



Urban Circuit
Operations Guide
Revision 1
January 3, 2020



Defense Advanced Research Projects Agency
Tactical Technology Office
675 North Randolph Street
Arlington, VA 22203-2114

Approved for Public Release, Distribution Unlimited

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1. Overview

This document serves as the Operations Guide for the DARPA Subterranean (SubT) Challenge Urban Circuit being held February 18-27, 2020 at Satsop Business Park in Elma, Washington, USA.

This Operations Guide is intended for teams who qualified to participate in the SubT Challenge Urban Circuit. **The purpose of this document is to provide details regarding (1) competition activities, (2) event logistics and operations, and (3) supporting information to ensure a safe and successful event.**

2. Systems & Virtual Team Participation

As detailed in the [Qualification Guide](#) document, Systems Teams were required to qualify prior to December 3, 2019, and Virtual Teams were required to qualify prior to January 3, 2020, to be invited to participate in the SubT Challenge Urban Circuit event. Teams were notified directly of their qualification status.

Systems Teams will be scored on multiple courses over their ten (10) days at Satsop Business Park. Teams will be assigned one (1) 60-minute scored run time slot, preceded by 30 minutes for integration, for four (4) of the six (6) competition days. Each team is expected to have up to four (4) scored runs throughout the Urban Circuit event. DARPA Competition Staff will be available to support teams during the 30-minute integration window.

Virtual Teams will submit their solutions to the SubT Virtual Portal, where cloud-based simulations will be run against the unreleased Urban Circuit Event competition scenarios. The solution submission window for the Virtual Competition opens January 23, 2020, and closes January 30, 2020. The submissions will be evaluated and the final results will be announced alongside the Systems Competition results. Virtual Teams are invited to attend the Urban Circuit Awards Ceremony and Technical Interchange Meeting at the Hotel RL in Olympia, Washington, February 27, 2020. Virtual Teams may also participate remotely, as the event will be live streamed. Virtual Teams are invited to participate in the team course walking tours starting at 4:30 p.m. PST on Wednesday, February 26, 2020 at Satsop Business Park in Elma, Washington. Virtual Teams are not permitted to be onsite during any other Systems Competition dates and times.

The SubT Challenge Urban Circuit will be governed based on the rules as outlined in the SubT Challenge [Competition Rules \(Urban Circuit\)](#) document, so teams should reference that document for additional technical rules and restrictions. Questions related to the rules and any information provided in this Operations Guide may be posted to the SubT Community Forum (<https://community.subtchallenge.com/>).

3. Systems Competition Task Operations

Competition Staff will be responsible for providing transportation of the Team's systems between the Team Garages and the course Staging Areas (see Figure 1). DARPA will provide utility vehicles to support transport. Teams will not be allowed to use their own vehicles for transport of systems or team members. The team members supporting field operations will walk to the Staging Areas. For one of the courses, the walk to the Staging Area will include a set of stairs. Robots for this course will be transferred via elevator.

Operational details can be found in Section 9, System Competition Rules, in the [Competition Rules \(Urban Circuit\)](#) document. Teams should note that no team members will be permitted to

enter the courses. Competition Staff will assist with platform recovery at the end of each run. Safety is one of the most important facets of the event and the Chief Official will have the final authority to determine if any team is operating in an unsafe manner or is not operating in the spirit of the SubT Challenge.

