

**OPTIONS FOR SAFE STORAGE PRACTICES FOR ELECTRIC VEHICLES IN
EVIDENTIARY STORAGE FOR THE WASHINGTON STATE PATROL**

**Washington State Patrol
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Northwestern University Center for Public Safety
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OPTIONS FOR SAFE STORAGE PRACTICES FOR ELECTRIC VEHICLES IN EVIDENTIARY STORAGE FOR THE WASHINGTON STATE PATROL

Problem

The Washington State Patrol (WSP) currently stores electric vehicles (EV) as evidence in bullpens in the same manner as vehicles with internal combustion engines. Electric vehicles, when involved in dynamic traffic collisions or when used in criminal traffic activity are damaged and the damage makes the lithium-ion battery at an increased risk of a thermal runaway. A thermal runaway begins when a battery generates heat and is unable to dissipate the heat, triggers other processes, and results in an uncontrollable increase in temperature. This can result in the destruction of the battery, as well as a fire that reaches 2000 degrees in 60 seconds.

A thermal runaway from a stored EV in WSP facilities may damage or destroy the facility, and it will result in loss of evidence for criminal investigations. Current evidentiary storage of electric vehicles in bullpen facilities of the Washington State Patrol (WSP) do not meet suggested recommendations by industry professionals. A recent thermal runaway occurred in Sydney, Australia when an EV caught fire and destroyed five vehicles parked in close proximity (Fire & Rescue, 2023).

Washington State currently has the fourth highest number of EV's in the United States (Annex A). The number of EV's registered in the state of Washington continues to increase annually. (Annex B). Batteries that have been damaged in a collision should be stored uncovered, with sufficient space between vehicles, and outside due to a higher risk of a thermal event (Annex C).

If WSP does not create or improve storage practices for impounded or damaged EV's, they may lose valuable evidence due a thermal runaway of a lithium ion battery, and a thermal runaway from a vehicle stored in the current conditions will result in the loss of, or damage to evidence or the facilities.

Assumptions

- With the number of electric vehicles continuing to be purchased and registered in the state of Washington, the number of collisions involving electric vehicles will continue to increase.
- The public expects evidence collected by the Washington State Patrol to be stored safely for use in criminal trials.
- Damaged electric vehicles should not be stored in the same manner as internal combustion vehicles due to a risk of a thermal event also known as thermal runaway.

Facts

- The primary goal of the WSP is to provide a safe motoring environment for the public. 531 troopers in Field Operations Bureau enforce traffic laws, investigate collisions, and assist motorists on 17,524 miles of the state's highways.
- In 2021, The White House set a goal that half of all new vehicles manufactured in 2030 be zero emission vehicles.
- Washington State set a target that all vehicles of model year 2030 or later, sold, purchased, or registered be electric vehicles.
- Washington State had the fourth highest number of electric vehicle registrations in the United States through July 2023.
- There are currently no procedures for the storage of electric vehicles listed in the WSP Property Evidence Custodian Manual, or the WSP Officers Evidence Handbook.
- Electric vehicles damaged in collisions require different storage conditions to mitigate thermal hazards.

Discussion

Each year there are more electric vehicles produced, purchased, and registered in the State of Washington. There are an increasing number of collisions each year in Washington State, and some of them are criminal in nature. Some of those collisions involve electric vehicles and as a result there is an increasing need to safely store the damaged EV's as evidence in the bullpens of the WSP. The Washington State Patrol currently stores EV's the same as internal combustion vehicles in its evidentiary bullpens.

In 2021, President Biden signed an executive order targeting half of all new vehicles sold in 2030 to be zero emission vehicles (The White House, 2021). As EV's become more common, Washington had the fourth highest number of EV's registered in the United States as of July 2023 (Annex A). Additionally, there are more EV's being registered in Washington each year than the previous year (Annex B). In 2022, Washington State Governor Jay Inslee signed a bill that targets that all vehicles of model year 2030 or later sold, or purchased in Washington be an electric vehicle (Dow, 2022).

There are currently no procedures in either the WSP Officers Evidence Handbook, or the WSP Property Evidence Custodian Manual describing how to store EV's. The term electric vehicle or EV is also not listed in either manual. Additionally, there is no description of the potential hazards that damaged EV's may present listed in either publication.

