I-70 Floyd Hill

Floyd Hill Design - Deicer Issue Task Force

Meeting Summary

February 15, 2024, 10:00 AM to 12:00 PM

Kraemer Floyd Hill Office: 35715 US-40 Building B, Ste 220, Evergreen, CO 90439

1. Introductions and Agenda Review

CDR Associates reviewed the agenda.

ITF Agenda 2-15-24

- *Issue Recap & Prior Input*
- *Review of Current Water Quality Monitoring Data*
- *Review Maintenance Best Practices in Deicer Application and Tracking*
- *Other Water Quality Issues and Updates*
- *Review Action Items & Wrap Up*

ITF Members confirmed the meeting agenda with no changes. CDOT maintenance brought a snow plow for ITF members to look at after the meeting.

2. Issue Recap & Prior Input

Daniel Estes, CDR Associates, began the meeting by reviewing the purpose of the Deicer ITF and recapping specific interests expressed by the ITF in prior meetings.

Deicer ITF Purpose

- Discuss Floyd Hill project-specific opportunities and strategies regarding deicing products that balance safety and environmental needs
- Identify strategies to collect data, share and apply to Floyd Hill project maintenance and operations
- Identify corridor and region-wide ideas and/or process recommendations for addressing issues related to deicing practices and design.

ITF Interests

- Understanding existing water quality data through data-sharing, expert presentations, other methods
- Strengthening ITF's collective understanding of the relationship between deicers

and the natural environment (including stream health and vegetation)
- Opportunities to mitigate potential effects of deicers within the Floyd Hill project area
- Gathering information that may be applied to future I-70 corridor projects

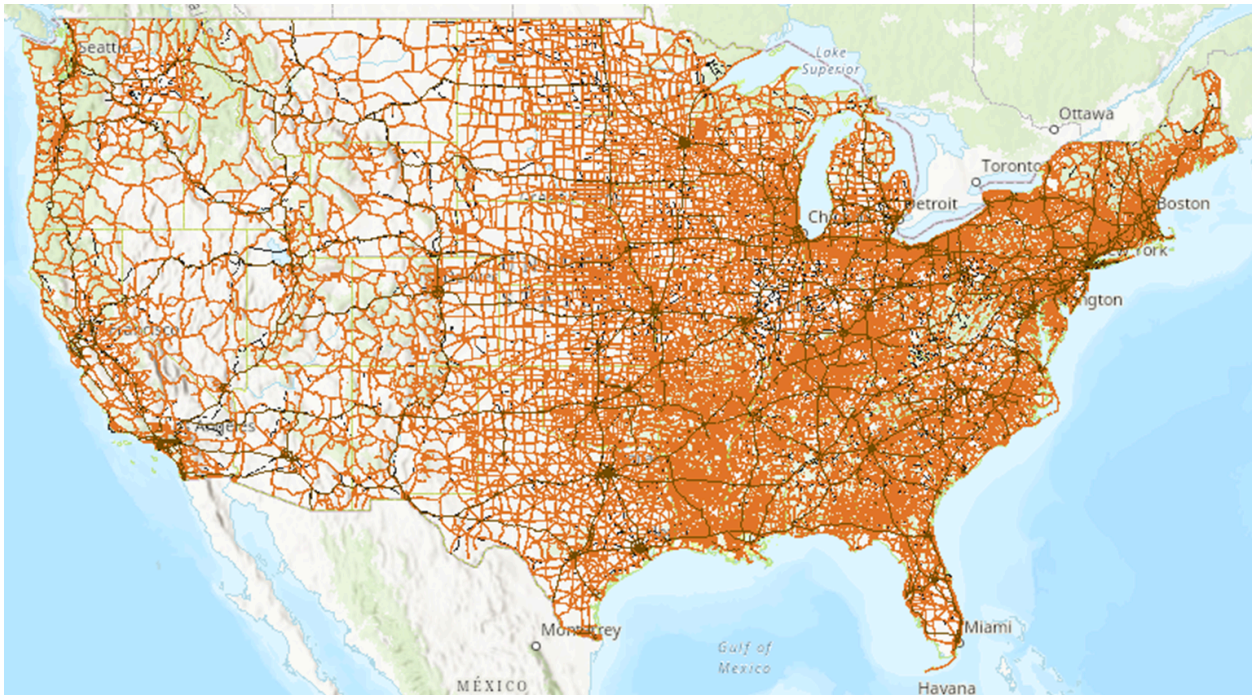
ITF members did not have any additional comments about the interests or objectives of the Deicer ITF.

ITF Questions

- **Question** (Ashley Giles, Trout Unlimited): Is it possible to record this meeting?
    - **Response**: A detailed meeting summary will be sent out after the meeting as a permanent record.

3. Review of Current Water Quality Monitoring Data

Josh Giovannetti, CDOT Region 1 Water Quality Specialist, presented to the ITF on the current water quality monitoring data that CDOT is collecting in the project area. Josh first shared a larger national perspective on deicing impacts, then narrowed in on CDOT and specifically the Floyd Hill project area.



Map showcasing all of the primary and secondary roadways in the US.

At the national level, there is not a fully developed response to the deicing issue, and larger scale changes will need to happen at this level. The US Geological Survey (USGS) has been studying chlorides and the associated impacts from road salt and other sources. This research led to the development of the Stochastic Empirical Loading and Dilution Model (SELDM), FHWA's approved water quality model. Although highway salt use has increased in the US over time, about 70% of salt that enters the environment comes from other sources such as agricultural runoff, sewage, fracking brine, and mine drainage. Chloride-based deicers are currently the best known solution to keep roadways clear and safe during weather events, reducing accidents by 8x on two-lane roads and 9x on multi-lane roads. Of deicing materials that have been studied and shown to be effective, magnesium chloride has shown the least environmental impacts.

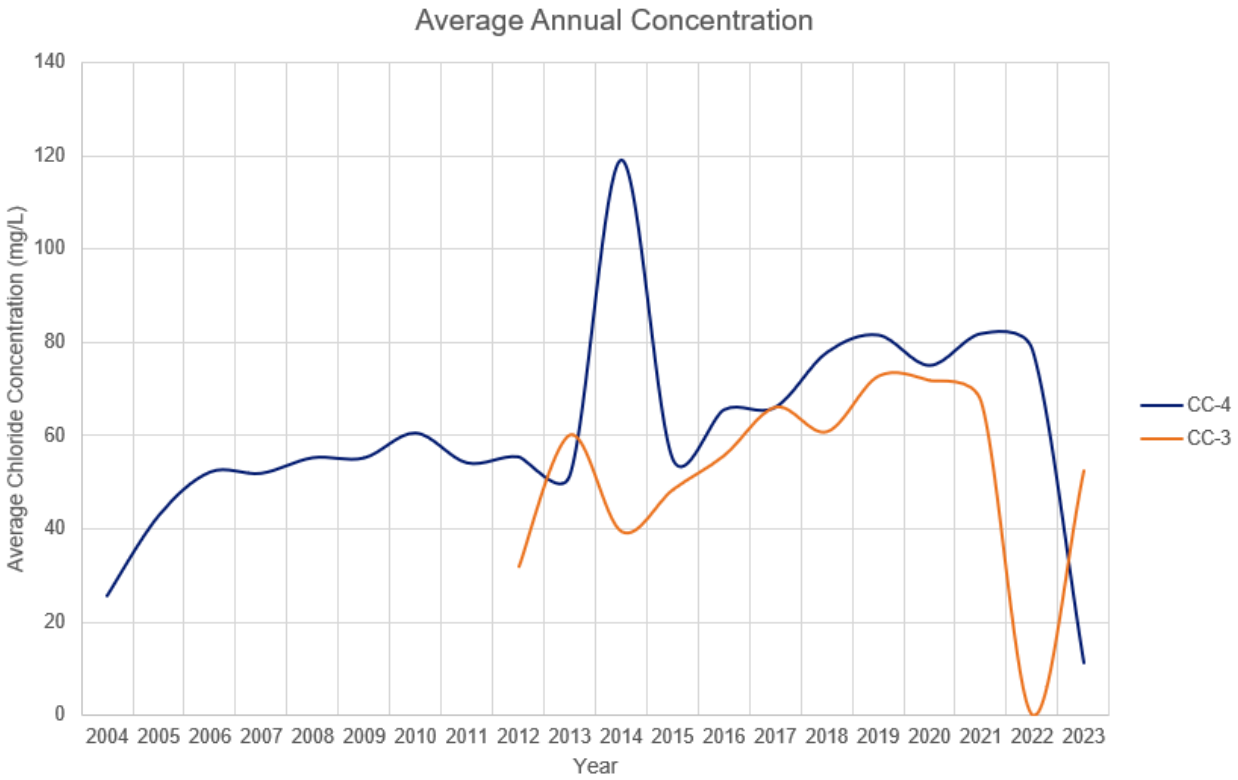
The midwest and northeast are known as the "salt belt" due to high levels of impairment from chloride. In 303(d) listings, Colorado has 1 impaired waterbody where chloride is identified as the primary stresser, whereas Minnesota, for example, has 50.