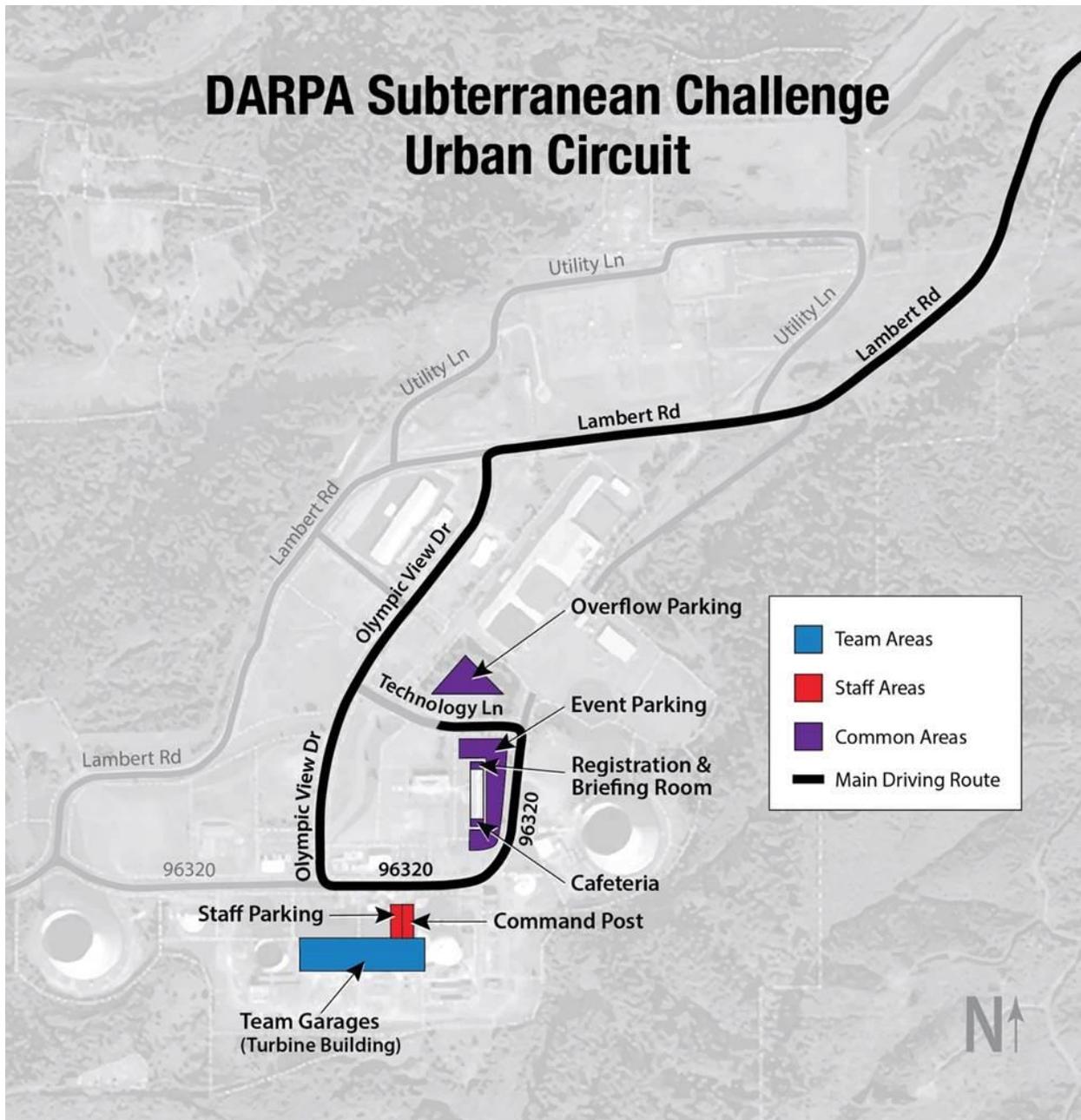


Figure 1: Satsop Business Park Site Map

4. Schedule

All qualified Systems Teams will be on-site February 18-27, 2020. Systems Teams should plan to be in the Olympia, Washington area by 7:00 a.m. PST Tuesday, February 18, and Virtual Teams should plan to be at Satsop Business Park in Elma, Washington, by 4:30 p.m. PST Wednesday, February 26. Systems and Virtual Teams should plan to be onsite until 5:00 p.m. PST Thursday, February 27, for the Awards Ceremony and Technical Interchange Meeting.

		Tuesday, February 18	Wednesday, February 19	Thursday, February 20	Friday, February 21	Saturday, February 22
		Team Orientation, Move-in and Systems Checkout	Team Move-in and Systems Checkout (continued)	Scored Runs Day 1	Scored Runs Day 2	Scored Runs Day 3 Group Photo & Team Mixer
Sunday, February 23	Monday, February 24	Tuesday, February 25	Wednesday, February 26	Thursday, February 27		
Course Reset/ Working Day	Scored Runs Day 4	Scored Runs Day 5	Scored Runs Day 6 Course Walking Tours & Team Move-out	Awards Ceremony & Technical Interchange Meeting		

5. Location

The SubT Challenge Urban Circuit will be held at Satsop Business Park in Elma, Washington.

[Satsop Business Park](#)
150 Technology Lane
Elma, WA 98541

Teams are not allowed to use or visit the Satsop site from the publication date of this document, until the completion of the Urban Circuit. Teams are also not permitted to contact Satsop for information related to the SubT Challenge or the Satsop facilities. All questions about Satsop or the Urban Circuit are to be sent to SubTChallenge@darpa.mil.

6. Enrollment

Systems Teams are limited to 20 members in attendance at the Urban Circuit event. Each individual participant must enroll by 11:59 p.m. EST Friday, January 17, 2020. Qualified teams have been emailed a link to the enrollment website. Team leads must enroll their systems separately to their individual enrollment. Systems enrollment will require details on the equipment a team is bringing to Urban Circuit and will require both technical details on the platforms as well as descriptions of the team for use in public communications. The Systems enrollment website has been sent to team leads.

Virtual Team members planning to attend the course walking tour and/or the Awards Ceremony and Technical Interchange Meeting *in person* must enroll by 2359 EST on Friday, January 17, 2020. Virtual Teams will be emailed a link to the enrollment website upon qualification.

7. Systems Team Orientation

All enrolled Systems Team members are required to attend the Team Orientation from 8:00 a.m.– 9:00 a.m. PST Tuesday, February 18, 2020. Check in will begin at 7:00 a.m.. The orientation will be held at the Hotel RL in Olympia, Washington.

[Hotel RL Olympia](#)

2300 Evergreen Park Drive SW
Olympia, WA 98502

During the Team Orientation, teams will receive:

1. Overview for the Urban Circuit
2. Information on move-in and move-out procedures
3. Challenge details
4. Safety brief

8. Systems Team Garages

Systems Teams will be provided a defined open work space in the Turbine Building as their Team Garage for their time at Urban Circuit. Each space will notionally be 30 feet (9.1 m) long x 25 feet (7.6 m) wide on cement flooring. These spaces will be clearly identified but teams should note these open spaces will be adjacent to each other. Each Team Garage will be outfitted with ten (10) tables and twenty (20) chairs. No computers, monitors, or power distribution equipment will be provided. The Turbine Building is not equipped with heating and has been reading at 40-50 degrees Fahrenheit, so it is suggested that teams wear plenty of warm layers. Teams may bring and utilize their own electric heaters; however, teams will receive limited power and will be responsible for prioritizing their power needs.

Teams may operate ground robots within their assigned Team Garage as long as operations are deemed safe as determined by Competition Staff and such operations do not interfere with adjacent teams. Teams operating multirotors or other aircraft should note that such aerial vehicles are not permitted to launch or fly in the Team Garage areas. DARPA will not control wireless interference in the Team Garages.

DARPA will provide power to the teams in two (2) locations: in the Team Garages and in the course Staging Areas. In the Team Garages there will be two (2) 120V, single-phase, 20A circuits, and in the Staging Areas, there will be one (1) 120V, single-phase, 20A circuit. Both of these locations will have NEMA 5-20R T-slot receptacles. Teams should plan accordingly to have the correct adapters, chargers, and power strips to match their individual team needs. International teams should pay special attention to voltages common in the United States and bring any necessary equipment. If teams have additional power needs, they should identify them in the team enrollment form and/or inform DARPA via SubTChallenge@darpa.mil before January 17.

Teams are only permitted in the Staging Areas during their scheduled runs and must otherwise remain in their Team Garage areas while on site. A DARPA representative will be available at all times in the Turbine Building to answer questions or assist with on-site issues.

9. Practice Areas

Systems Teams will have daily access to two (2) practice areas, also within the Turbine Building. The spaces are roughly 50 feet (15.2 m) long x 40 feet (12.2 m) wide and 40 feet (12.2 m) in height. In the practice areas, teams may operate all of their systems, both air and ground. Platforms will be able to take off and fly within the practice area for practice flights. Teams are required to have a Safety Officer who is responsible for preserving the safety of personnel and property during all practice runs. No personnel are permitted to be inside the practice areas while robots are active. Personnel will operate and monitor their active systems outside of the netted areas.

10. E-Stops

DARPA has established a set of emergency stop (E-Stop) requirements to ensure the safety of personnel, equipment, and the course environment. These requirements are designed to address common and/or anticipated modes of failure and provide a consistent, predictable method to disable equipment without creating additional hazards. All systems participating in Urban Circuit will be required to demonstrate and utilize a Tier 1 wireless emergency stop, Tier 2 recovery wireless emergency stop, and Tier 3 on-platform emergency stop (if applicable) as described in the [Competition Rules \(Urban Circuit\)](#) document.

