Summary Notes
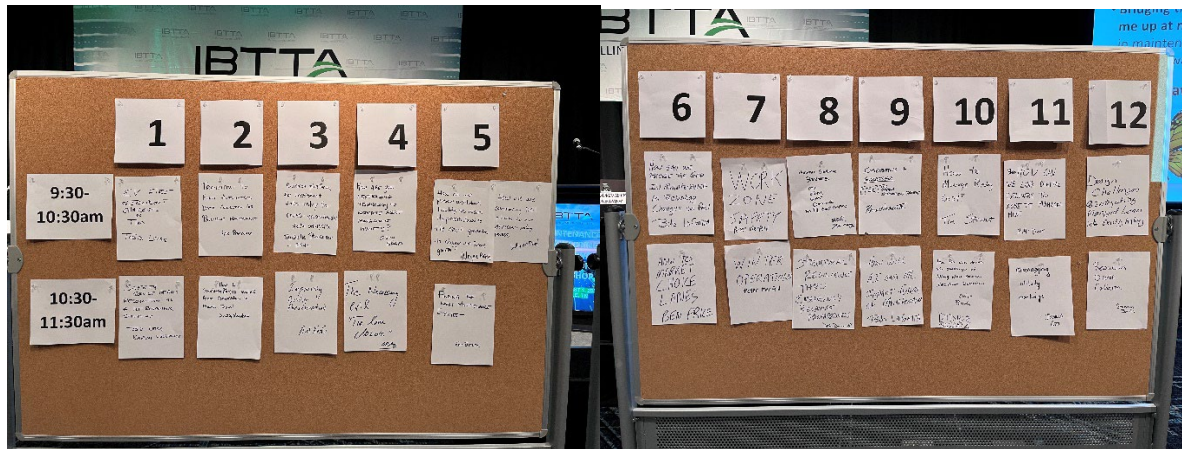**Special Session – Open Space Format**
"What Keeps You Up at Night? Current Challenges in
Maintenance, Engineering and Roadway Operations"
IBTTA Maintenance, Engineering, and Roadway Operations Workshop
July 31, 2023 * Nashville, TN

File: *IBTTA Nashville Maintenance Workshop Open Space Summary Notes Rev 2023.08.01 1231pm.docx*

Theme

- **Bridging the Gap: What keeps me up at night.** (Big challenges in maintenance, engineering, and roadway operations)

The Law of Mobility

The Four Principles

1. Whoever comes are the right people.
2. Whenever it starts is the right time.
3. When it's over, it's over.
4. Whatever happens is the only thing that could have happened.

Note: Sections highlighted in yellow have been edited by the facilitators.

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Opening Remarks

These are the opening remarks of Patrick Jones, CEO, International Bridge, Tunnel and Turnpike Association to kick off session. These remarks are based on the content of this video accessed on July 31, 2023. https://www.youtube.com/watch?v=XFLPO0l3l9s&t=17s

Welcome to open space.

Our theme for this gathering is posted here. Bridging the Gap. What keeps me up at night. (Big challenges in maintenance, engineering, and roadway operations.)

During our time together we're going to develop our best thoughts around the issues and opportunities associated with our theme.

As we start, I want you to notice the empty marketplace.

This will be our agenda and is currently empty.

How many times have you been to a meeting where the agenda was completely blank in the beginning?

If you're wondering how you ever got into this or, even more, how you will ever get out, you should know that groups all over the world – some as large as 1,000 individuals – regularly create their own agendas in only a few minutes.

They then proceed to self-organize the whole affair.

To get from here to there we will use a marketplace.

In a few moments, I will ask you to identify any issue or opportunity you see around our theme, give it a short title, write it down – with your name – and then announce it in front of the group at one of these microphones.

I emphasize, give your issue a short description of 10 words or less. Say what your issue is and post it in the marketplace.

Make sure that you have some real passion for this issue and it's not just a good idea for someone else to do.

You will be expected to take personal responsibility for the discussion.

That means saying where and when the group will meet, convening the group, and adding the results to the proceedings.

You may offer as many issues as you like and if at the end of the day you don't see your issue on the wall, there is exactly one person to complain to: yourself.

Once all the issues are up, we will then open the marketplace and everybody will join as few or as many of the groups as they desire.

From there on out, you are in charge.

Even though open space is truly open, there are four principles and one law that we need to keep in mind.

The four principles are:

1. Whoever comes are the right people, a reminder that the group and configuration are also organized.
2. Whenever it starts is the right time, a reminder that ideas flow on their own schedule.
3. When it's over, it's over, a reminder to move on when the work is completed. Do the work, not the time.
4. Whatever happens is the only thing that could have happened, a reminder to be prepared to be surprised.

Open space also has one law, the law of mobility.

This law creates two possible new roles in open space called bumblebees and butterflies.

Bumblebees are an extension of the law of mobility.

The law of mobility provides a means for people to move from group to group as their interest changes.

The metaphor of the bumblebee is used to encourage movement which, in effect, cross pollinates the groups.

Ideas are carried from one group to the next and create new ideas.

Butterflies are also an extension of the law of mobility.

Where bumblebees cross pollinate, butterflies bring the power of observation and new ideas to the group.

Not everyone joins the groups in open space.

Some form a group of one where the person contemplates the ideas created in the marketplace and adds their thoughts to the pool of developing ideas.

Keeping the four principles in mind along with the one law, it is now time to get to work.

Along that line there is one question to start.

What are the issues and opportunities around our theme for which you have real passion and will take genuine responsibility?

And when you have identified an issue, give it a short title and write it down, legibly, in large letters, and include your name on the sheet.

As soon as you're ready announce your title and add it to the Marketplace. Don't wait to be asked; go when you're ready.

Time and space are on a first-come first-served basis.

The rest of you might take a look at the various offerings posted on the Marketplace and decide which group or groups you wish to join to learn or lend your expertise.

As you can see in the Marketplace, there are 12 spaces and two time frames for your discussions. Spaces #1 through #4 are in this room. Spaces #5 through #12 are out through that door in other rooms. There are signs clearly indicating the location of the other numbered spaces.

At 11:30am, we will reconvene in this large circle for a debrief on the experience and the discussions you've had.

It may seem a little chaotic at first, but it turns out that chaos is the way the fields of the mind are plowed so that new ideas can grow.

From here on out, you are on your own.

As soon as your group is ready to go to work, go to it.

We'll see you all back here at 11:30 am at the end of the open space in our closing circle.

The Marketplace is now open for you to announce your issue and post it in the marketplace. Go when you are ready.

# # #

9:30 - 10:30

Identifying

1. Is it an EV fire? Are the batteries impacted or is another area of the vehicle on fire.
2. Is it a thermal runaway fire?

E-Stop. E-Stop is a device that plugs into the charging port of an IV disabling the batteries, approximate cost $925 per unit.

Blankets. Fire blankets used to prevent fires or to extinguish EV fires, these can be placed prior to a fire to try and mitigate an EV fire.

Go Jaks. GoJaks can be used to move an EV safely if disabled or damaged to prevent charging or damaging the vehicle when moving.

Storage after fire. Where is the vehicle going to be stored safely away from any other structures or vehicles.

Weight of EVs. Given the weight of EV batteries and EV's becoming more prominent, what impact does this have on road surfaces and parking structures. (if any).

Lack of info given to vehicle owners. Very limited info provided to vehicle owners about their vehicles.

Database of IU Incidents. Can a database be started by IBTTA to report and compile data on EV incidents so we can help determine what went well, what went not so well and what can be improved.

Infrastructure Damage. What is the impact of a EV fire on roadway surfaces, fiber lines or other tech or items close to the EV fire.

Training/Coordination

- Best Practices

- Cost of using automated LCMS systems?
- How condition assessment results from Automated Data will compare with manual?
- How will this affect <u>decisions</u>?
- Learning curve
- Accuracy of fully automated systems?
- Training existing staff on use of the system
- Timeline for transition from manual to automated systems?
- How often to collect data?
  - Based on resources
  - Maintenance needs
  - Funding $
- Logistics (Ship equipment?)
  - Agencies have an existing system in place and transition to automated is a major change.
- ML/AI/Data Analytics for automated distress identification

- Predictive Maintenance – Decision Making criteria
    - Currently: Lifecycle time frame used as decision making
    - Future: consider using A.I. through corridor analytics
- Condition of assets at network level vs. corridor/project level
    - Heat Map (Pavements)
        - Over timeframe
        - Corridor wide
        - At Lane Level
- Work Order (WO) System
    - GIS-based inventory for asset management
        - Write WO against currently assets
        - For example: Used for overhead signs in Colorado E-470
    - Use for land management systems?
        - Can agencies track change order development?
- How can you structure your assets digitally (A.I.) for Maintenance tracking?
- How is A.I. being used for Asset Management
    - Use A.I. for Asset Condition Management
    - Condition rating vs predictive modeling (Similar to item listed above)
- Challenges in shopping for asset management software
    - MS Access/Excel/GIS – combination of different software is tiresome
    - Streamlining platform collaboration
        - Periodic data audits
        - Need to implement standards for data scheme
- Use of Digital Twin Technology within agencies
    - Utilities Information
    - No benefits for planning expansions observed by agencies yet
    - Explore implementing CM field as-builts for scope of work for future maintenance at agency
    - Need to be cloud-based
    - Maintenance team field visits during construction
        - Google KMZ files – is it enough for asset management inventory?

Is the agency getting accurate as-builts for collaboration?

#5- How Do We Preserve Institutional Knowledge and Ensure It's Passed Down to the Next Generation to Advance our Future Growth?
Group Facilitator: Wayne Reed

What does our Next Gen look like?

- Build our own training programs
- Agencies need to take ownership
- Build them ourselves
- Tuition reimbursement programs
- Mentorship/<u>SPONSORSHIP</u>
- Leadership support => Show interest in our people
- Open conversation => promote it
- Make inclusion a priority => everyone feels a part of the mission
- Create videos of the work
- Empower our front line supervisors
  - Train and develop
- In the people business
- Accountability

The discussion starts with mentions of buying new equipment like plow trucks and the need to properly train operators on how to use them. Some states have training academies to teach maintenance workers about new technologies as they are implemented.

The group talks about adopting bridge monitoring sensors and how it requires coordination between engineering and maintenance teams. Engineers need to analyze the data, while maintenance must be directed where to inspect based on sensor alerts. Consultants are often brought in to install sensors and interpret data. Proper integration with asset management systems is important for sensors to be effective.

There is discussion around technology training and adoption challenges. Often only basic training is provided initially, and there's no follow-up. People learn new systems on their own through online videos or coworkers. The importance of having champions and ownership over new technology is emphasized, rather than just pushing it out to staff.

The generational differences in comfort with technology are brought up. Younger staff tend to adapt better to new tools compared to workers used to older systems. Resistance to change is noted as an issue that leads to technology underutilization.

The lack of standards around emerging technologies like self-driving vehicles and drones is discussed. Policy and regulation lag innovation. Liability in accidents involving autonomous vehicles is highlighted as an unresolved issue.

Pros and cons of various communication platforms are analyzed, including email, Slack, Microsoft Teams, SharePoint, texting, etc. Email overload is called out as a problem. No single solution fits all needs and generations.

Siloed teams and lack of integration between finance, IT, operations, safety, etc., is cited as a continuing challenge. Toll operations are often disconnected from overall roadway management. Doing preventative maintenance based on sensor data can conflict with scheduled rehabilitation contracts.

The importance of pilot testing and getting user reviews before fully deploying new technology is recommended. A top-10 or top-5 list of recommended options based on peer agencies would help guide procurement decisions.

More openness to change and adopting new practices is advised over sticking to the status quo. The discussion covered various technology and workforce-related issues relevant to transportation agencies.

Bulleted Recap:

- Adopting new technologies like sensors for bridge monitoring and how they impact processes, training needs, and communication between engineering/maintenance teams. There was discussion around having champions for new technology and getting user feedback.
- Asset management systems and the challenges of integrating different legacy systems across organizations. Questions around who owns selecting and implementing new systems.
- Communication methods across generations and finding effective tools for information sharing. Email overload was discussed as an issue, along with the pros/cons of various alternatives like Slack, Teams, SharePoint, etc.
- Changes in tolling technologies, like going to all electronic tolling and impacting operations, costs, and staffing.
- Governance issues around new technologies like self-driving vehicles and drones and determining liability in accidents.
- Importance of standards, testing, and reviews when selecting and implementing new technologies to ensure return on investment and proper training.
- Bridging organizational silos between finance, operations, IT, safety teams, etc., when managing transportation infrastructure and assets.
- Generational and cultural changes needed in being open to new ways of doing things vs. sticking with the status quo.
- The group discusses the benefit of tolling agencies being private/independent from state DOTs, as it allows more flexibility and speed in adopting new technologies if there is a return on investment without political barriers.
- Differences between tolling operations key performance indicators (KPIs) and asset management KPIs are analyzed. Tolling focuses more on revenue generation, while asset management looks at overall system condition, safety, etc.
- The challenge of hiring and retaining young talent as older workers retire is brought up, to ensure knowledge transfer and have staff able to use newer systems and processes.
- Importance of change management and communication from the top down when implementing major new technologies is emphasized, along with getting buy-in across the organization.
- As vehicles increasingly have in-built sensors and connectivity, the data generated will grow enormously. This requires planning for the scale and complexity of smart infrastructure management systems.
- Potential future scenarios like drone package deliveries and airspace integration are discussed – operationally, and for governance, there are still many unknowns on how to handle it.

- Possibilities like fully automated tolling without cash options could significantly change traffic throughput and operations. Again, system capacity and transition planning will be crucial.
- Even as new technologies are implemented, issues like distracted driving and allowing mobile phone use complicate enforcement and safety considerations.
- Funding constraints, political resistance, and institutional inertia are cited as barriers to technology modernization for many public agencies. Leadership and staff engagement are key to driving change.

- Merfeld asked "Does anyone not put up work zone signage on median side of the road?
- Pennsylvania Turnpike
    - No Work Zone signs in median
    - More signs on Right side of road
- Tennessee DOT
    - More signs on Right side of road
    - More Attenuators
    - Have HAAS Alerts on Trucks

Merfeld asked to get policies or documentation of this practice if available.

- MD Transportation Authority
    - Allow congestion, do work in days, provide notice to public.
    - Merfeld "we provide times we can handle lane closures so does not cause delays. Delays lead to secondary crashes, as well as political issues. We say we are a premium road, our customers get premium service. Of course this means night work which is becoming more difficult to get people to work- both employees and contractors."
    - Automated speed enforcement is very effective at slowing speeds
    - Merfeld "Maine legislature has not allowed cameras for speed enforcement. We have tried with a collation of contractors"
    - Breaks in concrete barrier separation- discussed the crash on in Maryland recently that killed 6 workers.
        - New detail to put TMIA to protect adjacent employees to opening
- Blue lights – not just police, some agencies add blue light without police. Merfeld "That is not allowed in Maine. We find using police on projects is helpful but they need to do enforcement. If just sit, they will become less effective over time."
- Closing sections of road or a bridge is more efficient and safe, though need to Promote alternative mobility if it is available.
- Setup:
    - Some agencies use Police slow downs to set up taper
    - Discussed Trailer vs truck mounted attenuators, both valuable
    - If not Attenuator or using the smaller attenuator some agencies require a Loaded truck – add weight
        - Non CDL = < 26,000 lbs.
- Illinois Tollway
    - Use the Mobile barrier wall

- Lighting for night work is critical
- Longer tapers are helpful
- Move over laws are helpful for slowing traffic
- Do agencies allow contractors to use Rolling lane closures?
    - Contractors – yes, in NJ required to have police and a NJ Turnpike <u>employee involved</u>
    - Others agree to Have agency involved
    - Use GPS to monitor (TN DOT)

#8- Minimum Compliance Standards and Other Government Compliance for Toll Roads Company.

Group Facilitator: Iqbal Batubara of Jasa Marga

It is attended by:
Mr. Andre from HNTB Engineering Lawfirm Company
Mr. Javier from AIMM Company Maintenance Management Consultants of Tollroads
Mr. Ernie from AIMM Company Maintenance Management Consultants of Tollroads
Ms. Rosa from Atkins Engineering Services

Topic 1: Is there a compliance standard for USA Toll companies? If yes, what are the differences compared to Indonesian Toll companies?

The discussion starts by stating that in Indonesia, there are certain minimum compliance standards that must be met within specific time periods. These standards consist of 8 indicators, namely:

      a. Toll road conditions
            - Pavement conditions
            - Drainage conditions
            - Median conditions
            - Road shoulder conditions, etc.
      b. Average travel speeds
      c. Accessibility
      d. Mobility
      e. Safety
      f. Relief/Rescue Unit
      g. Environment
      h. Rest area services

These indicators also include a total of 42 sub-indicators, and they are quite consistent throughout the country as they are uniformed.

The gentlemen and gentlewoman then mention that the USA also has similar compliance standards, but they are not uniformed. They vary from one state to another, depending on each state's or authority's preferences, and there is no central authority to approve them.
Some states or authorities have 11 indicators, while others may have more or less, depending on what they consider to be the most important.

It's roughly the same, with indicators like pavement conditions, etc. However, the key difference worth noting is that in the USA, these conditions are thresholded into two distinct forms: safety-related and structural-related. The safety indicators are more likely to incur penalties if they are not met.

But these indicators mostly are implemented for the tollroads that are falls into P3 (Public Private Partnerships) and Local Authorities that do partnerships, and not the state owned or central owned ones.

Topic 2: Is there a governmental entity that always keeps in check for compliance with these requirements? If yes, what is the frequency of the inspections? Are there penalties if the conditions are not met?

In Indonesia, toll road operators are required to conduct daily checks and inform the government authority about the status of the toll roads. Additionally, they conduct their own inspections every six months, and there is a special period when they seek approval for increasing the toll rates to keep up with inflation. Penalties exist if the conditions are not met, and the toll road companies may not be allowed to increase their tariffs as intended. This makes meeting the minimal requirements mandatory and crucial.

According to the information provided by the gentlemen and gentlewomen,
In US: most of the time, the states do not directly conduct regular inspections, but they are well-informed periodically about the condition status. There are penalties, but they vary depending on the specific criteria that are not met. Unlike Indonesia, the penalties do not generally affect the toll rates.

Mostly, the issues that fall into these categories are findings that pose hazards to the car passersby, such as large potholes. There are specific thresholds for these issues.

Goals: Greenfield (fully) vs Brownfield Project

Concepts/Implementation:

- Team Communication
  - Data measurables/deliverables
  - "Define" terms of contract and scope
    - Time condense tasks and forming scope by utilizing or mimicking prior tasks, assignments
      - "Cookie cutter" templates; prior attachments
  - Clearly define TEAM roles and responsibilities
    - Agency
    - Contractor
    - Consultant PM
  - RTM - Requirement Traceability Matrix

All above items should assist in avoiding "Change Order Chaos"

- Consider project sustainability O&M
  - "Maintenance over traffic issues " – Gantries, roll-up hardware
  - AVI equipment
  - Antennas
  - Level I
- Collection / Enforcement / Violation Leakage
  - Volume Control Tolling
  - Weight-in-motion

Note lessons learned

#10- How to Manage Rising Cost?
Group Facilitator: Tim Stewart

- Constantly monitor market conditions and update program estimates
  - Find reliable data
  - Reschedule or change scope of projects to conform with budget available
- Risk-based contracting for highly volatile materials and other costs
- Rehabilitating vehicle fleets rather than buying new
- Partnering meetings with contractors and suppliers
- Align bid dates with market availability
  - Work with other local and state agencies on scheduling
  - Contractor capacities
- Fixed escalation % - fixed rates
- Separate out highly volatile priced materials and allow price adjustments
  - Minimize change orders
- Schedule materials and services purchasing ahead of time for future use
  - Automated tools to schedule

- Map the process at the beginning. Need to engage with Designer, Contractor, and Maintenance to understand the data fields that are important.
- Quality of data from construction/contractor must be maintained. This needs oversight from qualified staff.
- **Requires $$$.** Is it worth the upfront money to save time and money down the road. We believe, yes.
    - Savings in future design costs and timelines due to no need for future survey/base model creation
- What are the important data fields?
    - Start with more, not less, but be mindful of data saturation
    - Figure out what the contractor wants and needs and what designers are doing and what maintainers need
- Import 3D digital design models into ArcGIS. From there, we need to link the ArcGIS data to the maintenance software to understand how it is used by maintenance contractor.
- Updating design file based on change orders
    - Legal ramifications
    - Who does based on EOR (chain of custody)
- Identify technology and software platforms to be used and how does it merge with the existing system
- The 3D As-Built Model could be used as a base to perform real time background subtraction on daily lidar scans (use AI). This will quickly inform the agency if there is a maintenance issue (i.e. something is different than it used to be). The lidar scans could be compared day to day as well as in 6-month lookbacks.
- Maintenance changes and improvements need to be captured in design model, therefore designed by designer. There may be legal implications in who is responsible for the validity of the 3D model as it evolves from design to as-built to during maintenance period.
- Must use open standards and sources**.** The only way all of this can work is if software platforms are interoperable.

- Which kind of physical separation from General Purpose lanes: Barrier or Pylons? Or, striping only?
- How many lanes needed?
- Left and right shoulders? How wide? Pavement type?
- Allowing trucks or no trucks?
- Right of Way needs
- One-way/reversible or two-way?
- Locations of Entry/Exit points and transitions into General Purpose lanes
- Signing needs
- Pricing Information to the drivers
- Design of ITS and how to integrate with existing ITS
- Enforcement aspects
- Public support / Public communication
- Utilities/lighting
- Transit needs
- Design exceptions
  - Sight distance/barriers
- Political support
  - Providing choice
- Bus only lanes?
- Research available technology
  - Similar facilities
  - Publications
- Emergency responder access
- Local exits vs Expressway exits
- Accommodating autonomous vehicles

National SP (or statewide. There needs to be a National standard and accredidation for SSP Operators. As part of this certification, obtain "First Responder" status and benefits for SSP operators.

Training/Certification

I/C Training. Make sure all SSPs have incident command training, including Unified Incident Command.

Minimum Job Qualifications. There needs to be standards and minimum job qualifications.

Rold of Incident Scene Command

Expanding role and expectations. SSPs are being asked to do more, make sure there are trained and equipped properly

Advanced Technology. Use technology to make the incident scenes safer for SSP operators, emergency responders and motorists.

Crisis Intervention. Make sure SSP operators receive critical incident stress debriefings and mental health support., this also includes using the heroes hotline,

Heroes Hotline

#2- How to Seamlessly Do Project Handoff from Construction to Maintenance Team.

Group Facilitator: Amitis Mekhkani

- Bring Maintenance in early
- Use of Technology – ArcGIS
    - Update as constructed
    - Use of Asset Management
    - Asset Hierarchy
    - Pictures
- Allocate resource to document
- File management
- CM's responsibility
- Warranty
    - When does it start/end?
    - What voids the warranty
    - Performance measure / inspection cycle
    - Performance and Bonds Warranty
- Process
    - Establish
    - Audit/Check
    - QA/QC with Maintenance
- List of Deliverables
    - Acceptance testing

#4- The Necessary Evil "The Lane Closure."
Group Facilitator: Obaid Shah

- Lane closures for planned maintenance
- Lane closures for unplanned maintenance
- <u>Time</u> – uses of resources and the usage of technology
- Communication notification
- Hand pre-defined KDIs in the SCA make it work more efficiently
- Predictive maintenance
- Regulatory regime

#5- Finding the Next Maintenance Employee.

Group Facilitator: Eric Becker

- Pay to peak interest
- Look at restrictions that are there and reevaluate
- Ease of onboarding
- Start looking young

- Share data
  - ~ 15% benefit to GP lanes
  - Benefits all users
- Not Lexus Lanes
  - Occasional use as needed
- Who is user?
  - Trucks?
  - Bus Rapid Transit (BRT)
- Reliability
- Communicate!
  - Apply to the personal
  - Don't call it something it's not
  - Be ready to discuss revenue
    - Fair and reasonable profit
  - Lanes are about maximizing people through
    - Congestion relief
- Mobility
- Keep message simple
- FAQ's – Internally consistent messaging
- Why & Who
- Have it now – no debt
  - Today's cost
- Prepare for opposition
- Proper pace - bring folks along
- Track Success
  - Messaging for future projects
- Explain the "How"
- Selling the idea of transponders vs imaged based
  - Free
  - Cobranding – VOLS, Titans
- Consider Tolling Interoperability
  - TDOT join E-Z Pass Group
- Zero to Choice Lanes
  - P3 Structure within DOT
    - Ongoing contract management group
  - You can't abdicate the role of owner

- - Consultants can't be the owner
  - Need expertise in-house
  - Core Group

- Do agencies have Time Limits?
    - ITR- 14 hour limit, work shifts
    - Others use 16 hour limit
- Allow a Lower level of service for breaks?
- Need to Set up shifts, share trucks
    - Do agencies use Bunk houses?
    - Colorado has contractor requirement – will share agreement
    - Use others to fill in?
        - Seasonal workers
        - Private contractors
        - Partner with AGC or companies to get seasonal workers
- Tow plow lowers labor need
- GPS – strategic efficiency for monitoring and establishing plow routes when limited labor available
- Rate of material
    - Who makes the call? Most allow employee with supervisor check in
- Storm forecasting good tool
- RWIS is a good tool
- Communication with law enforcement is key during winter operations
- DeBriefs after storms always helpful
- Training Partnerships
    - Hire non-CDL, train up
- Generation Gap
    - Marijuana drug test is limiting pool
- Vocational schools needed to grow the pool

Existing Assets:

- Have existing data to show what it needs to be built back to after an event
- Have multiple SOPs with understanding and communication (multiple asset owners in developing these SOPs)

    o Network redundancy
    o Communication with travel apps
- Have funding approval process that is FAST
- Have emergency team or teams in-place should include – in-house staff, consultant(s), contractor(s)
- Develop a risk register
- Have mutual-aid contracts in place
- Have selective infrastructure/sensors in place to speed detection & recovery time

New Assets – steps to take during planning and design

- Update design codes (structural redundancy)
- Update weather models and projections to current weather events
    o Use AI?
- Include adaptive capacity in design
- Use new/innovative materials based on these products proven performance at withstanding known hazards/risks
- Develop risk register

The discussion started around how AI could be used for predictive roadway maintenance, such as analyzing key performance indicators to detect needed future maintenance. Some initial ideas were using AI for automated alerts if incidents like crashes occur, stalled vehicles, or debris on the roadway.

The group talked about how currently, maintenance relies on manual quarterly inspections to assess asset health. This is a low-tech process compared to AI and machine learning capabilities. However, adoption of new technologies has been slow, like with augmented reality and drones. Barriers are the desire to maintain the status quo and cost concerns.

Several participants emphasized the need for proper governance of AI systems, including ground truth validation by humans. This is to avoid issues like algorithmic bias and inaccurate results. There was an example given of an AI chatbot fabricating court cases.

Many ideas were suggested for how AI could be applied in maintenance:

- Weather detection, such as ice on roads
- Safety alerts for workers and drivers
- Training assistants to support learning
- Integration across data feeds like traffic cameras
- Automated work order generation through image analysis
- Predictive modeling for maintenance cycles and lane closures

However, some challenges were also discussed. There were concerns about overreliance on AI leading to human skill loss. The importance of change management and communication when implementing AI was emphasized to avoid fears of job loss. The cost-benefit analysis of AI was another theme regarding upfront costs versus long-term productivity gains.

Overall, the conversation covered many potential applications for AI in predictive maintenance, from automated alerts to predicting optimal timing. But it balanced the opportunities with discussing real-world adoption challenges and the need to consider impacts on workers.

Bullet point summaries of the key topics discussed in the conversation:

- Using AI for predictive roadway maintenance:
    - Analyzing KPIs to detect needed future maintenance
    - Automated alert systems for incidents, stalled vehicles, debris, etc.
- Current maintenance process:
    - Reliance on manual quarterly inspections
    - Low-tech compared to AI/ML capabilities

- o Slow adoption of new techs like AR and drones
- AI governance:
  - o Need for ground truth validation by humans
  - o Avoiding issues like bias and inaccurate results
- AI application ideas:
  - o Weather detection like ice on roads
  - o Safety alerts for workers and drivers
  - o Training assistants for learning
  - o Data feed integration across cameras
  - o Automated work order generation from images
  - o Predictive modeling for maintenance cycles and lane closures
- Challenges:
  - ▪ Overreliance on AI leads to human skill loss
  - ▪ Change management and communication
  - ▪ Cost-benefit analysis and ROI
  - ▪ Upfront costs vs. long-term productivity gains
- Key themes:
  - o Many potential AI applications for predictive maintenance
  - o Balancing opportunities with real-world adoption challenges
  - o Considering impacts on workers

#10- How Do You Handle the Challenges of Wrong Way Driver Incident Detection?
Group Facilitator: Didier Bessala

- Best ways of catching drivers' attention
- Automated incident detection
- Wrong way detection sensor connected to portable DMS
  - "Wrong Way" / "Stop" / "Do Not Enter"
- Warning to other drivers
  - "Wrong Way Driver Ahead"
- Public outreach/ public education about wrong way driver
- Improved wrong way driver detection technology
- Impaired drivers/driver confusion
- Coordination with state agencies
- Technology
- Suicidal drivers
- Right/Safer wrong way detection device
- Avoiding law suits

#11- Managing Utility Markings.
Group Facilitator: James Go

- Underground service alert
- 811
- As-Built Rewards
- Contractor communication
- Protective cover / concrete to prevent cuts
- Utility liaison / standing meetings
- Tracer/detection devices
- Safety considerations in markings
- Asset management system
- Permit

1. More WW efforts
2. Interoperability => NIOP
    a. How to know if your transponder will work
3. Public Marketing Campaign (National)- most agencies have local marketing, what is the efforts for national marketing once nationwide interoperability is available
4. Informed Usage- drivers need to know where their transponder works
5. Sign technology (sheeting/lights/solar lights)- what is the best option to make sure signs are visible and legible so that drivers don't get confused
6. Refresh Pavement Markings frequently
    a. RetroReflective Pavement Markers- update frequently
7. Interface toll rates with GPS navigation- Can GPS navigation have real time updates to allow drivers the ability to make the decision to use general purpose or express lanes
    a. Dynamic pricing- if GPS updates available, how would it work with dynamic pricing and the rates changing
8. Getting drivers to understand there is always a next exit
9. Work zone notices (public outreach)
    a. New Approach
    b. Social Media
    c. GPS Navigation Updates
10. Add to Driver Education material for new drivers
    a. DMV outreach at renewal of driver's license
11. How to reduce sign numbness- drivers see the same signs all the time (or similar signs due to the same color)-
12. DMS sayings – driver engagement – some states are using catchy phrases on DMS signs to get drivers attention

Group Facilitators and Contact Information

9:30-10:30am

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