Narrowing down to Upper Clear Creek, CDOT has four permanent monitoring meters installed which measure conductivity, temperature, and turbidity at 15 minute intervals. In the Floyd Hill project area, CC-3 is just west of the twin tunnels, and CC-4 is located at the bottom of FH.

CC-3 (left) and CC-4 (right) indicated by the blue stars on the map above.

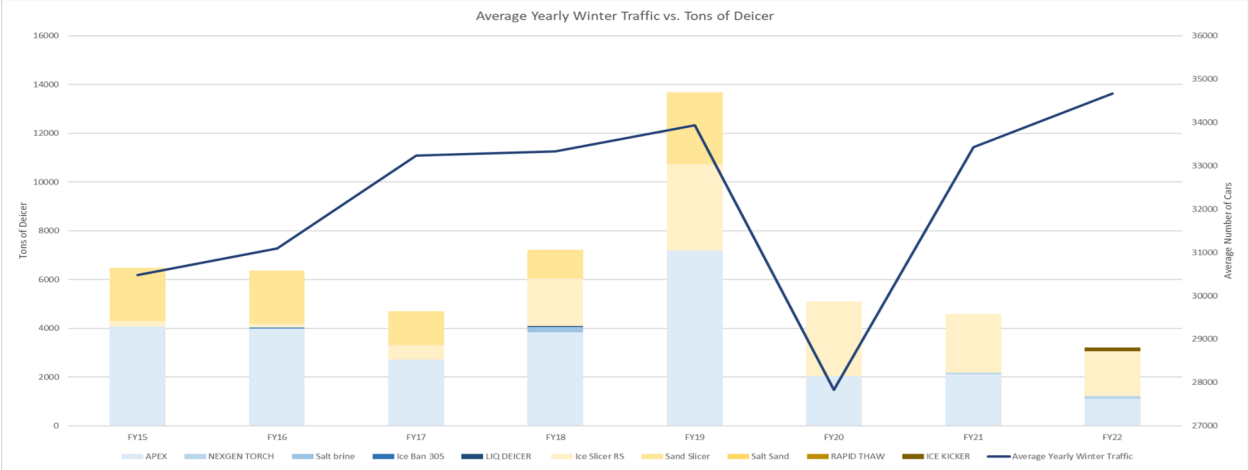
Conductivity and temperature are used as a surrogate to represent chloride concentrations through the use of an empirical formula. This value is confirmed by manual chloride sampling during one to two storm events per year.

Josh then presented data from CC-3 and CC-4, the two sampling stations in the project area. These two stations will be used to monitor the Floyd Hill project. One of the trends seen in the data is that chloride decreases as it travels down the watershed. Josh also noted that he has presented to Clear Creek County and the Upper Clear Creek Watershed Association (UCCWA) many times, and can follow-up with others for a deeper data dive as needed.