Physical damage to an EV, or the high voltage battery may result in immediate or delayed release of toxic and/or flammable gases and fire. NHTSA also recommends that all EV's damaged in collisions, or those with damaged lithium-ion batteries be stored 50 feet away from other vehicles or structures (NHTSA, 2012).

In contrast, retired Seattle Fire Captain and Energy Hazard Response Subject Matter Expert Chris Greene stated in an interview that a reasonable course of action would be to store damaged EV's outside, uncovered, and separated from other vehicles or structures by

stacked concrete ecology blocks. The blocks are readily available throughout the State of Washington and cost approximately \$85 each. A small set of bays created by the blocks could be constructed for less than \$4000 in each of the eight WSP districts.

According to PEC Melissa Wiles from the WSP on September 27, 2023, there are six EV's and one electric bike being stored in WSP evidence bullpens. There have been more, but they were released or returned recently after evidence had been collected.

In order to address the issue of safely storing electric vehicles that are damaged or that have damaged batteries, the following alternatives can be considered:

- Maintain current practice.
 - Advantages
 - No training or change to procedures.
 - No cost to create bays with blocks in each district.
 - Disadvantages
 - An increasing frequency of EV's will place evidence at risk.
 - Risk to employee's safety.
 - Risk of destruction of other evidence.
 - Costs
 - No additional cost to continue current business practices.
- Create several safe parking areas in bullpens for EV's with concrete blocks.
 - Advantages
 - Creates a barrier to shield evidence and facilities should a fire result from a thermal runaway.
 - Inexpensive.
 - Impervious to weather.
 - Fire resistant.
 - Disadvantages
 - New procedure update for the Property Evidence Custodian Manual, and Officer Evidence Handbook required.
 - Employee training required for updated procedures.
 - Costs
 - One-time expense for each district.
 - Blocks are \$85 each and several bays could be constructed for approximately \$4,000-\$6,000 at each facility.
- Renovate current facilities or construct new facilities in each district to handle anticipated increase of EV storage.
 - Advantages
 - Facility planning well ahead of construction to forecast anticipated need.
 - Redesign of facilities would address current deficiencies in each location.
 - Disadvantages
 - Time to study the problem.
 - Expense for planning, design, construction.

- Time to construct would not address the current need.
- Costs
 - Legislative funding required for capital projects in each district.

Conclusion

EV’s are increasingly more common on the roadways of Washington State. The WSP currently employs practices that do not address EV’s. The Washington State Patrol is not prepared to mitigate the risk of thermal runaway and safely store damaged EV’s in the bullpens of each district. Three options have been proposed to address the concern of protecting evidence and facilities from risks associated with thermal runaway of lithium-ion batteries. Storage of EV’s that are damaged in collisions, and EV’s with damaged batteries creates a higher risk of fire as a result of thermal runaway.

The phrase electric vehicle currently does not appear in either the Property Evidence Custodian Manual, or the Officer Evidence Handbook and there is no procedure on how WSP will safely store the evidence. There is also no way currently for employees to mitigate the risk of thermal runaway by separating the vehicles with more than 50 feet due to overcrowded facilities. Safer storage practices will mitigate risk of a fire damaging the facilities, and/or damaging/destroying evidence in cases involving EV’s, as well as cases with additional vehicles stored too close to EV’s due to current conditions.

This study has presented three possible alternatives that the Washington State Patrol can implement. Each has its strengths and weaknesses. While each are viable, only one is the best fit for the current concern that damaged electric vehicles in evidence present. Renovation of facilities is costly and takes a significant amount of time and resources. Conversely, making no change ignores a risk that may result in catastrophic loss of evidence including the loss of an entire bullpen facility. Implementing a temporary safe storage space to park damaged EV’s using concrete blocks will mitigate the risk at a relatively low cost while being a temporary solution that can be modified as needs change.

Recommendations

In order to create a safe storage condition for all Washington State Patrol evidence bullpens, it is recommended that the Washington State Patrol construct temporary storage bays using concrete ecology blocks at each district bullpen so that EV’s may be stored in a manner that mitigates the risk of a fire that could destroy other valuable evidence or damage or destroy WSP evidence bullpens. Implementation can take place quickly. A cost estimate has been created and included (Annex D).

