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Institute for Transportation

Pile assessment tool evaluates steel H-pile capacity

Tool helps engineers make rapid decisions in scour situations

As winter slowly slides into spring, local agencies are beginning to shift their focus from clearing the roads of ice and snow to the coming thaw, and its potential to lead to flooding.

If, or more likely when, flooding comes to Iowa's communities, it will be up to engineers to make quick—and informed—decisions on whether the rapids are leading to scour and ultimately impacting a bridge's overall capacity. The Bridge Engineering Center (BEC) has been working for years to develop just such a tool to aid state rating engineers in their decision-making.

“The main benefit is that you can get data-driven, educated decision-making in times of emergency events such as flooding,” said BEC Associate Director Katelyn Freese, who is leading a second phase of the project that initially developed the pile assessment tool.

She added, “Tools like this are great because they give you more confidence in making decisions that provide safe infrastructure to the traveling public.”

The tool has a user-friendly graphical interface that requires the input of a few key factors to quickly calculate pile capacity, including taking into account the varying amounts of unbraced pile lengths and the stiffness contribution of concrete encasements, for state rating engineers

to make the needed timely decisions on pile capacity and stability.

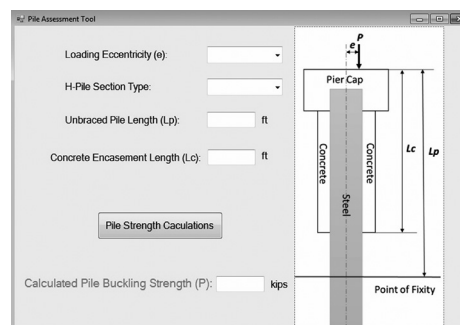
In addition, rating engineers could use the tool to establish the maximum permissible amount of scour for each pile bent prior to any flood event, since the tool is relatively easy to use.

“Basically, it just allows you to make informed maintenance and closure decisions,” Freese said.

The second phase of the project is a laboratory validation of the tool to ensure the experimental data matches the outputs of the tool, or make any tweaks necessary if the two do not align properly.

For more information about the tool, contact Freese at kfreese@iastate.edu.

To learn more about the project, see the completed Phase I project page at <https://intrans.iastate.edu/research/completed/development-of-a-rapid-assessment-tool-for-pile-capacity-and-stability-in-response-to-scour-situations/> and stay up to date on the in progress Phase II project here: <https://intrans.iastate.edu/research/in-progress/experimental-validation-of-a-rapid-assessment-tool-for-pile-capacity-and-stability-in-response-to-scour-situations/>. ■



Screenshot of pile assessment tool and example of scouring underneath bridge

Acronyms and Abbreviations in *Technology News*

AASHTO	American Association of State Highway and Transportation Officials
APWA	American Public Works Association
FHWA	Federal Highway Administration
ICEA	Iowa County Engineers Association
IHRB	Iowa Highway Research Board
InTrans	Institute for Transportation (at ISU)
Iowa DOT	Iowa Department of Transportation
ISU	Iowa State University
LTAP	Local Technical Assistance Program
MUTCD	Manual on Uniform Traffic Control Devices
NACE	National Association of County Engineers
TRB	Transportation Research Board

About LTAP

LTAP is a national program of the FHWA. Iowa LTAP, which produces *Technology News*, is financed by the FHWA and the Iowa DOT and administered by the Institute for Transportation at Iowa State University:

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Printed with soy ink

From the Director: Embracing the “I don’t know”

During the last year, have you become more comfortable with the answer “I don’t know”? Is it something that has become more acceptable to live with and through? This adjustment was essential here at LTAP for us to advance and serve. I have a variety of characteristics, not the least of which is the pre-disposition to embrace my engineer/research/instructor brain, that has resulted in times and circumstances where I believed all problems were solvable and all questions answerable. It has been a while since I believed that. Perhaps that is due to a better understanding of things that comes with experience or age. I don’t know. For quite a long time, though, I have started many of the courses in which I am an instructor with the phrase “If I don’t know the answer to your question, I’ll tell you.” Sometimes, I also add, “There is also likely someone in this audience who has experienced what you have and has found a solution.”