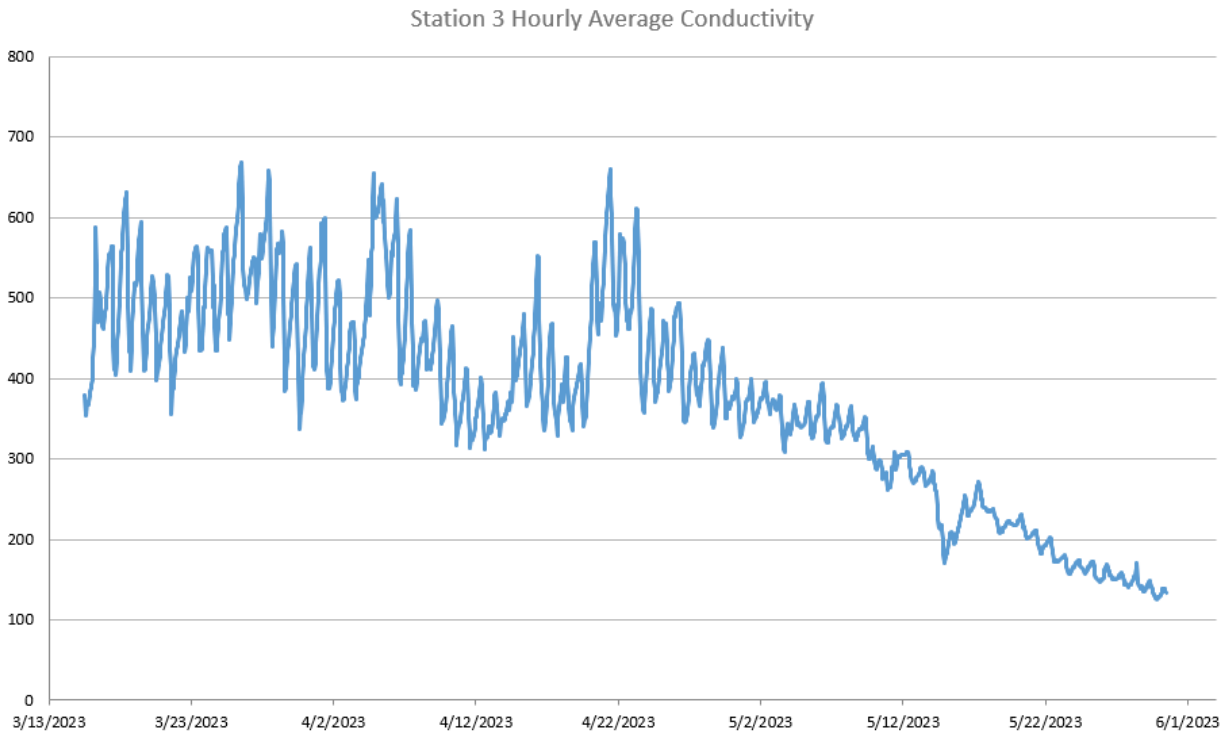
Graph showing the general chloride trend of the two Floyd Hill stations since each was installed. CC-3 is represented in orange and CC-4 is represented in blue.

As seen in the below graph, traffic does not have much of an effect on deicer usage. There is a higher correlation between the two in FY19 as many snow events occurred over weekends during that year. CDOT is no longer using sand and sodium chloride in the Clear Creek Watershed, and is primarily using magnesium chloride.



Graph showcasing the average yearly winter traffic versus tons of deicer applied.

Since the monitoring stations are collecting data averaged in 15 minute intervals, the data can be quite variable. CDOT's WQ strategy for the Floyd Hill Project is to address the larger peaks.



Graph showcasing hourly average specific conductivity data from CC-3 from March through May, 2023.

There are three recognized guidance documents CDOT uses to assess chloride water quality (WQ) 1) Canadian WQ Guidelines for aquatic life, 2) EPA 1988 Ambient WQ Criteria, and 3) Colorado Regulation 38 (5 CCR 1002-38). Stations CC-3 and CC-4 have at times exceeded some of the values on these indicators.

CDOT is taking this seriously and mitigating where possible, while recognizing that per the Colorado Stream Quantification Tool (CSQT), most of Clear Creek is functionally impaired. As part of the Floyd Hill Re-Evaluation NEPA process, CDOT addresses 15 additional pollutants associated with roadways. Though not in an MS4 permit area, the Floyd Hill project is implementing CDOT's most stringent water quality treatment process typically reserved for Its Municipal Separate Storm Sewer System (MS4) permit area.

Chlorides fully dissolve in water and move through both above and below ground flow paths within a basin over time. As they move through the soil, they can slowly leach and flush back into waterways. One of the strategies to mitigate this is to vegetate, which helps to slow and reduce the input of chlorides into the soil. There is a challenge with finding plants that can do well with the short growing season, cold temperatures, high elevation, and salient environment of the roadside. Project landscape architects are putting together seed mixes with these limitations in mind. In order to fully remove chlorides, there are very complicated and costly strategies including evaporation, reverse osmosis, and ion exchange. However, slowing stormwater with drop structures, vegetation, detention basins, and filter trenches is expected to reduce chloride peaks within Clear Creek.

ITF Questions/Comments

- **Question**: What does solid deicer mean?
    - **Response** (Josh Giovannetti, CDOT): Solid deicer is mined rock. It's the pink/red bits of rock you will see on the roads.
- **Question**: What about Clear Creek is functionally impaired?
    - **Response** (Francesca Tordonato, CDOT): Before it was determined that the Creek did not need to be moved, CDOT had to complete the Colorado Stream Quantification Tool (CSQT) which looks at various components of stream function. The stream is confined and does not provide for a lot of riparian connectivity. In order to promote stream functioning in the project area, additional riparian habitat work was incorporated into the West and Central Section.
- **Comment** (Ashely Rust, CPW): Colorado does not have a recognized aquatic life standard for chloride which is why there aren't many chloride related

impairments in Colorado and that can be misleading. Clear Creek salinity may still be an item of concern for freshwater species.

- **Question** (Ashley Giles, TU): This group had talked at one point about having a database where data and research could be housed (including the River Watch citizen science sampling data). Has there been any more conversation on that?
    - **Response** (Daniel Estes, CDR Associates): This idea was discussed at the last ITF, however questions still remain around how best to support this, who would host this, and the parameters of what would be posted there. There has not been much progress on making this actionable.
    - **Response** (Josh Giovannetti): UCCWA has been collecting data and is looking to change the format of their report to be electronic. The committee is looking at ways to put additional information on UCCWA's website so that there can be an annual snapshot. For CDOT as a public agency, the information is public, however it can also be easily misinterpreted. The Team is working to figure out what would be best to include.
- **Comment** (Amy Saxton, Clear Creek County): Amy thinks a database would be a good idea, but acknowledges that one of the challenges of this ITF is figuring out how to have a project focus while recognizing what can be extracted for the broader deicer question. In thinking about the Clear Creek County 1041, the County aims to make requests that are feasible, meaningful, and represent the county's interest. This means looking at the types of things the project can actually do such as water sampling and data collection. Many drainage and roadway elements for this project were designed to limit salinity. This offers an opportunity to sample in the area to help determine how effective those design features are based on the theory that they will help salinity. We have many standards for sediment control through SCAP, but not much for salinity. This type of project specific sampling could contribute to the larger conversation.
    - **Response** (Josh Giovannetti): CDOT can collaborate on this with Clear Creek County.
    - **Response** (Gary Frey, TU): There are stakeholders outside of the Clear Creek County 1041 process as well who are interested in the actual effect of using these deicing materials.
- **Comment**: (Ashley Rust, CPW): There is a lot of sampling that has taken place ahead of the project and during the project, but not a lot is planned for after the project. This would be an opportunity for collaboration including between CPW, TU, and River Watch and could build on existing stations. CPW would like to see sampling above and below the project and would be interested in determining if

the design features help decrease salinity. This would lead to less resistance on future projects.

- **Comment** (Bill Coffin, Saddleback POA): There are a lot of people that live on/around Floyd Hill who are all on wells. The main concern for residents is maintaining drinking water quality.
- **Comment** (Kevin Shanks, THK Associates): There is the potential for a soil pH issue on this project, so the Team is looking for something pragmatic. This includes revegetation efforts that account for the drainage plan and reconstructing habitat in locations that do not have a large salinity input.
    - **Response** (Josh Giovannetti): CDOT's focus has been to decrease peaks in chloride to try and prevent stores of chloride in specific locations. As we reconstruct the riparian area, the Team is going to make an effort to ensure we don't introduce new roadway drainage to priority riparian areas.
- **Question** (Gary Frey, TU): With all of the activities going on, are these documented in the plan or strategy?
    - **Response**: (Josh Giovannetti): The water quality activities were originally laid out in the Environmental Assessment (EA) signed in 2021, but the agency's WQ program highlights monitoring stations which are ongoing and separate from the project. The EA and Finding of No Significant Impact (FONSI) is the best place to see the documentation of the plan and design elements chosen to be incorporated into the project. The FONSI was completed in January 2023. The target for the Floyd Hill project is to not increase the salt concentration in Clear Creek.
- **Comment** (Gary Frey): It is discouraging that we are where we are in terms of impacts to Clear Creek, even though we've been working on this for 20 some years.
    - **Response**: Salinity is an emerging issue that needs to be looked at in more depth.
- **Comment** (Amy Saxton): There is an important distinction to make that the work that CDOT does mostly centers around mitigating project impacts. CDOT's work does not focus on mitigating transportation impacts.
- **Comment**: CDOT is not in the business of water quality sampling. CDOT monitors and has consultants to analyze the data. This is an ongoing monitoring effort, not a specific study or time-based. The Team is working to spend extra attention in the Floyd Hill area.

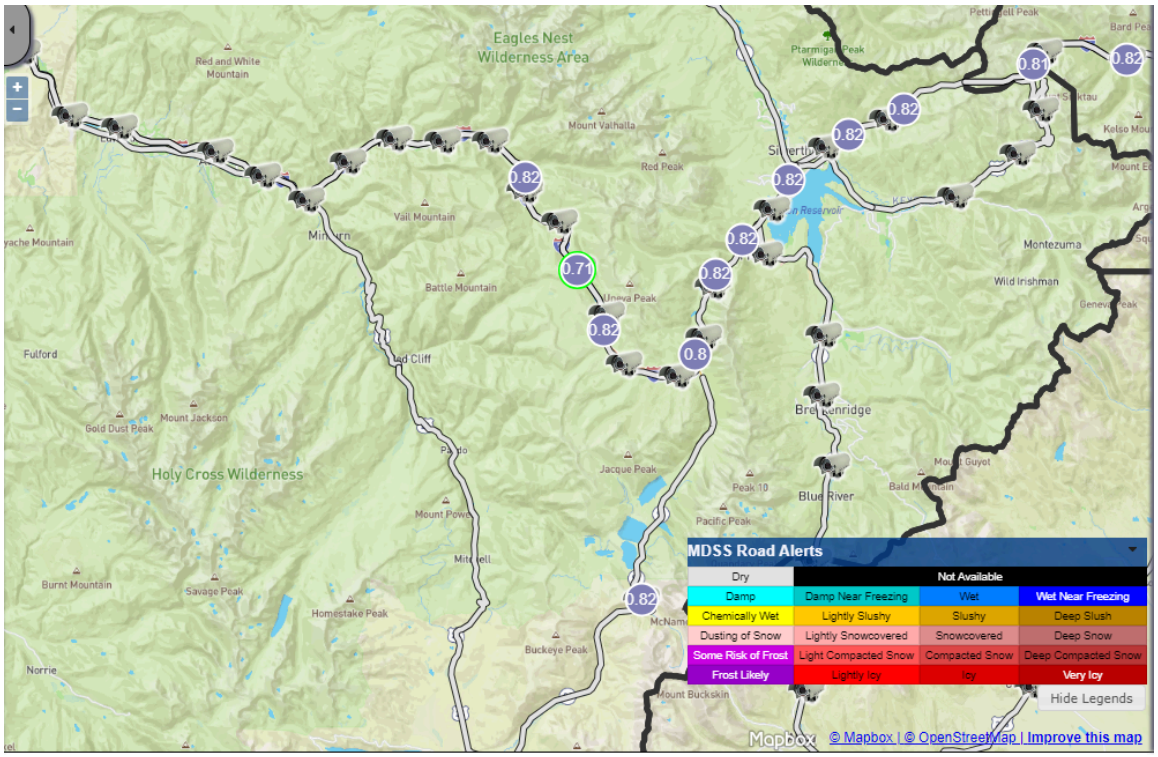
Summarizing the discussion, Jonathan Bartsch, CDR Associates, highlighted the needs expressed by the ITF for a project focused on the effectiveness of design features and control measures, the potential creation of a sampling plan, and sharing of information.

ACTION: Distribute the Clear Creek CSQT assessment to ITF members.
ACTION: Restart annual update meetings from Josh to Clear Creek County.
ACTION: Project Team will send out the slide deck and meeting notes to the ITF for comment.

4. Review Maintenance Best Practices in Deicer Application and Tracking

Mike Chapman, CDOT Winter Operations Program Manager, then presented on CDOT winter operations and deicer application decision-making processes. Mike is a trained meteorologist and has a background specifically in road weather. Mike spoke first about the back end for winter operations including the weather modeling, forecasting, and observations, which all tie into making better and more efficient decisions. Winter Operations is a part of CDOT Headquarters Department of Maintenance and Operations. Their work encompasses: weather forecasting, advanced technologies and applications, avalanche mitigation, winter road maintenance, and research and development. They specialize in road centric and geography specific forecasting. Beyond the winter time, they work on other items including run-off, particularly in burn scar areas.

The Maintenance Decision Support System (MDSS) was created at NCAR. Colorado is at the forefront of using this technology, and invests over half a million dollars a year. MDSS allows for plow route specific forecasts by reading pavement temperature, air temperature, relative humidity, wind, and precipitation type and amount. This leads to more efficient decision making and magnesium chloride application. The system is not foolproof but gives streamlined recommendations of what materials should be put on roads.The Team is also working on using real time data and machine learning to better calibrate this system to be more specific to CDOT needs.



Example of an MDSS Road Alert map.

The Team also works on operational readiness region by region and section by section, to ensure situational awareness about what's available. The Team is tracking what they have available and are able to shift resources before a storm if needed.

CDOT also has over 150 Road Weather Information System (RWIS) stations mainly on I-70 and I-25. These are also a significant investment at ~$80k each. The RWIS helps with operational decision making for plow operators, by providing models based on: wind, water, humidity, and friction data, as well as camera imagery. Friction data helps to measure the slipperiness of the road.

Additional technologies include GPS and GeoTab, which provide high resolution tracking in real time of what materials are being used and at what rate they are coming out on the road. This makes the modeling more efficient, and builds an understanding of how previous applications in similar conditions affected the road. This helps operators learn how much product to apply based on the effectiveness of the product during previous storm events. CDOT is also crowdsourcing friction data from Audis, VWs, and Porsches across Colorado and assessing how the vehicle is reacting to the road. This assumes a typical type of tire and can also detect what types of tires are losing traction. This type of data will continue to grow and can be utilized in conjunction with other tools.

CDOT has specifications and conducts independent testing of deicing products. Any new products go through a rigorous testing process. CDOT is heavily involved with the PNW Snowfighters Association and follows their recommendations. CDOT is also part of many consortiums including Clear Roads which is made up of 39 states and covers a lot of materials research and best practices; and Aurora which covers best practices for technology. This information is used to potentially expand the arsenal of materials that CDOT is using. There is a lot of research happening related to deicers.

More national data is looking at deicer alternatives, but there are drawbacks to everything. On the natural side, ground up cheese rinds have been tested, but this impaired the equipment. There are tradeoffs to any of the materials that can be used, but CDOT has looked at alternatives in the bridge section. On Floyd Hill the weather is more extreme than other locations, so the Team is limited to high performing chemicals.

Mike concluded his presentation by reiterating that CDOT is not just "throwing stuff on the road," and that there is a lot of investment and careful consideration going into winter operations decisions.

ITF Questions/Comments

- **Question**: With Floyd Hill moving to an elevated roadway design, what is the minimum temperature that magnesium chloride can be?
    - **Response**: It can be used down to 15 degrees F. Apex and Torque can be used for lower temperatures. The application rate is most important along with the type of snow, blowing wind, etc. This comes down to training and letting the material do its work. Solid deicers are applied to help the snow to melt, but have limited traction benefits. Technology has evolved to apply less magnesium chloride. Calcium chloride is the next level down for colder temperatures, but has more of an impact and would only be applied as needed and in lesser quantities.
- **Question** (Gary Frey): Gary noted that he was struggling with the correlation between application of deicing material and the natural environment. There was no mention of research on streamside vegetation, water quality, or the effect on fisheries. Do any of those parameters fit in?
    - **Response** (Josh Giovannetti): Research has been conducted and published once chloride has already been added in. Through the AVL and real time tracking of materials, that data could then be correlated with the water quality monitoring data.

- **Question** (Gary Frey): Does CDOT have a program for identifying what research is needed?
    - **Response** (Mike Chapman): The Transportation Research Board (TRB) is a national scientific group that conducts a large amount of transportation research. The consortiums Mike mentioned also have funds for research.
    - **Response** (Josh Giovannetti): CDOT has an internal research arm.

4. Other Water Quality Issues and Updates

Upcoming Research
CDOT has funded research on the corrosion of bridges and abutments, and will look at how chloride travels through fill material and impacts the soil at different lengths. Another study has been funded and will be conducted by CSU focusing on the effects of road salt on mountain wetlands.This will be a statewide study, but the Team has proposed some study locations closer to the tunnel in the R1 section in Clear Creek. This study is in the contracting phase. One additional study has been proposed to CDOT on roadside vegetation, identifying corridors where there are impacts and investigating the causes. This study has only been proposed and is not guaranteed to be funded.

UCCWA Draft Sampling Plan
UCCWA is working on a draft sampling plan. It is still a work in progress and requires additional internal dialogue, but once it is further fleshed out, they would like to receive feedback from the group. UCCWA is also working on an update to the Upper Clear Creek Watershed Annual Report with opportunities for collaboration.

Riparian Bench Restoration
Once the project gets to the Central Section there will be additional details on riparian bench restoration. Although not specifically designed to address deicer impacts, this restoration effort will have an overall water quality benefit.

SCAP
The SCAP may be a good place to host much of the discussion happening today and could be a good home for updated practices and more relevant for current winter maintenance practices. The SCAP and guiding document are out of date and both need to be updated in order to be applied to future projects.

ITF Questions

- **Question**: How will the SCAP update be addressed?

    - **Response**: The SCAP is a corridor-wide document. This is a question that needs to be further discussed to determine who would be involved and the process by which the SCAP could be updated.
- **Question** (Diane Kielty, UCCWA): What is the most current version of the SCAP? Diane wants to make sure that the one UCCWA has posted is current.
    - **Response** (Mandy Whorton, PEAK Consulting): Mandy does not believe that it has been updated since it was created in 2012.

5. Review Action Items and Next Steps

- **ACTION**: Distribute the Clear Creek CSQT assessment to ITF members.
- **ACTION**: Restart annual update meetings from Josh to Clear Creek County.
- **ACTION**: Project Team will send out the slide deck and meeting notes to the ITF for comment.
- **ACTION**: UCCWA will connect internally on draft sampling plan before wider distribution for feedback.
- **ACTION**: Consider updating the SCAP.
- **ACTION**: Review the SCAP that Diane sent to make sure it's the most up to date.

6. Attendees

John Curtis, Jo Ann Sorensen, Diane Kielty (UCCWA); Sam Hoover (Central City); Gary Frey, Ashley Giles (Trout Unlimited); Amy Saxton (Clear Creek County); Mike Raber (Clear Creek Bicycle User Group); Bill Coffin (Saddleback POA); Jeremy Shaw (CSU); Kyle Battige, Ashley Rust (CPW); Lisa Wolff (Floyd Hill POA); Tracy Sakaguchi (CMCA); Mandy Whorton, Ashley Bushey, Chelsey Atkinson (PEAK Consulting); Kevin Shanks (THK); Abbie Modafferi, Josh Giovannetti, Kurt Kionka, Francesca Tordonado, Mike Chapman, Stacia Sellers, Peter Young, Becky Pierce, Scott Crabtree (CDOT); Daniel Estes, Jonathan Bartsch, Julia Oleksiak (CDR Associates)