Chief John R. Batiste
Washington State Patrol

Approve **Not Approved**

Comments:

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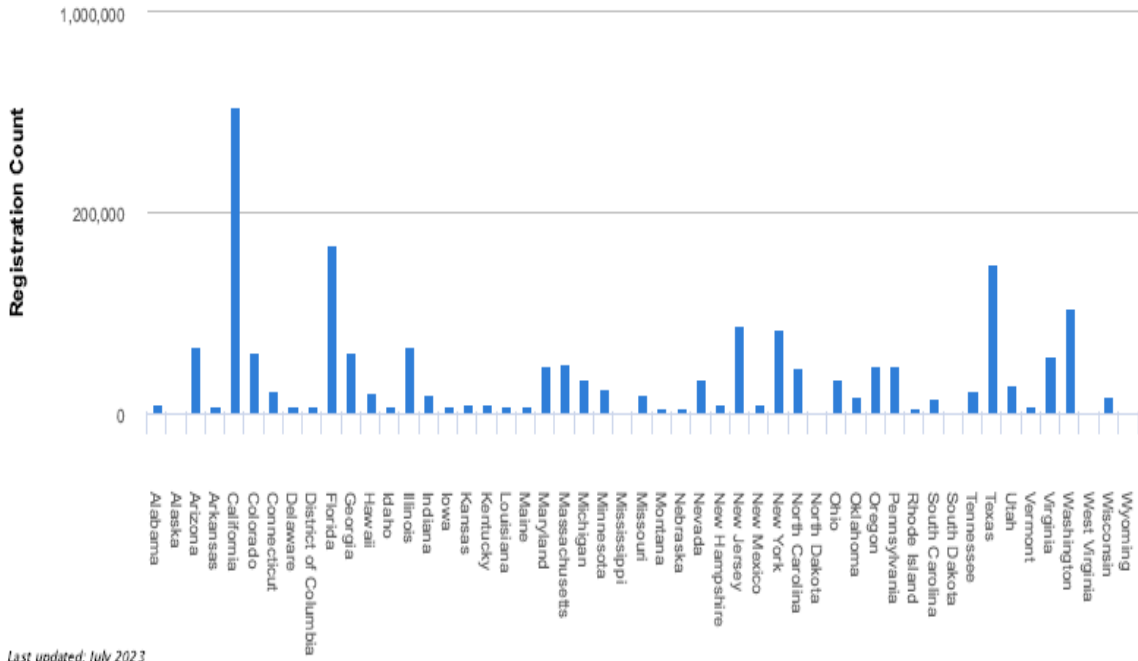
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List of Annexes

- Annex A)** Electric vehicle registrations by state.
- Annex B)** Electric vehicle registration activity by year in Washington.
- Annex C)** Interim guidance for electric and hybrid-electric vehicles equipped with high voltage batteries.
- Annex D)** Implementation Schedule for temporary parking storage for electric vehicles.