The response to these statements can be very different from university undergraduates and seasoned professionals. It is always interesting to observe them. One response I have gotten is disbelief that I could or would admit it. Exploring where that response really comes from is something that I suspect is an individual discovery, but I am comfortable with what I consider this basic truth. Getting comfortable with “not knowing” is something that all of us work on, and we’ve had a lot of practice with it in the past year! It is okay to not know and, in all cases, realize that an answer may be in the collective “head of the room” rather than the head of the individual at the front of the room. Right now, it feels like we are entering another stage of not knowing. Perhaps this has always been true, but 2020 and now 2021, have been full of these transitions. There is hope and caution all mixed together, and we don’t know where we’ll be in three or six months. But did we ever really know? In this case, though, whether consciously or subconsciously, I think most of us recognize

that a shift, transition, or metamorphosis has occurred, and there is no going back. There has been too much water over the dam, and reversing it is not an option (despite the example of the Chicago River).

In the mindset of embracing change and the “I don’t know,” Iowa LTAP will be attempting to offer some training alternatives. We will continue with some virtual efforts but also phasing in some small group, limited attendance, regional offerings of trainings we have done annually for many years. For example, regional Flagger/Work Zone and Motor Grader Operator sessions will be advertised for April and May. The same shortened content will be offered in two sessions each day at particular venues. Each session will be limited to 20 attendees, and the number of attendees per agency is limited to four per session. This approach allows us to train those most in need from as many agencies as possible. Of course, if there are attendee spaces available near the end of registration, we’ll shift and adjust and reach out with this opportunity. In addition, masking will be required to enter the classroom, if not socially distanced (classroom chairs will be six feet apart), and in the general areas of the venues. In addition to these on-site sessions, we will also continue to offer our one hour webinars, but they will be limited to two per month rather than weekly. We also have virtual workshops advertised that focus on the Iowa DOT Culvert and Bridge Backwater Program (April 7), the Design Length of H-piles and WEAP Equation (April 14), and Excavation Safety (April 27–29). Also, don’t forget, the 2021 Iowa Build a Better Mousetrap competition is now open for submissions at <https://iowaltap.iastate.edu/iowa-babm-competition/>.

With Gratitude,
Keith ■

Watch Now

Miss any of our 50+ webinars last year? Good news! Just about all of our webinars were recorded and are available through our website: <https://iowaltap.iastate.edu/webinars/>. Fill out a brief form and catch up on them all! ■

In brief: Lasting LTAP impacts

Lucas County Engineer Todde Folkerts borrowed LTAP's trailer-mounted speed feedback sign last August through LTAP's Equipment Loan Program to check for possible speeding problems at a problem location on the outskirts of the City of Chariton.

The area was at a machine works located along a high truck-traffic road with employee parking on one side of the road and the plant on the other. Semis and other vehicles were coming through the area at speeds higher than the posted speed limit, which is a safety problem for employees crossing the road.

David Veneziano, LTAP Safety Circuit Rider, performed a speed study using LTAP's radar recorders, which assist in the collection of bi-directional data on vehicle speed, length, gap, and volume. These recorders are a non-invasive way of collecting traffic data and are



Speed feedback sign trailer in the City of Chariton

also available through LTAP's Equipment Loan Program. The study confirmed that speeds in this problem area were indeed high.

The speed feedback sign trailer was placed in the trouble area for a few weeks, which slowed speeds down.

"Following deployment, there was an approximately 14 percent reduction in the number of vehicles passing through the site that were exceeding the posted speed limit by 15 miles per hour or more," said Veneziano.

Shortly after retrieving the trailer, the machine works decided to fund the purchase of two permanent speed feedback signs based on the experience of having the trailer deployed in the vicinity of the plant.

LTAP currently has two speed feedback signs (one post-mounted and one trailer-mounted) available for loan here: <https://iowaltap.iastate.edu/speed-feedback-signs/>. A pair of sidefire radar units is also available to collect traffic volume and speed data: <https://iowaltap.iastate.edu/radar-recorders/>. Check out all the equipment available here: <https://iowaltap.iastate.edu/equipment-loan-program/>, and share your impact story with us!

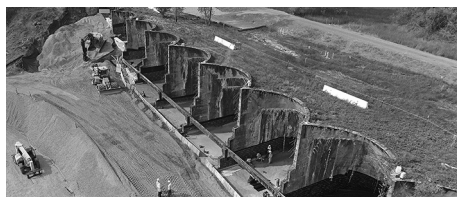
Article written by Brandy Haenlein, a communication specialist with InTrans. ■

CP Tech Center releases *Guide to Lightweight Cellular Concrete for Geotechnical Applications*

Long used as a construction product for flooring systems, lightweight cellular concrete (LCC)—a mixture of portland cement and water slurry, combined with preformed foam to create air voids—has continued to expand its applications into a variety of fields, including the geotechnical industry.

In order to provide information for construction professionals and design engineers on the use of LCC in specifically geotechnical applications, the National Concrete Pavement Technology Center (CP Tech Center) in collaboration with the Portland Cement Association (PCA) released the *Guide to Lightweight Cellular Concrete for Geotechnical Applications*.

"Given that an LCC mix is highly flowable, it can be efficiently and safely placed in confined or problematic spaces such as in pipes, trenches, tunnels, wall backfills, and other areas where the routine placement of earthen fill is difficult, if not impossible," said Greg Halsted of the PCA and an author of the



LCC placed as fill for dam (Cell-Crete Corporation)

guide. "These attributes make LCC a low-cost solution for many geotechnical applications."

LCC's properties help it act as a strong, lightweight, durable, and inexpensive alternative to soil or fill replacement for many geotechnical applications. LCC's lightweight property reduces ground settlement and improves the bearing capacity and the static and seismic stability of embankments.

"The rapid placement and reasonably fast setting time of LCC expedite construction operations," added Scott Taylor, another author of the guide. "Many other attributes of LCC provide additional advantages for specific challenges, such as freeze-thaw resistance, local

availability, ease of pumping, and increased worker safety."

The guide focuses on the materials, properties, design, proper handling, and applications of LCC for geotechnical applications, including common uses, conceptual guidance, and design guidelines. It provides examples of both mix design preparation and field installation, geotechnical evaluation, and the design, construction, and field testing of LCC. It discusses the segments of the geotechnical marketplace where LCC has been successfully used and reviews the properties, functions, and benefits.

In addition, the applications presented in the guide have exhibited excellent long-term performance, providing cost-effective solutions and better and safer designs for projects across North America.

The guide is accessible here: https://intrans.iastate.edu/app/uploads/2021/01/guide_to_LCC_for_geotech_apps.pdf. ■

Iowa LTAP Mission

To foster a safe, efficient, and environmentally sound transportation system by improving skills and knowledge of local transportation providers through training, technical assistance, and technology transfer, thus improving the quality of life for Iowans.

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Iowa DOT earns TSMO award

Agency recognized for its work zone management program

The Iowa DOT earned a 2021 Transportation Systems Management and Operations (TSMO) Award from the National Operations Center of Excellence (NOCoE) for its Comprehensive Work Zone Management Program.

The Iowa DOT developed a detailed, five-year Work Zone Management Service Layer Plan, in conjunction with SRF Consulting Group, to clarify the tactical areas in which the department should apply its limited time and resources.

The plan elevated the importance of work-zone management throughout the DOT, resulting in a number of crucial activities, all of which contribute to improving safety, the effects of delays, and the DOT's TSMO maturity.

Many of those activities were implemented in partnership with InTrans researchers, including the following:

- Real-Time Performance Monitoring – Daily and weekly reports are shared with the statewide traffic management center (TMC), construction engineers, and law enforcement partners. InTrans also used machine learning to develop an application that identifies slow and stopped conditions and sends text alerts with camera images during sustained traffic delays. This allows those responsible for day-to-day operations to have an immediate awareness of traffic delays.
- Iowa Work Zone Data Hub – Iowa DOT is partnering with InTrans to develop a “research grade” work zone data hub

leveraging proposed standards and architecture proposed through the FHWA National Work Zone Data Initiative.

- Smart Arrow Boards – The Iowa DOT has developed a specification to require smart arrow boards by 2021 for interstate and 2022 for all state highway projects. The smart arrow boards include a Global Positioning System (GPS) unit and cellular modem that continuously reports location and status. This generates an accurate record of lane closures and allows the TMC, and others via data feed, to be notified automatically with work zone closure times and locations.

The NOCoE TSMO Awards Competition is in its third year, and it is a national competition that recognizes the latest TSMO projects and programs that are increasing the efficiency of America's existing infrastructure to address air quality and improve the safety and mobility of the traveling public.

A case study on the Iowa DOT program is available here: <https://transportationops.org/case-studies/iowa%E2%80%99s-comprehensive-work-zone-program>. To delve deeper, the NOCoE has a library of over 100 case studies on TSMO projects available here: <https://transportationops.org/nocoe-case-studies>.

The Iowa DOT, along with this year's other winners, automatically became a nominee for the Overall TSMO Award, which will be presented later this spring. ■



Smart arrow board at the beginning of a work zone in Iowa

Iowa creates virtual public involvement tool

The Iowa DOT developed a virtual public involvement platform to manage its stakeholder outreach and improve project decision-making and is now making the tool available to other highway agencies.

As mobile phone, internet, and social media use grows, agencies are turning to virtual public involvement—the use of digital technology to engage people or visualize projects—to supplement in-person public involvement strategies during planning and project development.

The Iowa DOT created its Public Involvement Management Application (PIMA) to expand citizen input on transportation projects, reduce manual processes, and improve consistency of data collection for public meetings. “PIMA allows us to manage and coordinate our public involvement effort across our organization,” said Brad Hofer, director of the Iowa DOT Right-of-Way Bureau.

PIMA Goals

The agency had several goals in developing PIMA, which features both an internal management tool and a public portal. “We wanted to better analyze and adjust our public involvement effort based on real data,” said Hofer. “We also wanted to improve the ease with which the public can provide feedback on all our projects.”

Traditionally, the Iowa DOT held public meetings primarily for larger, more complex projects. “We wanted a public space that gives everybody an opportunity to comment on every project,” said Hofer.

The searchable public portal gives users information on all Iowa DOT projects and details from any past public meetings. It also displays the level of support a project has received, which is based on comments that have been submitted. In addition to providing a way for people to learn about and comment on projects, PIMA allows Iowa DOT staff to respond to and manage citizen comments electronically.

In recent months, the Iowa DOT has used PIMA for online public information meetings, offering participants the opportunity to view a prerecorded presentation at their convenience and make comments as they watch. Meeting materials can include visuals such as videos, story maps, and slide presentations.

“With PIMA, Iowa has been able to continue business as usual,” said Valerie Brewer, public involvement manager. The agency is working on the capability to livestream public information meetings in the future.

Spreading the Word

The Iowa DOT has demonstrated the PIMA platform to other state DOTs interested in using it for their public involvement efforts. The Georgia and Massachusetts DOTs have incorporated PIMA into their processes and others are considering implementation.

The Iowa DOT offers PIMA free by agreement with the stipulations that other agencies give Iowa credit for PIMA when appropriate, not share proprietary information with others, and share any improvements they make with Iowa. “We’re excited that this will continue to stimulate innovation around virtual public involvement,” Hofer said.

For More Information

Learn more about PIMA here: <https://www.news.iowadot.gov/pim/>.

Watch a presentation from the Iowa DOT on virtual public involvement here: <https://youtu.be/9oeQ1td5ORs>.

Learn more about the FHWA EDC-5 virtual public involvement initiative here: https://www.fhwa.dot.gov/innovation/everydaycounts/edc_5/virtual_public_involvement.cfm. ■

Article reprinted with permission of the FHWA.

Entries welcome for Mousetrap contest

Competition deadline is May 3

We are looking for submissions from Iowa’s local public agencies that have created different solutions to problems or found better ways of doing things.

The Iowa Build a Better Mousetrap Competition gives local agencies the opportunity to share—and show off—the innovative solutions they’ve developed for their shops, employed in the field, or fabricated to improve safety.

Local agency employees can learn more about the competition and submit an entry at <https://iowaltap.iastate.edu/iowa-babm-competition/>. The deadline to submit an innovation is May 3, 2021.

Entrants must provide a photo of their invention, details on its cost and savings/benefits to the community, and offer background as to why and how the solution was developed. Videos of the equipment or innovation are encouraged. The entries will be judged on cost savings/benefit to the community, ingenuity, ease of transferability, effectiveness, and video demonstrations.

Top entries will be recognized with plaques at the Iowa Streets and Roads Conference, and they will earn between three and one free registrations to LTAP’s many training courses. The first place winner will also get on-site recognition and an appreciation lunch.

The 2020 winner, Page County, won for its inventive snow fence roller. Other recognized entrants developed a grease slinger, social distancing CMP banding tool, and sign truck work basket. ■



Page County’s snow fence roller

Road diets: An overview and opportunities to STEP UP

“Some people think [Road Diets] are negative because of the term ‘diet.’ They don’t like that it implies making the roadways ‘skinnier.’ Instead, I like to think about it like this: lane reallocation, lane rebalancing, and conversion.”

—Keith Knapp, Road Diet Informational Guide co-author

In 2019, as an effort to improve pedestrian safety, the FHWA introduced the STEP or Safe Transportation for Every Pedestrian program—an Every Day Counts initiative.

For pedestrian safety, one of the countermeasures promoted in STEP is road diets, which can reduce vehicle speeds and the number of lanes pedestrians cross. Road diets can also sometimes create space to add new pedestrian facilities such as refuge islands.

The benefits of the STEP program include improved safety through countermeasure implementation, targeted investment on pedestrian safety, and enhanced quality of life for pedestrians. STEP identifies and describes a number of effective countermeasures, such as raised crosswalks, pedestrian hybrid beacons, etc.; however, the FHWA emphasizes that each should be used in the appropriate roadway context.

The impacts, feasibility, design, and effectiveness evaluation of road diets were described in the FHWA *Road Diet Informational Guide*.

Although seven years old now—having been published in 2014—this guide is still the FHWA’s go-to resource on the subject.

Iowa LTAP Director Keith Knapp co-authored the original four- to three-lane conversion guidelines for Iowa and is also a co-author of the 2014 *Road Diet Informational Guide*. He has been involved with road diets for over 20 years.

“Some people think [Road Diets] are negative because of the term ‘diet.’ They don’t like that it implies making the roadways ‘skinnier.’ Instead, I like to think about it like this: lane reallocation, lane rebalancing, and conversion.”

Knapp adds that when considering a road diet, each potential location should be context sensitive.

“Ask yourself: Will this serve everyone? Why am I doing this?”

In many cases, road diets have been known to reduce conflict points, improve sight lines, lower or create more uniform speeds while still meeting traffic demands, provide opportunities for “green” features, as well as lower costs while still supporting traffic flow (vehicles, bicycles, and pedestrians) for area businesses.

It is not unusual for a four-lane undivided highway to have a history of increasing crashes as traffic volumes rise and more and more motorists begin to share the inside lane for

through movements and left turns. According to the guide, with the use of a road diet, conversions could result in an overall crash reduction of 19 to 47 percent.

Additionally, as active transportation increases, communities desire more livable spaces, pedestrian and bicycle facilities, and transit options, which may not be easily and/or safely accommodated along a four-lane undivided roadway.

“Everything depends on the situation you are looking at, always remember to get feedback and get people involved early,” says Knapp.

There are six chapters that make up the *Road Diet Information Guide*, including information on road diet feasibility, design, and effectiveness. The guide can be downloaded or viewed here: https://safety.fhwa.dot.gov/road_diets/guidance/info_guide/.

Additionally, 24 case studies from 9 states have been conducted to show the outward benefits of road diets. These can be viewed here: https://safety.fhwa.dot.gov/road_diets/case_studies/.

Article written by Brandy Haenlein, a communication specialist with InTrans. ■

More Information

In October 2020, Knapp led a webinar focusing on Road Diets and provided an overview of the *Road Diet Informational Guide*. A link to the recording can be found here: <https://iowaltap.iastate.edu/events/road-diet-webinar/>. Tune in for more webinars on important safety and transportation-related topics here: <https://iowaltap.iastate.edu/events/>.

More information about the STEP program can be found at https://safety.fhwa.dot.gov/ped_bike/step/ and https://www.fhwa.dot.gov/innovation/everydaycounts/edc_5/step2.cfm. ■

Workshop and conference calendar

[Information current as of March 19, 2021] Iowa LTAP will continue with some virtual efforts but also begin phasing in some small group, limited attendance, regional trainings. The in-person spring 2021 trainings will have registration limitations and on-site attendance requirements. This approach allows us to train those most in need from as many agencies as possible.

For the most up-to-date information about in-person attendance requirements and additional upcoming virtual events, please check regularly at <https://iowaltap.iastate.edu/events/> and consider subscribing to our mail list at <https://iowaltap.iastate.edu/> for email updates. Thanks for bearing with us as we work through this transition.

Date	Event Name	Location	Contact
April 2021			
7	Iowa DOT Culvert and Bridge Backwater Program Workshop	Webinar (8:00 a.m. CT)	Paul Albritton
7	2021 County Engineers Research Focus Group	Ames (9:00 a.m.)	Keith Knapp
14	Design Length of Steel H-Piles and WEAP Equation	Webinar (8:30 a.m. CT)	Paul Albritton
15	2021 APWA Iowa Chapter Virtual Spring Conference Day 1	Webinar (1:00 p.m. CT)	Beth Richards
16	2021 APWA Iowa Chapter Virtual Spring Conference Day 2	Webinar (9:00 a.m. CT)	Beth Richards
20–21	Work Zone and Flagger Workshop (2 sessions each day)	Waterloo (8:30 a.m. or 12:30 p.m.)	Paul Albritton
23	Safety Improvements and Funding	Webinar (12:00 p.m. CT)	Keith Knapp
27–29	2021 Excavation Safety–Virtual	Webinar (8:00 a.m. CT)	Paul Albritton
28–29	Work Zone and Flagger Workshop (2 sessions each day)	Sigourney (8:30 a.m. or 12:30 p.m.)	Paul Albritton
May 2021			
4	Motor Grader Operator Workshop (2 sessions)	Atlantic (8:30 a.m. or 12:30 p.m.)	Paul Albritton
5–6	Work Zone and Flagger Workshop (2 sessions each day)	Atlantic (8:30 a.m. or 12:30 p.m.)	Paul Albritton
11	Motor Grader Operator Workshop (2 sessions)	Ames (8:30 a.m. or 12:30 p.m.)	Paul Albritton
12–13	Work Zone and Flagger Workshop (2 sessions each day)	Ames (8:30 a.m. or 12:30 p.m.)	Paul Albritton
18	Motor Grader Operator Workshop (2 sessions)	Storm Lake (8:30 a.m. or 12:30 p.m.)	Paul Albritton
19–20	Work Zone and Flagger Workshop (2 sessions each day)	Storm Lake (8:30 a.m. or 12:30 p.m.)	Paul Albritton
25	Motor Grader Operator Workshop (2 sessions)	Sigourney (8:30 a.m. or 12:30 p.m.)	Paul Albritton
June 2021			
2	Motor Grader Operator Workshop (2 sessions)	Waterloo (8:30 a.m. or 12:30 p.m.)	Paul Albritton

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Event details and online registration

Watch for details and online registration information, by specific dates and events, on the Iowa LTAP Workshops page, iowaltap.iastate.edu/workshops/. ■

Iowa LTAP library resources available

“With the nation facing tough economic times, libraries offer us a remarkable wealth of resources.” – American Library Association

Iowa LTAP’s Stan Ring Memorial Library has many valuable tools and resources for local transportation professionals. We can provide information at your fingertips, with hundreds of videos, publications, and manuals from various agencies and organizations.

Visit our website to access the following resources:

- Pre-recorded webinars: <https://iowaltap.iastate.edu/webinars/>

- Safety training courses: <https://iowaltap.iastate.edu/2020-safety-resources-main-face/>
- Innovation videos: <https://iowaltap.iastate.edu/videos/>
- Hard copy library loans: <https://iowaltap.iastate.edu/stan-ring-memorial-library-and-online-resources/> (Request a copy of a printed publication or training DVD that we’ll mail to you)

VHS Giveaway

Iowa LTAP is updating our Stan Ring Memorial Library resources that we have

available for check out. We have made the decision to remove all our VHS tapes and are offering them **free** to anyone on a first come, first served basis. The full list of titles available can be found on our website at <https://iowaltap.iastate.edu/stan-ring-memorial-library-and-online-resources/>.

Email Shari Butterfield at sharib@iastate.edu or visit our website at <https://iowaltap.iastate.edu/> for more information about any of our resources and programs.

We’re here to help! ■

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