT as the subject matter expert to determine if their specific incident/situation requires professional intervention.

Source: Standard Operating Procedure 02.03.07, Stress Management Program

12. Determining close call event status

Findings:

There was a two week delay in identifying that this incident met the requirements to be classified as a close call event. This delay led to considerable time passing before the FRD took action, making it difficult for some participants to recall specific details from the incident during interviews afterwards. It also prohibited the collection of vital evidence from the scene. The incident was not reported to the Department of Public Safety Communications (DPSC) on the assigned incident channel (prompts notification of Operations Deputy and the Staff Duty Officer), and a Significant Incident Report was not completed.

Contributing Factors:

Failure of officers to take appropriate actions



Recommendations:

- a. Incident commanders and personnel assigned to investigate injuries and accidents shall notify DPSC when personnel are significantly injured, which in turn will prompt the notification of chief officers. In addition, S.O.P 01.09.16, Significant Incident Reports, states that a Significant Incident Report (SIR) will be completed anytime a firefighter is injured requiring hospitalization, further notifying the aforementioned chief officers.
- b. When an employee is significantly injured during training, the exercise shall be suspended until an initial investigation can be completed to determine the risks and benefits of continuing.

Source: Standard Operating Procedure 01.09.16, Significant Incident Reports

13. Organizational Culture

Findings:

During the investigation, personnel reported significant occurrences of excessive risk taking, staff being taunted with insults (name calling) in order to get them to take additional risks (beyond their comfort zone), and that safety guidelines and policies were not followed or enforced. Several personnel reported that peer pressure prevented them from raising issues about the drill, while others spoke up and were taunted or mocked (Personal communication, September 2014). Staff reported requesting to notify the chain of command and/or safety officers about occurrences at the drill, but instructors objected. This included denying and delaying the request for additional medic units when personnel were clearly injured. DPSC and staff officers were notified late in the event, and the topics of critical incident debriefing or close call reporting were not considered, and significant incident reports were not completed.

Following the event, statements were requested from involved staff. Staff were not forthcoming with information, drill instructors asked (directly to participants) to review statements prior to submission, and staff were not fully cooperative with close call investigators.

Contributing Factors:

- Organizational Culture
- Failure of on-scene chain of command/rank structure

Recommendations:

- a. The committee strongly recommends that a Battalion management team and a safety officer be present and actively engaged in all training activities which may place staff in an IDLH. This not only provides a higher level of supervision, but it also reinforces the department's safety culture and provides command staff with an opportunity to gain experience in the technical rescue arena.



- b. The department shall utilize the Incident Command System and Personnel Accountability System during all training sessions which include and IDLH environment.
- c. The department shall reinforce department expectations of compliance with all policies and safety guidelines with TROT personnel.
- d. The department shall establish crew resource management expectations and ensure constructive and productive workplace behaviors are maintained during TROT program activities.

14. Swift water training frequency concerns

Findings:

Swift water training opportunities are limited due to the large number of staff holding certifications, the remoteness of training locations, competing training demands, equipment deficiencies, and limitations in master calendar out-of-service time. Interviews with staff revealed significant concerns about the department's ability to develop the level of expertise needed to mitigate incidents in Great Falls and also in flooded roadways. Training deficiencies include swift water swimming, boat operations, and familiarization with response area waterways. Many staff reported that they operated a boat once a year. Most staff self-reported that they were unable to identify the river landmarks discussed in the pre-drill briefings, severely inhibiting their ability to recognize exclusion zones or communicate the location of emergencies.

Contributing Factors:

None

Recommendations:

- a. The department shall enhance swift water training availability and/or limit the number of staff included, ensuring that each swift water certified technician or boat operator gets sufficient annual swift water exposure to ensure safe and efficient operations on emergency events.
- b. The department shall consider limiting personnel approved to operate on the upper Potomac River to those stationed at Fire Stations 12, 39, and 42.
- c. A baseline standard (river hours, boat hours, and operator time) shall be established to ensure competency.
- d. River features training shall be conducted as a part of in-station training.
- e. River maps (with features) shall be referenced during training briefings in order to clearly demonstrate river features and exclusion zones to participating staff.
- f. The department shall consider alternative swift water training sites.



15. Medical clearance processes

Findings:

A staff member was treated at the hospital for injuries after being ejected from a boat. A medical status report was issued by the emergency room physician indicating the employee could return to full duty in four days. Subsequently the employee was notified of a potential USAR deployment. The employee returned to the hospital and persuaded the physician to change the medical status report to allow a return to duty immediately. This was done with the knowledge of supervisors. The employee was subsequently deployed to a disaster area, without being interviewed by an Occupational Health Center (OHC) or Task Force Physician.

FEMA encourages task force sponsoring organizations to adopt and enforce health and fitness standards for its members. This ensures adequate performance and minimizes personal health risks. Deploying personnel with pre-existing medical conditions into disaster areas risks placing additional strain on already taxed local resources.

Contributing Factors:

Lack of adequate policies.

Recommendations:

- a. The department shall maintain a robust medical certification process related to the deployment of personnel to remote areas. The department shall follow FEMA recommendations which include a pre-deployment medical check-in for every deployed task force member, which is preferably overseen by a non-deployed task force physician. Recent injuries or medical problems shall be thoroughly reviewed by a physician prior to deployment (FEMA, 1997).
- b. The department shall develop a more robust process of having significantly injured employees medically cleared by the OHC, prior to returning to full-duty status.

16. Public Education

Findings:

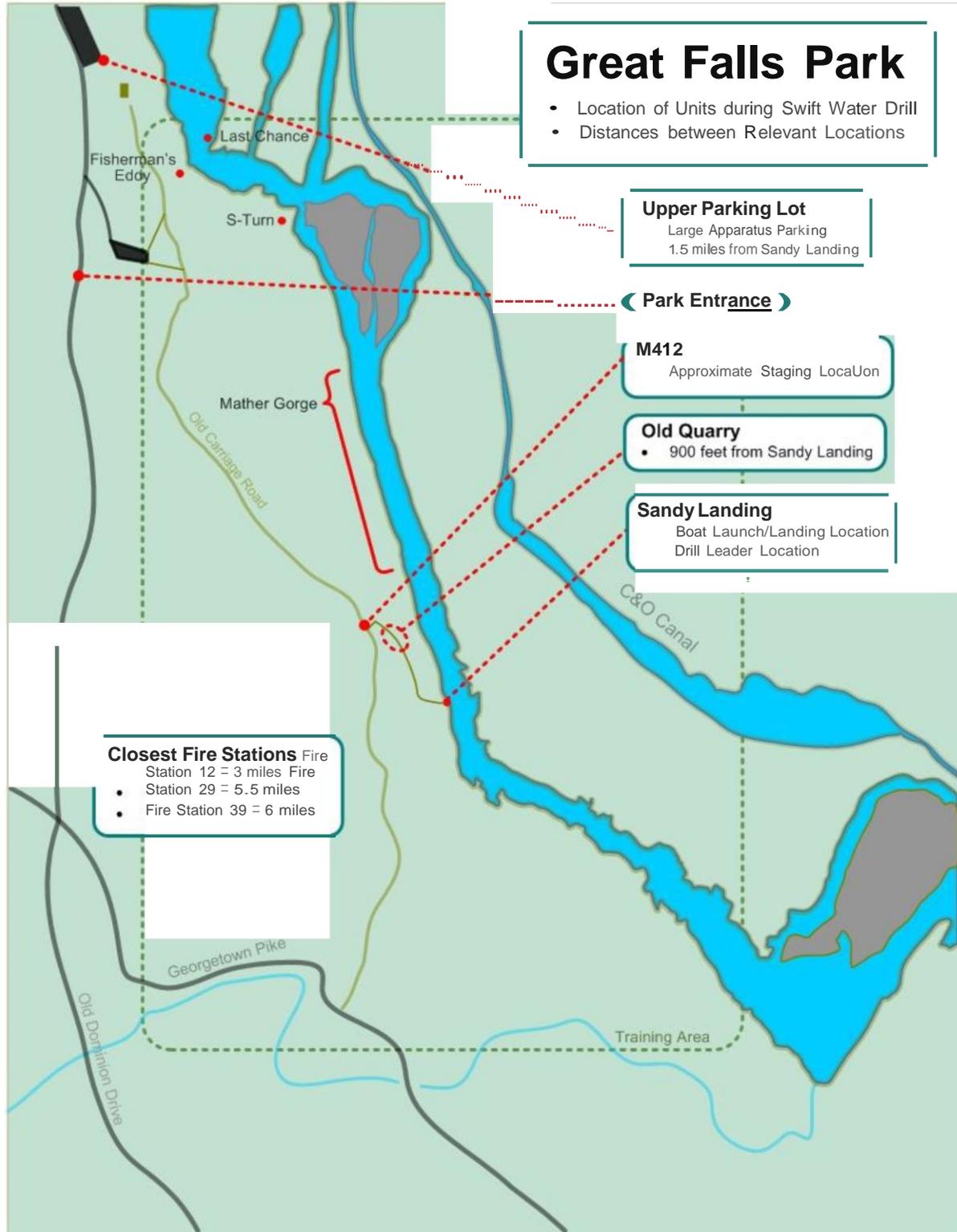
The department is called upon, with increasing frequency, to deal with swift water emergencies which place personnel in extreme danger. These low-frequency, high-risk events often occur in roadways which are known to flood. These events are best managed by preventing the emergency from occurring.

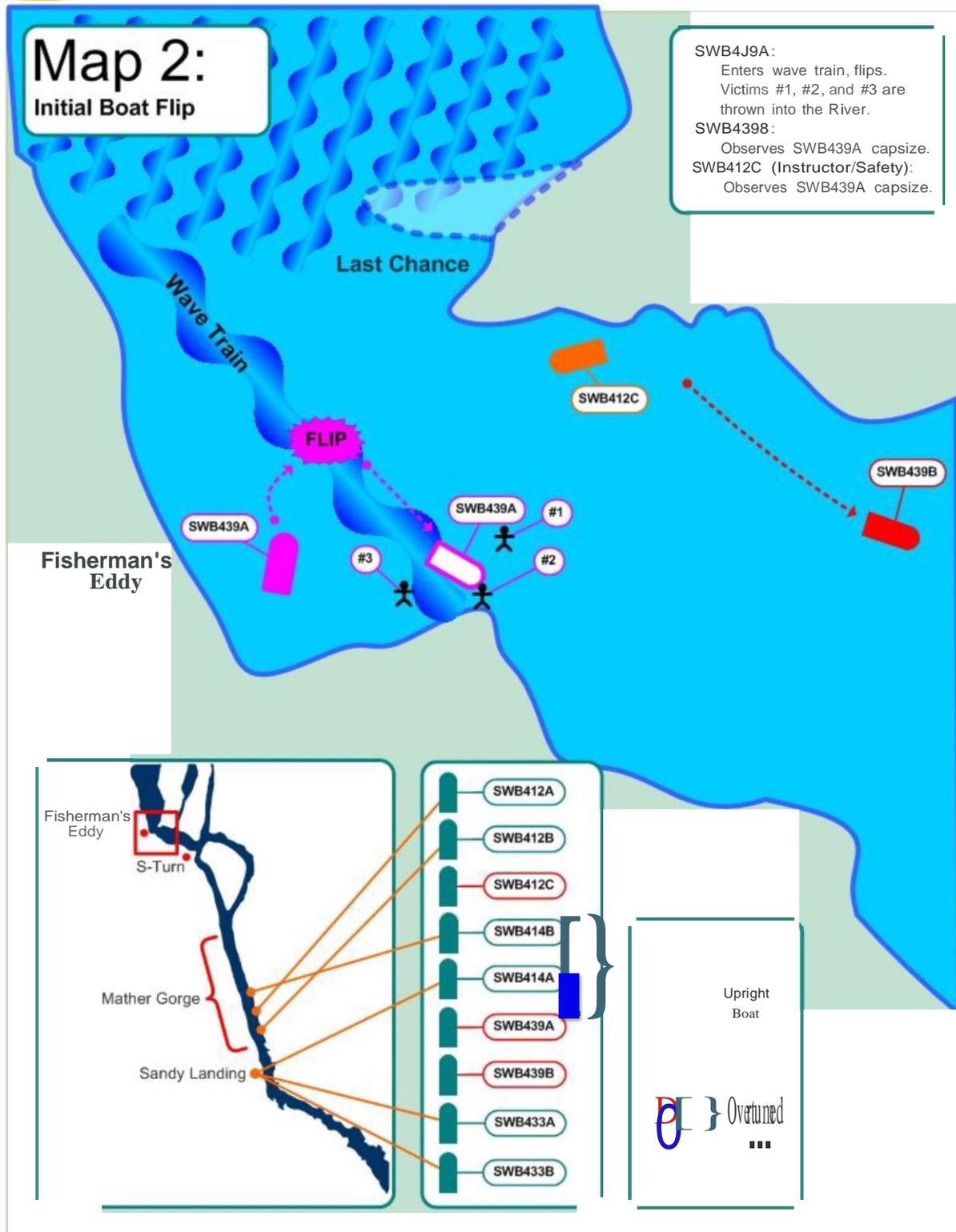
Recommendations:

- a. The department shall develop a public education campaign related to the dangers associated with flooded roadways.
- b. The department shall work with state and local agencies to proactively close roadways as soon as weather conditions are likely to flood roadways.



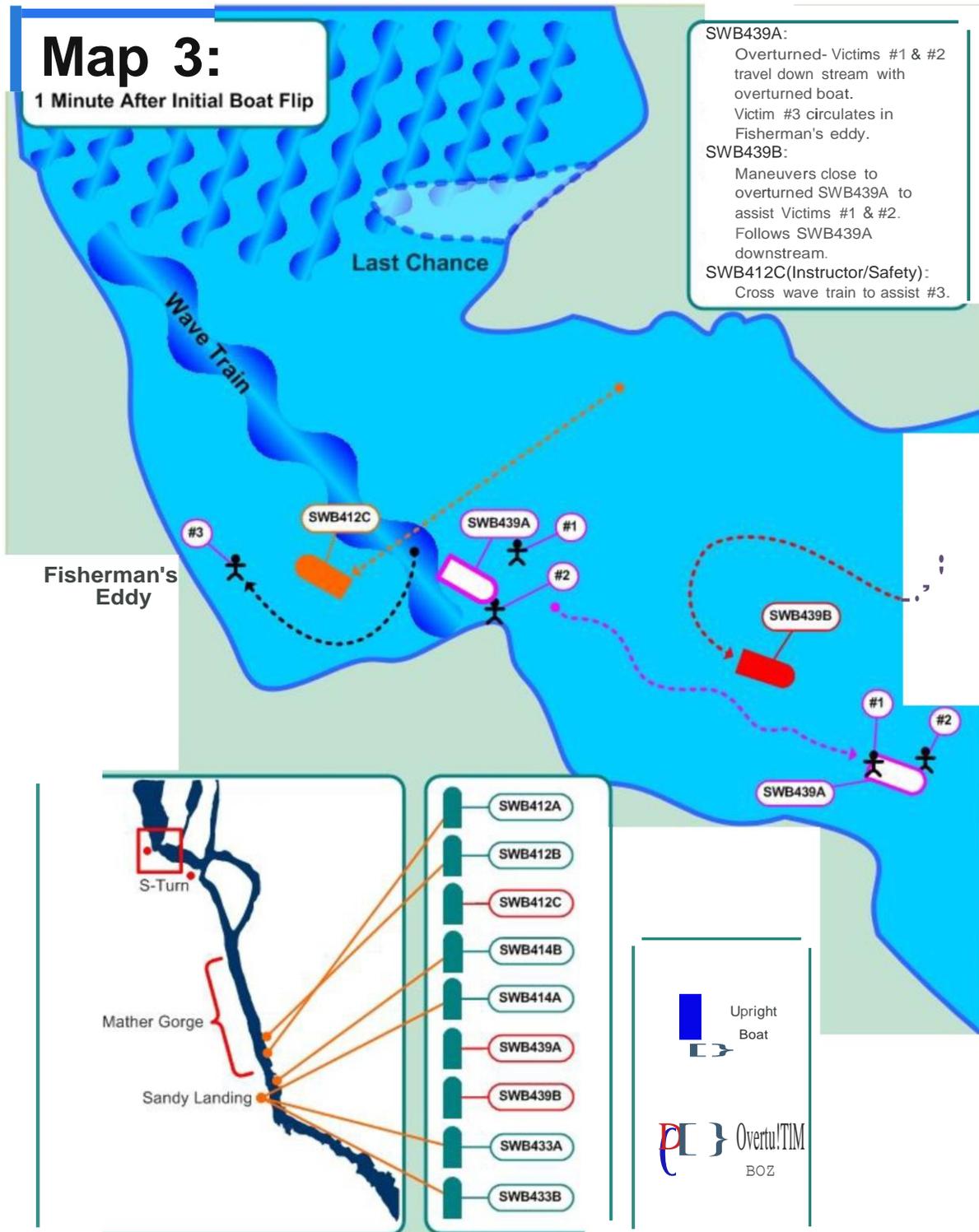
Drawings and Photographs:





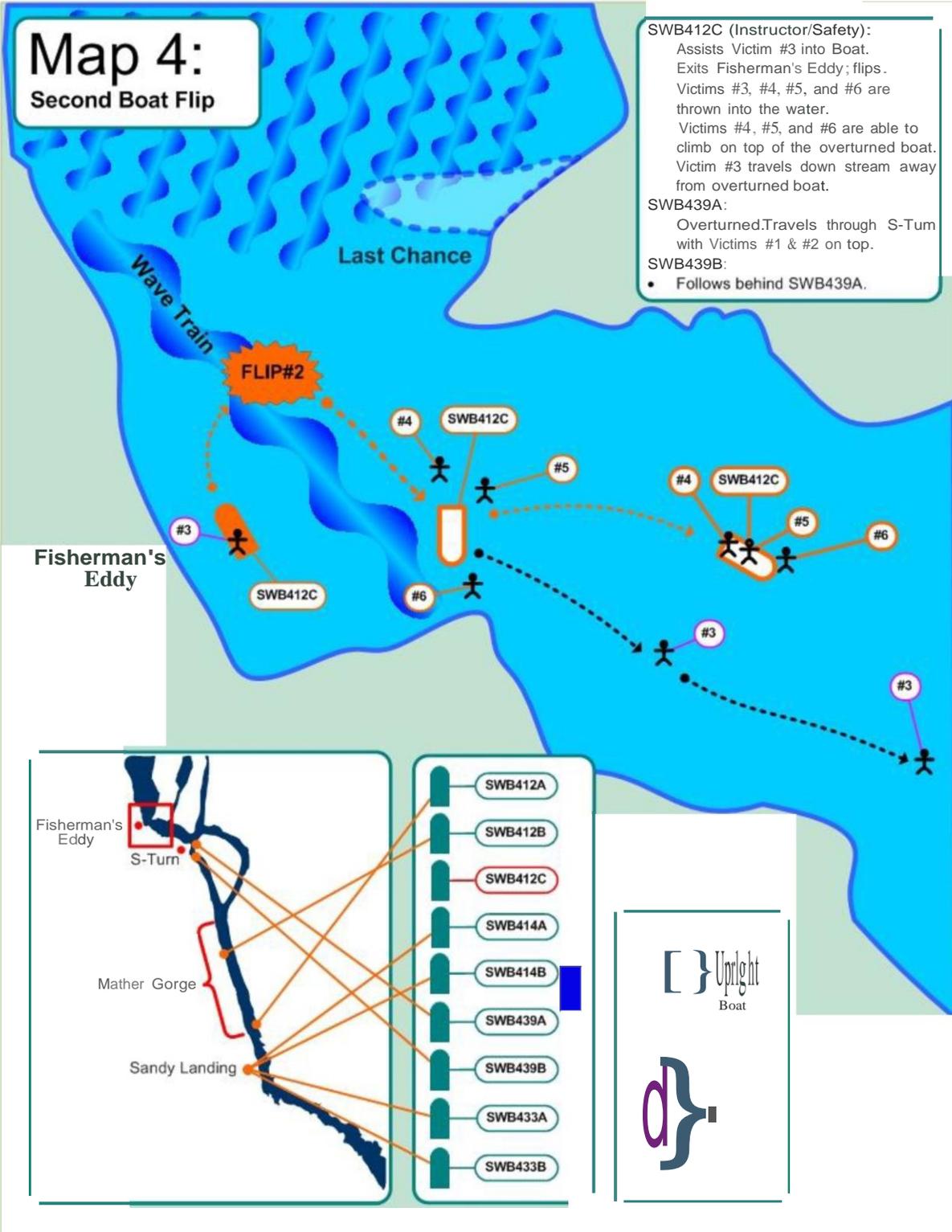


Map 3: 1 Minute After Initial Boat Flip





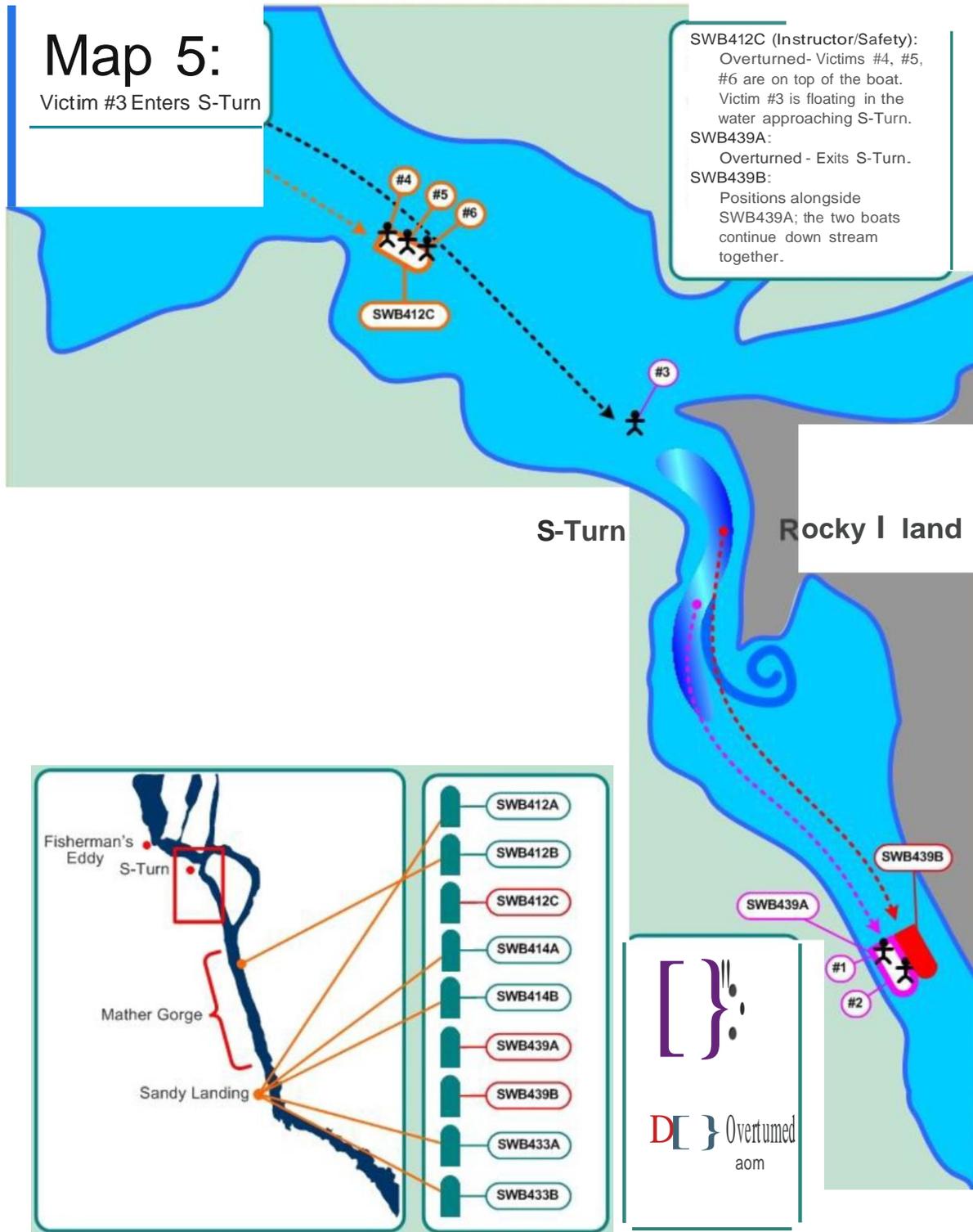
Map 4: Second Boat Flip





Map 5:

Victim #3 Enters S-Turn

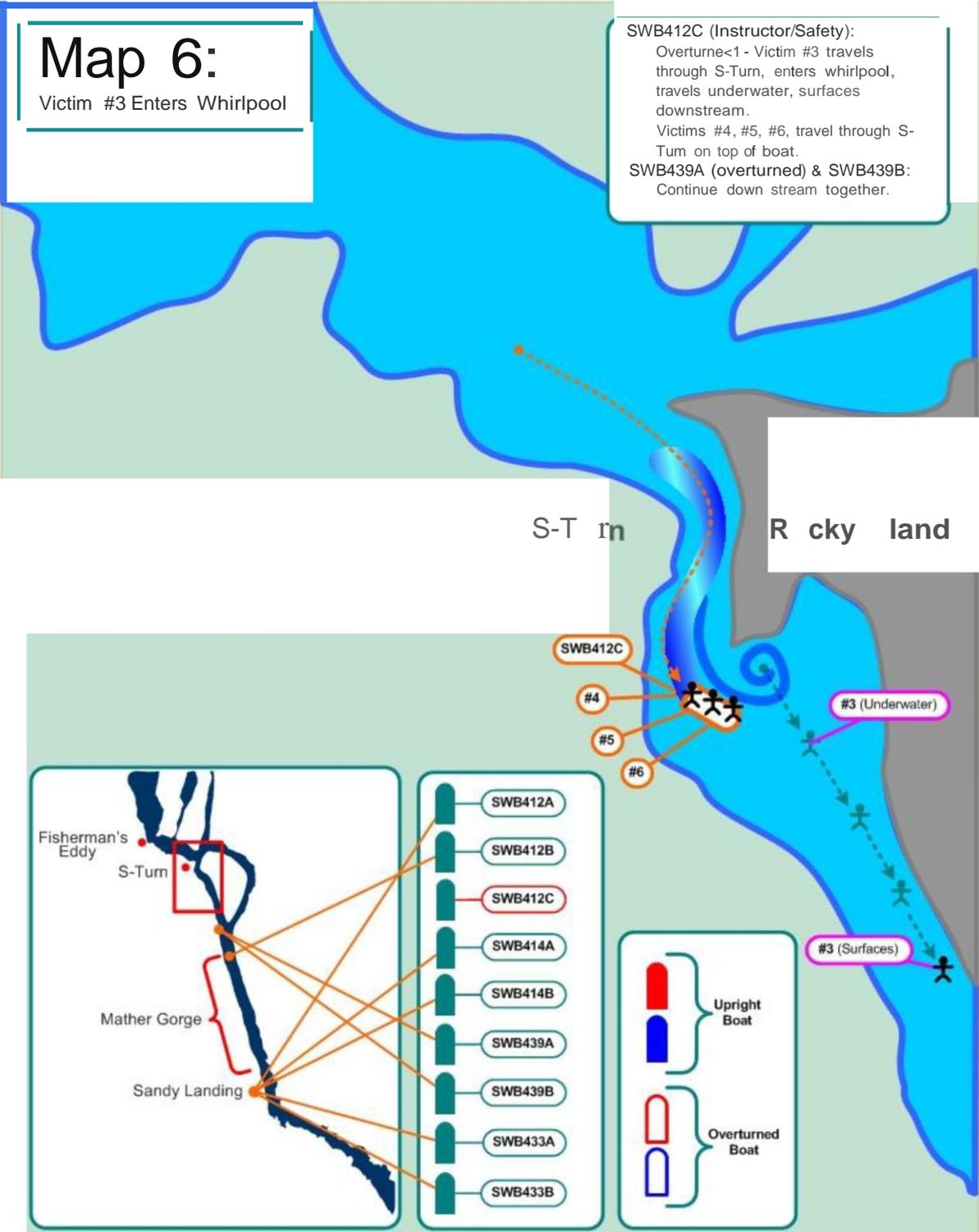




Map 6:

Victim #3 Enters Whirlpool

SWB412C (Instructor/Safety):
Overturne<1 - Victim #3 travels through S-Turn, enters whirlpool, travels underwater, surfaces downstream.
Victims #4, #5, #6, travel through S-Turn on top of boat.
SWB439A (overturned) & SWB439B: Continue down stream together.





Map 7:

SWB412B Rescues Victim #3

SWB4128 (Instructor/Safety):

Travels upstream, passes SWB439A & SWB4398. Spots Victim #3 surfacing. Positions to rescue.

First radio transmission notifying the Drill Leader of the capsized boat is made, "Hey, 39's boat flipped 2 are on top, we got one looks like he's in the water and we're headed up now to get him, copy?"

Removes Victim #3 from the water. Travels down stream to Sandy Landing, passing SWB439A & SWB439B again.

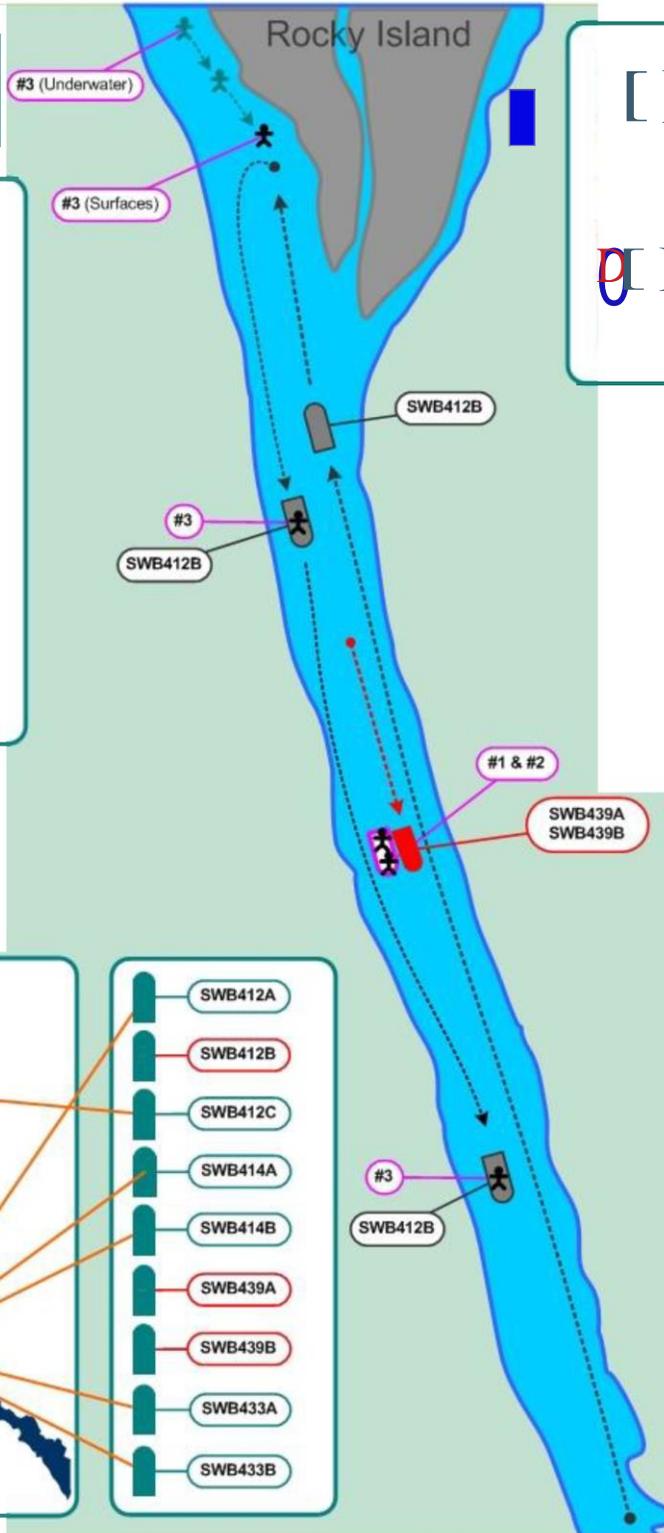
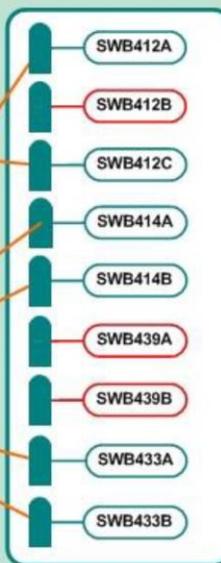
SWB412C (Instructor/Safety):

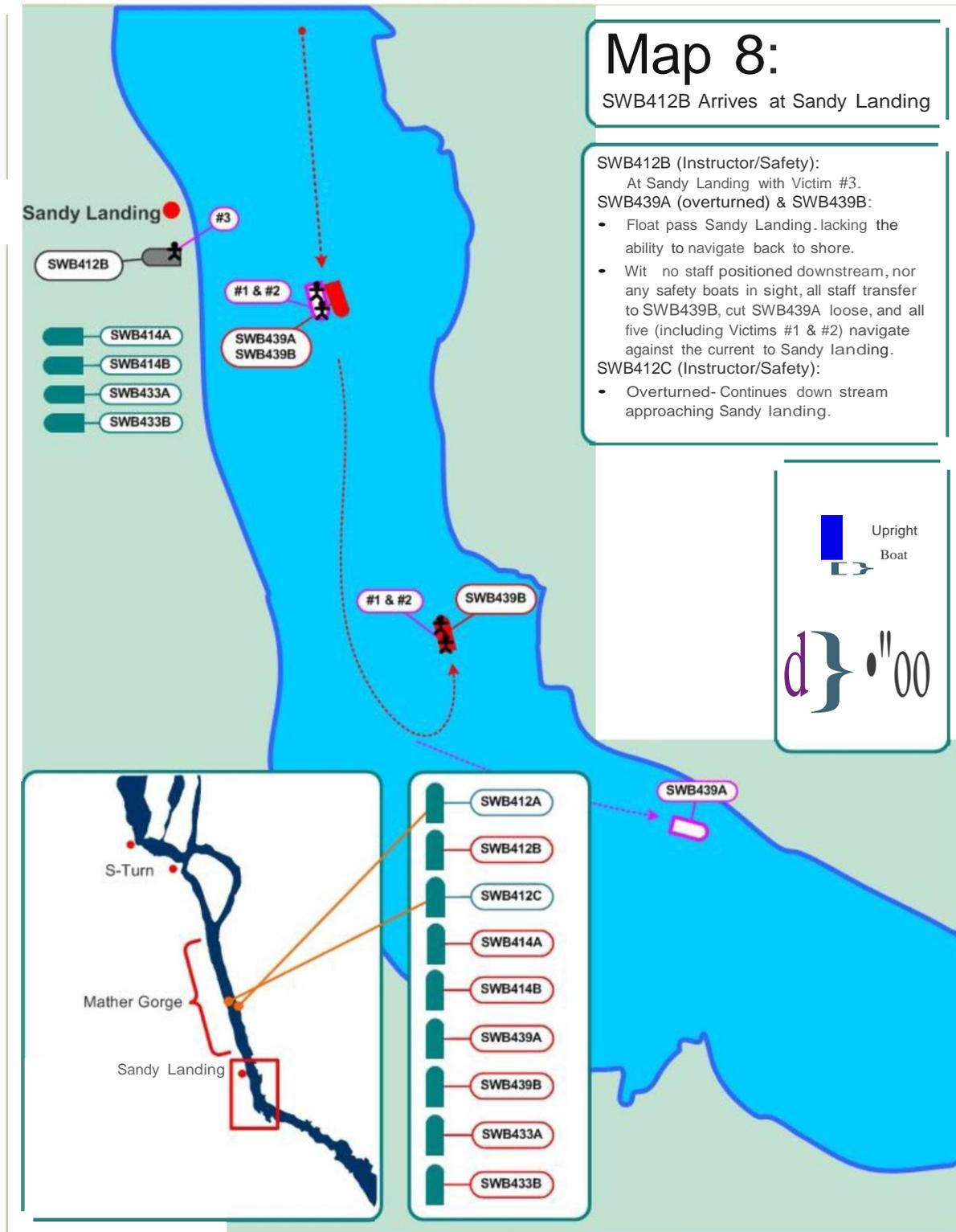
Overtaken- Exits S-turns, observes SWB412B removing Victim #3 from the water.

SWB439A (overturned) & SWB4398: Continue down stream together.

[} Upright Boat

[} Overturned







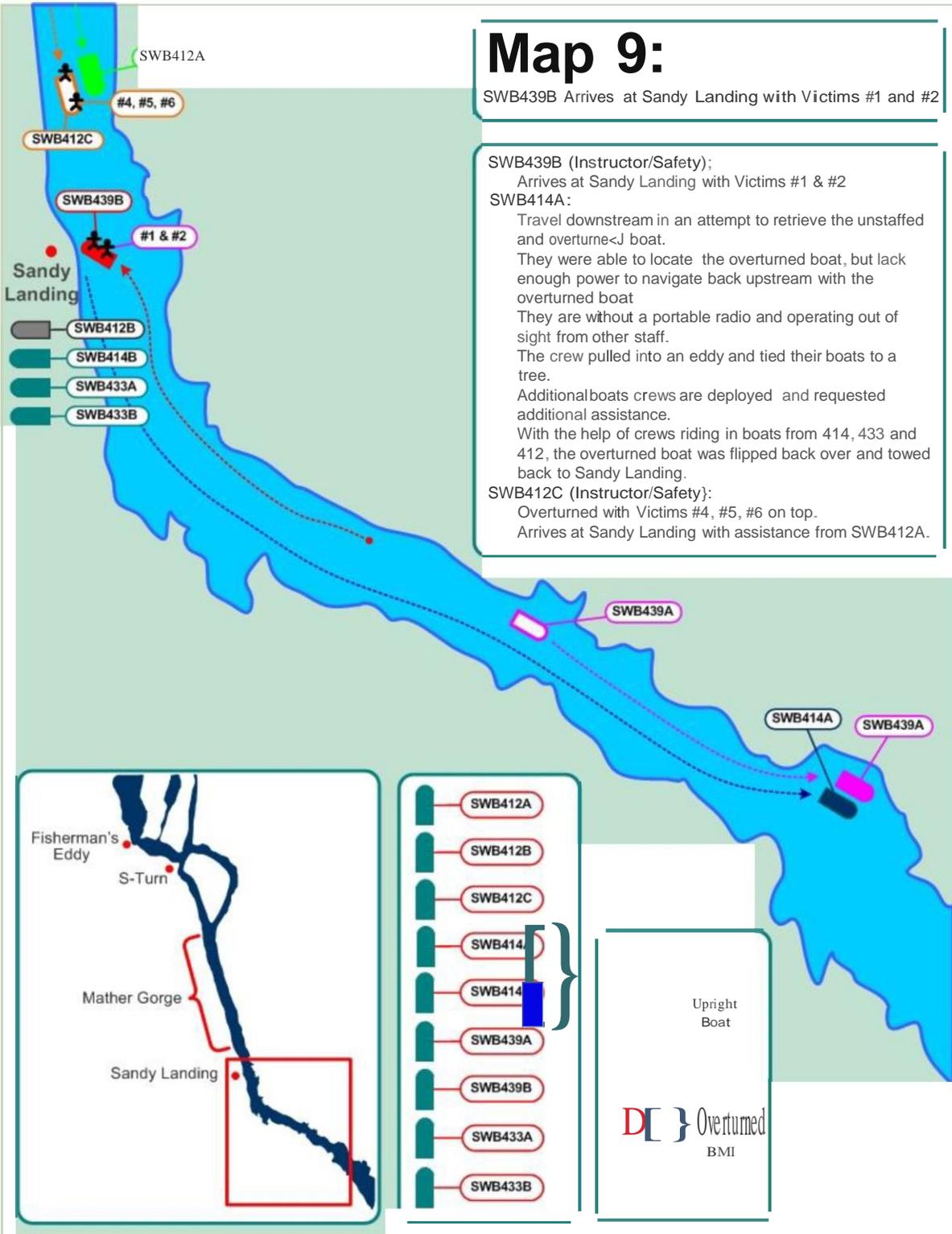
Map 9:

SWB439B Arrives at Sandy Landing with Victims #1 and #2

SWB439B (Instructor/Safety);
Arrives at Sandy Landing with Victims #1 & #2

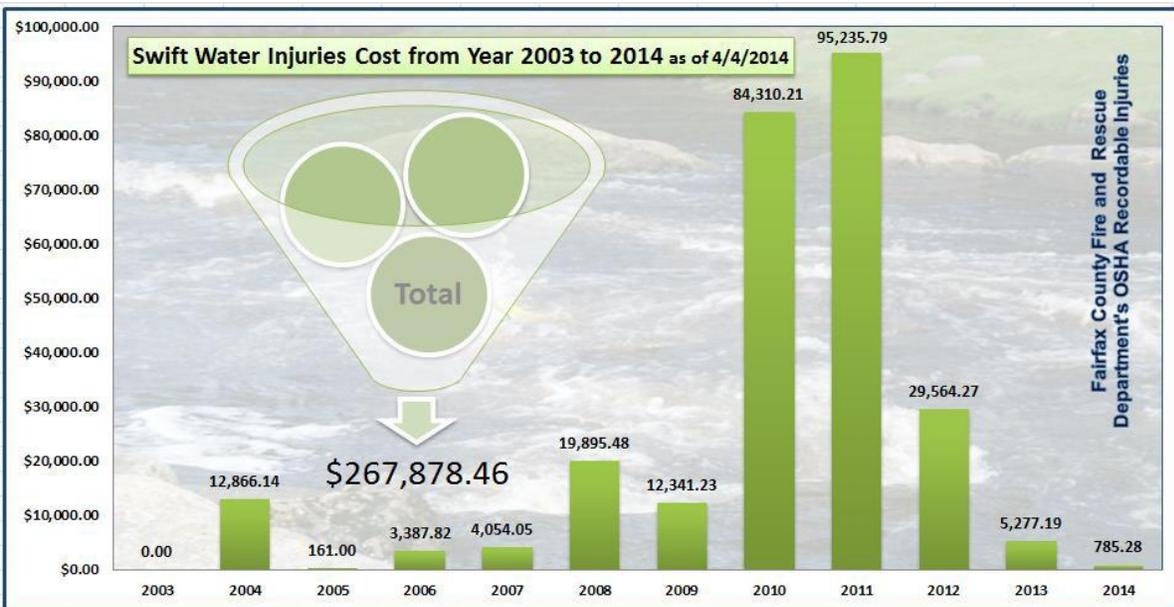
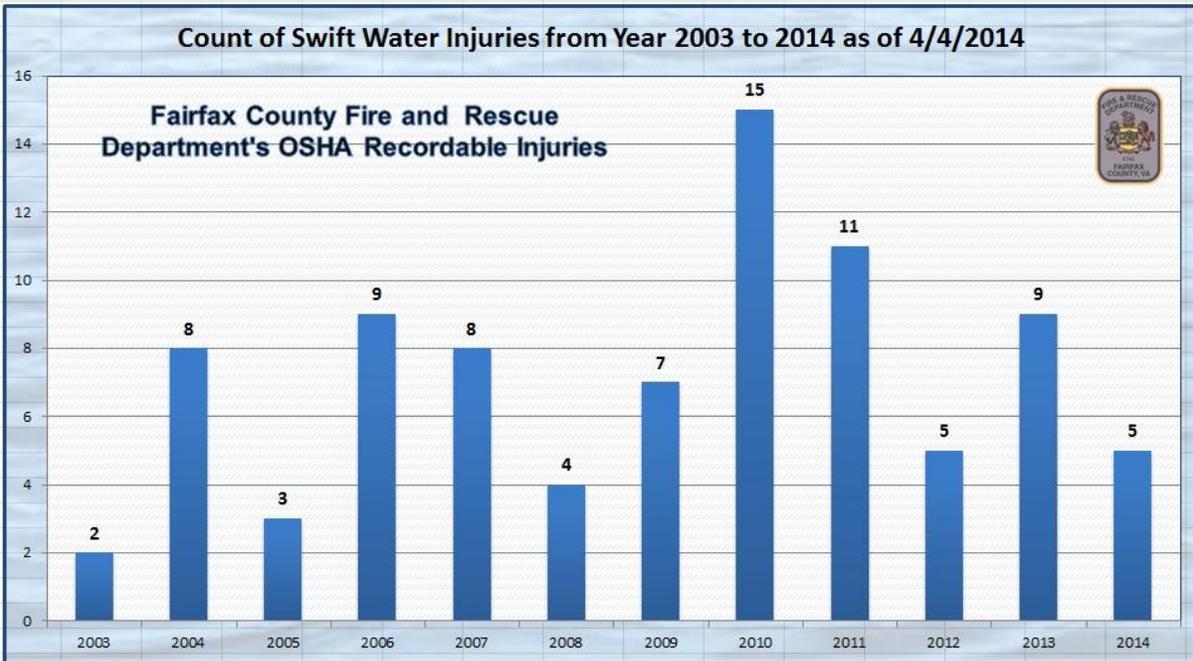
SWB414A:
Travel downstream in an attempt to retrieve the unstaffed and overturned boat.
They were able to locate the overturned boat, but lack enough power to navigate back upstream with the overturned boat
They are without a portable radio and operating out of sight from other staff.
The crew pulled into an eddy and tied their boats to a tree.
Additional boats crews are deployed and requested additional assistance.
With the help of crews riding in boats from 414, 433 and 412, the overturned boat was flipped back over and towed back to Sandy Landing.

SWB412C (Instructor/Safety):
Overturned with Victims #4, #5, #6 on top.
Arrives at Sandy Landing with assistance from SWB412A.





Attachment 1: Swift Water Training Injury Data 2003-2014





Attachment 2: Boat Specifications

Boat Specifications			
Characteristic	Potomac (DIB) with console*	Potomac (DIB) without console	13 IERB (DIB)
Length OA	16' 2"	16' 2"	13'
Width OA	6' 5"	6' 5"	6'
Max HP	65	65	30
Dry Weight (in pounds)	470	470	227
Max Buoyancy (in pounds)	4600	4600	3800
Working Load (in pounds)	2200	2200	1200
Inventory Items (in pounds)			
Motor	Potomac	Potomac	13 IERB
Motor	317	172	172
Fuel (6 pounds per gallon)	78	36	36
Battery	20		
Console	50		
SCBA Cylinder	20		
Stokes and Rope Equip	80		
Hand Tools	15		
PFD and Helmets	25	25	25
Oars	8	8	8
Fire Ext	8		
Throw Bags	8		
Throw Ring	5		
Personnel (AVG 225# per person)	675	675	675
Total weight of inventory (in pounds)	1309	916	916
Working Load (in pounds)			
Working Load (in pounds)	2200#	2200#	1200#
Total weight of inventory (in pounds)	1309#	916#	916#
Available capacity for rescue (in pounds)	891#	1284#	284#
*SWB412A & SWB412B			



Rules You Can LIVE By



RULES OF ENGAGEMENT FOR SAFE FIRE SERVICE TRAINING

1. Have a clear purpose for the training exercise and use a **TRAINING PLAN** with defined outcomes and learning objectives. Review the plan with all participants **BEFORE** training begins.
2. Establish and maintain a clear chain of command during training. Designate a training incident commander/lead instructor. Don't let participants pull rank and compromise safety.
3. Never allow freelancing during training. Require the use of staging and accountability systems.
4. Use only **QUALIFIED INSTRUCTORS** who possess both certification and experience in the subject they are teaching.
5. Adhere to all national, state and local standards for conducting training.
6. Only conduct training under **ACCEPTABLE CONDITIONS**. Don't place participants in a realistic environment before they are ready for it. Never use live victims during high-risk training.
7. Use all possible **SAFETY PRECAUTIONS** during training, even if they exceed what is possible during an actual emergency event. Even though it's "just training", never overlook safety precautions.
8. Require all participants to be **MEDICALLY CLEARED** before they participate in strenuous training. Enforce appropriate rehabilitation and monitoring during and after training.
9. Make sure the training is appropriate for the skill level of all participants and that they know what is expected of them.
10. Allow all participants to **STOP** - without penalty - if they don't understand their assignment or if they sense something unsafe during training. Stop, talk, and decide on a safer approach. **EVERYONE** is a safety officer.

The Rules of Engagement© are a product of the IAFC Safety, Health and Survival Section in partnership with the North American Fire Training Directors
Sponsored by Alabama Fire College and Fire Rescue In The Interest Of All Firefighters Returning To Quarters Safety ...After Every Run



FIRERESCUE



Glossary of Terms

Bow: The bow is the forward part of the hull of a ship or boat, the point that is usually most forward when the vessel is underway.

Confluence Wave: Formed when two separate flows meet.

Current Flow: The flow of the water tends to travel in a straight line (vector) until it comes into contact with an object, shore, or bank. The current does not always follow the shoreline due to this straight movement.

Downstream: Direction water is flowing

Downstream “V”: Water being pushed through a narrowing gap causes the level to rise up forming a “chute” or a “tongue.” This indicates the deepest part of a channel.

Downstream Safety: Personnel/crew assigned to operate downstream of the incident. These units ensure the safety of both the rescuers and victims by providing egress from the IDLH.

Eddy: A reversal of water flow from downstream to upstream, caused by negative pressure void formed by passing water. The water actually flows back upstream towards the object and is considered a “SAFE” area while boating or swimming.

Eddy Fence: Line of swirls caused by the reversal of the eddy and the downstream flow of the water. The friction between the two currents causes a spiraling effect in the water that can be sufficient enough to drag a swimmer under water or flip a boat. This line is usually evident by sight.

Ferry: The process by which a boat moves across the river without moving down stream.

Ferry Angle: Using the force of the water to assist the movement of a boat or a swimmers body to the target. Maintaining a 45 degree angle to the current a swimmer or boat can traverse the water with less difficulty.

Flood Channel: An artificial channel used to move floodwater away from an urban area. These channels are normally designed as a part of the storm water removal system. The current in this channel may be up to twice the speed as the main current.

Hydraulic: (smiling hole, frowning hole, low head) Water pouring over an underwater feature creating a void that will be backfilled by water traveling the opposite direction (upstream). This also creates a recirculation (Back-Wash) effect and the water becomes aerated by this churning.



Laminar Flow: Water moves in layers, one upon the other from the bottom. Each subsequent layer moves faster than the last. Therefore, the top layer of water is moving slower than that of the bottom.

Pillow: Where water meets an object and pushes water above water line. Water will push off to either side with a probable eddy on the opposite side downstream.

Reaction Wave: Rising of water due to encountering object underwater but not quite enough to form an upstream “V” or a hydraulic. These small “bumps” provide warning while operating a boat and/or swimming.

River Left: The left side of a river bank, looking down stream.

River Right: The right side of a river bank, looking down stream.

Standing Wave: Formed at the base of a downstream “V” due to channeling of the water into the chute/tongue. These waves are critical to acknowledging the presence of a chute while in the water swimming. The amount and speed of water will determine the size of waves.

Stern: The back or aft-most part of a ship or boat, which lies opposite of the bow (the foremost part of a ship).

Strainer: Object or structure that allows water to pass through but not rescuer (e.g. trees, fencing, cars/trucks, culvert/bridges with debris accumulated on upstream side, barbed wire, guard rails).

Under Cut: Where water meets an object that is undercut or has a narrow hole through object. The water will either be at water level or slightly dipping below indicating the presence of the undercut.

Upstream: Direction where water is coming from.

Upstream Spotter: Personnel assigned to watch for incoming hazards that can directly affect the incident. Units shall be located a sufficient distance upstream of the incident to afford adequate reflex time.

Upstream “V”: Indicates an object under the water. The speed and the depth of the water flowing over the object will need to be taken into account to determine the location. The object could be directly under the V or further upstream. Caution shall be used when either swimming and/or utilizing boat based rescues.

Wave Train: A wave train is a series of waves in succession. Wave trains usually consist of three or more waves.



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