Prior to operating their systems on the designated competition courses, teams will be required to successfully demonstrate connectivity to their systems and the operation of the Tier 1, Tier 2, and Tier 3 (if applicable) emergency stops. If a team fails to successfully pass their safety and network check, they will be required to use their first scheduled scored run to complete this task.

11. Course Walking Tours

At the end of the event, team members will be given a short walking tour to see the competition courses firsthand. Up to four (4) members from each qualified team will be permitted to participate in a course tour, which is expected to be less than sixty (60) minutes long. Walking tour participants are prohibited from bringing any cameras or sensors of any kind (e.g., cell phones). Participants will be required to wear closed-toed shoes. Steel-toed shoes are encouraged but not required. It is expected that the walking tour will include multiple flights of stairs and may include areas with low lighting and/or fog.

12. Travel

The [Seattle-Tacoma International Airport \(SEA\)](#) is the closest major airport and is about a 1.5 hour drive to Satsop Business Park. Thirty-one airlines serve 91 non-stop domestic and 28 international destinations out of SEA.

13. Area Maps

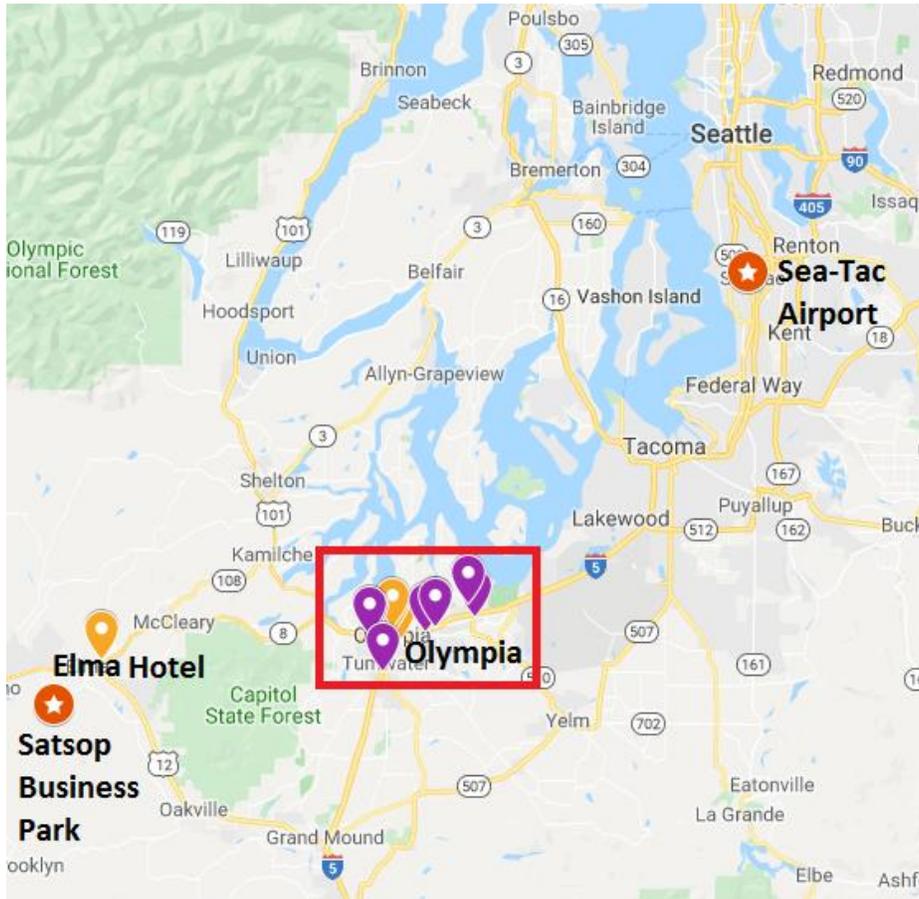


Figure 2: Seattle-Tacoma Area Map with Key Locations

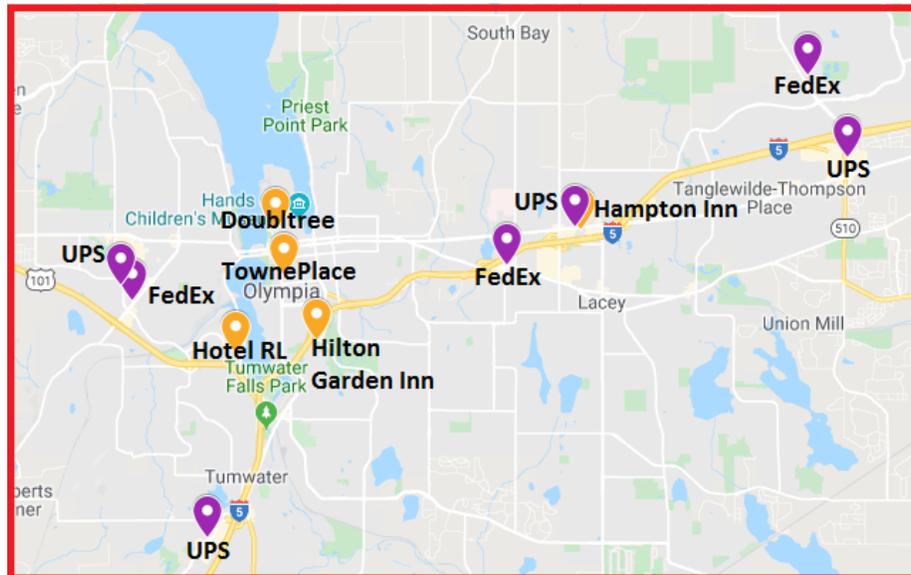


Figure 3: Olympia Area Map with Key Locations

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14. Lodging

Teams are responsible for making their own hotel reservations or sleeping arrangements. Local hotels and distances to Satsop are listed below. The hotel list is provided solely for informational purposes for the convenience of the teams. DARPA does not promote or prefer any of the hotels listed below.

Name	Address	Phone	Distance to Satsop
Stay Beyond Inn & Suites	800 E Main Street Elma, WA 98541	360-482-6868	6.3 miles
Hilton Garden Inn Olympia	2101 Henderson Park Lane SE Olympia, WA, 98501	360-236-9934	33.6 miles
Towneplace & Suites Olympia	900 Capitol Way S Olympia, WA 98501	360-753-8770	34.5 miles
Doubletree by Hilton Olympia	415 Capitol Way N Olympia, WA, 98501	360-570-0555	34.9 miles
Hampton Inn & Suites Olympia Lacey	4301 Martin Way E Olympia, WA 98516	360-459-5000	36.9 miles

15. Move-in/Move-out

Systems Teams will move into Satsop areas on a staggered schedule starting at 10:00 a.m. PST Tuesday, February 18, 2020. A detailed move-in schedule will be provided closer to the event date. Move-in times will also align with a safety and network check schedule so teams are asked to not arrive before their assigned time slot.

Team operations on site must conclude no later than 7:00 p.m. each day. After completion of the Urban Circuit, each team must return their workspace to its original condition and check out with DARPA staff before departure.

16. On-site Parking

Each Systems Team is permitted to bring up to six (6) total vehicles to Satsop to include a combination of both passenger vehicles to get team members on and off site and a utility vehicle for equipment move-in and move-out. Teams are permitted to park in the designated team parking areas of the Event Parking Lot until full (see Figure 1). The remaining passenger vehicles, as well as all large utility vehicles, should park in the Overflow Parking Lot. Parking passes will be distributed to the identified team leader at Team Orientation.

Virtual Teams attending the course walking tours are permitted to bring up to two (2) total vehicles to Satsop and should park in the Overflow Parking Lot (see Figure 1). Virtual Teams will need to stop by Registration prior to parking to collect their parking passes.

17. Transporting Equipment

All Systems Team equipment should be transported to their Team Garage at Satsop via one (1) team rented or owned vehicle. The team utility vehicle should be brought to the Team Garages (Turbine Building) to unload equipment. Once all equipment has been off-loaded, the vehicle must be moved to the Overflow Team Parking Lot. Teams will not be allowed to use their own vehicles for transport of systems or team members between the Team Garages and the Staging Areas. Teams will be provided a detailed site map at orientation and staff members will be present to help direct teams.

18. Shipping

Systems Teams are responsible for shipping their equipment to an outside provider as well as pickup and transfer of the equipment to and from the Satsop facility. Due to liability reasons, Satsop staff will be unable to receive or sign for any team shipments. Local shipping centers are listed below and illustrated in Figure 3. DARPA does not promote or prefer any shipping provider below.

Name	Address	Phone	Distance to Satsop
FedEx Print & Ship Center	1200 Cooper Point Rd SW, Suite 524 Olympia, WA 98502	360-943-4993	30.9 miles
The UPS Store	1001 Cooper Point Road SW, 140 Olympia, WA, 98502	360-705-2636	31.1 miles
The UPS Store	5729 Littlerock Road SW, 107 Tumwater, WA, 98512	360-878-9606	34.8 miles
FedEx Print & Ship Center	3510 Pacific Ave SE, Suite G1 Olympia, WA 98501	360-459-3680	36.1 miles
The UPS Store	4250 Martin Way E, 105 Olympia, WA, 98516	360-742-3399	36.8 miles
The UPS Store	1420 Marvin Road NE, C Lacey, WA, 98516	360-459-8833	40.4 miles
FedEx Ship Center	7820 29th Ave NE Lacey, WA 98516	800-463-3339	40.8 miles

19. Operational Considerations

Satsop Business Park is used for experimentation with existing and emerging technologies. However, Systems Teams are responsible for assessing the potential dangers and/or real-world limitations of their technical solutions to be tested, in the context of safety to both personnel and equipment. If a team is unsure if a specific piece of equipment is allowable, the team should check with DARPA prior to arrival at Urban Circuit.

Standard radio frequencies (i.e., ISM bands) are permitted for use in and around the site. Teams should note that technologies that either require amplification or non-standard frequencies may be limited to within the courses and possibly not be allowed for use within the Team Garages. If communication interference is discovered between systems, priority will be given to the Team(s) experimenting in the courses.

Systems Teams may only conduct flight operations at two locations at Satsop: the practice areas within the Turbine Building and the competition courses including the Staging Areas.

No fuel-based power sources are approved for this event.

20. Safety

DARPA will provide a safety brief at the Team Orientation. No manual physical intervention or entry by any (human) team members on the courses will be permitted, except for the course walking tours at the end of the event. Only trained and authorized Competition Staff will be allowed to enter the courses preceding, during, and following any course runs.

Closed-toed shoes, long pants, reflective safety vests, hard hats, and protective eyewear will be required to be worn in the Staging Areas and Practice Areas at all times. DARPA will provide all personal protective equipment (PPE), but teams are responsible for bringing their own closed-toed shoes and long pants. Team members participating in the course walking tours will be required to wear closed-toed shoes. Steel-toed shoes are encouraged but not required.

21. Security

The Satsop facilities will be locked after event hours. Systems Teams are still encouraged to secure their equipment at the end of the day in their garage or return their equipment to their hotel for overnight storage.

Team Garages are open spaces. Teams must respect each other's privacy and property. If teams do not want their systems viewed, they are encouraged to bring covering material for when they are being transported or stored in their garage.

DARPA is not responsible for any lost or stolen equipment. Nevertheless, acts of theft or sabotage will not be tolerated and will result in immediate disqualification.

22. Photo/Video Collection & Media

DARPA intends to capture photographs and video during Urban Circuit for use in future production materials and to provide situational awareness of progress throughout the courses. Team members may be asked to be interviewed on camera by DARPA Public Affairs and/or a DARPA-hired production crew. Participation is optional, but encouraged, to provide a range of perspectives on the work being done in the competition. Systems Teams may collect video and photographs of their systems operating within the Staging Areas and their Team Garage. Teams are not permitted to take photographs or video of other teams' equipment or operations without explicit permission.

Select national, international, and local media will be present at Urban Circuit. DARPA Public Affairs will assist in coordinating team interviews with media outlets and will provide additional details in the coming weeks.

23. Food

Food trucks may be made available on site for purchase of food and beverage. Teams are encouraged to bring food with them each day or plan to utilize the on-site vendors to minimize the number of trips off site. Water coolers will be provided by DARPA so teams are encouraged to bring their own reusable water bottles.

24. Weather

The weather in Elma during mid-February has an average high of 52°F (10.9°C), low of 35°F (1.7°C), and averages approximately 7.3 inches of precipitation and one (1) inch of measurable snowfall during the month. While the courses are underground, the movement between event areas is outdoors and periods of rain and/or snow are possible. The DARPA team will be monitoring weather and may temporarily halt operations due to rain or inclement weather. Participants should be prepared for all types of weather by bringing heavy coats, winter hats, warm gloves, umbrellas, and rain jackets.