Annex A

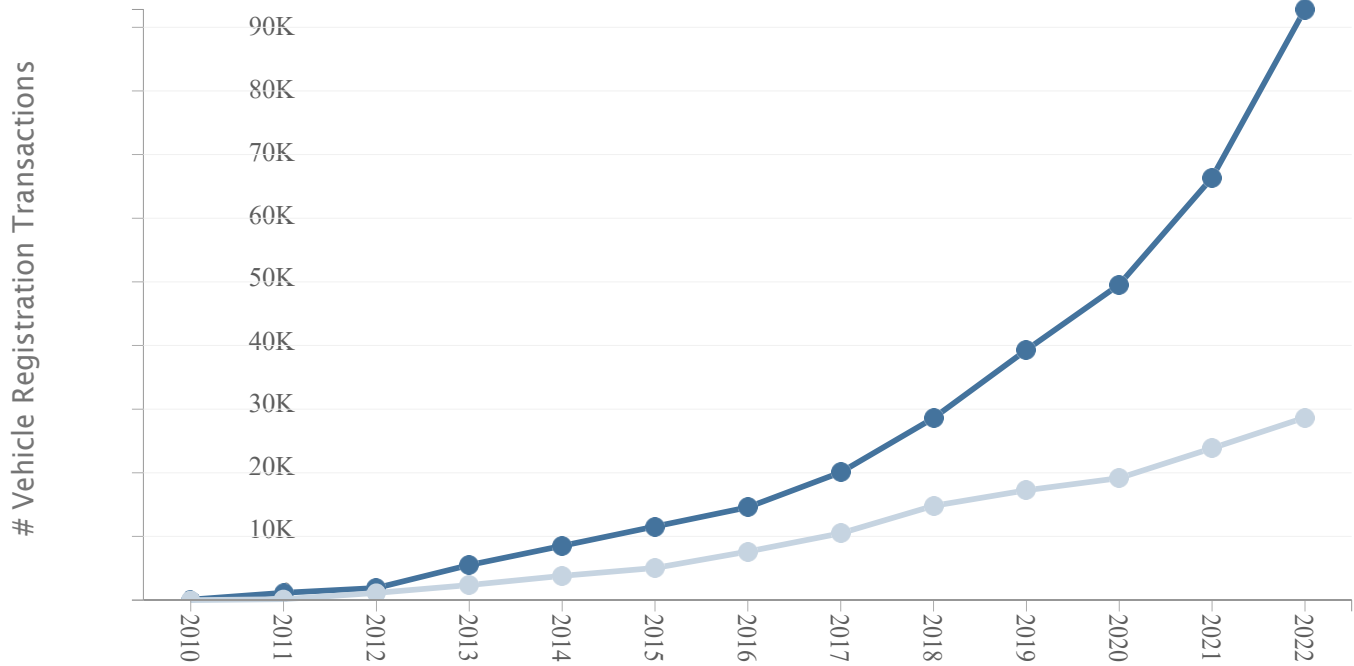


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Annex B

Electric Vehicle Registration Activity by Year for Washington

This shows the number of times electric vehicles obtained registration (new registrations as well as renewals) within each calendar year.



Annex C

Electric and Hybrid-Electric Vehicle Considerations:

In the event of damage to or fire involving an electric vehicle (EV) or hybrid-electric vehicle (HEV):

- Always assume the high voltage (HV) battery and associated components are energized and fully charged.
- Exposed electrical components, wires, and HV batteries present potential HV shock hazards.
- Venting/off-gassing HV battery vapors are potentially toxic and flammable.
- Physical damage to the vehicle or HV battery may result in immediate or delayed release of toxic and/or flammable gases and fire.

POST-INCIDENT

- Do not store a severely damaged vehicle with a lithium-ion battery inside a structure or within 50 feet of any structure or vehicle.
- Ensure that passenger and cargo compartment remain ventilated, i.e., open a window, door or trunk.
- Notify an authorized service center or vehicle manufacturer representative as soon as possible as there may be other steps they can take to secure and discharge the HV battery.
- Call 911 if you observe leaking fluids, sparks, smoke, flames, or hear gurgling or bubbling from the HV battery.

Annex D

IMPLEMENTATION SCHEDULE FOR TEMPORARY BULLPEN PARKING STORAGE FOR ELECTRIC VEHICLES

<u>TASK</u>	<u>ASSIGNED TO</u>	<u>TO BE COMPLETED BY</u>
Present Staff Study to Chief Batiste for approval	Captain J. Knott	11/20/2023
Meeting with BFS Director Walter Hamilton to reallocate funds for purchase and placement of blocks at district facilities	Captain J. Knott	12/20/2023
Place order for initial purchase for 240 concrete blocks	BFS Contracts Section	1/3/2024
Begin site preparation at each district HQ bullpen location	District Facilities Lieutenants for each district	1/10/2024
Accept delivery or 30 blocks per district	District Facilities Lieutenants for each district	2/1/2024
Complete placement of two bay parking per district	District Facilities Lieutenants for each district	2/14/2024

EXECUTIVE SUMMARY

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If WSP does not create or improve storage practices for impounded or damaged EV's, they may lose valuable evidence due a thermal runaway of a lithium ion battery, and a thermal runaway from a vehicle stored in the current conditions will result in the loss of, or damage to evidence or the facilities.

Possible Solutions:

- 1. Maintain the current conditions and store EV's as currently being done.**
- 2. Construct temporary bays using concrete ecology blocks at each in each district, (location determined by the district commander).**
- 3. Renovate or construct facilities in each district with additional space for EV's.**

Recommendation:

In order to create a safe storage condition for all Washington State Patrol evidence bullpens, it is recommended that the Washington State Patrol construct temporary storage bays using concrete ecology blocks at each district bullpen so that EV's may be stored in a manner that mitigates the risk of a fire. A fire resulting from thermal runaway could destroy valuable evidence, or damage or destroy entire WSP evidence bullpens. An implementation schedule has been included (Annex D).

Chief John R. Batiste
Washington State Patrol

Approve **Not Approved**

Comments: