HAWAIIAN CONNECTIONS

NEWSLETTER OF THE HAWAII LOCAL TECHNICAL ASSISTANCE PROGRAM

VOLUME 4, No. 3 FALL 2002

IN THIS ISSUE

Please pass this on to other interested parties in your office.

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LTAP assists with Statewide Research Program

By Casey Abe, Hawaii DOT

Training is the backbone of the Hawaii Local Technical Assistance Program (LTAP). But besides providing training, another major function of the Hawaii LTAP program is providing technical assistance. One area where the Hawaii LTAP program will be providing technical assistance is through its involvement with the Hawaii Department of Transportation (HDOT) Statewide Research Program.

The Materials Testing and Research Branch (HWY-L), Highways Division, is responsible for overseeing both the LTAP Program and the HDOT Statewide Research Program. Currently, the Highways administration has decided to fund both programs from the same source of funding, the Statewide Planning and Research (SPR) Program, Part II - Research. Due to the limited amount of SPR Research Funds available, deciding whether to provide more funding to the LTAP program or to the research program is a very tough decision.

The LTAP's training program is an extremely valuable program to the transportation community. The training workshops are practical and information that the attendees obtain can be applied to their daily jobs.

Like the LTAP program, the Statewide Research Program has more research projects than funding. Developing a criterion of prioritizing the numerous research projects can be very challenging.

After networking with other state DOT's that fund their LTAP and Research Programs with SPR Funds, we have found that some of them have their LTAP Program assist with the implementation phase of the research project, while the state employees assist with the follow-up and monitoring phase.

In the near future, the LTAP Program will be assisting the HWY-L with prioritizing various research projects based on the probability of the proposed findings being implemented into the HDOT's daily operations.

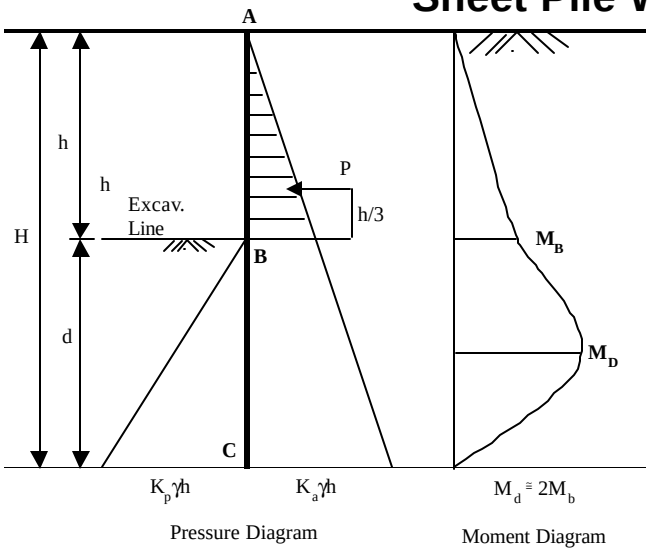
As these research findings are successfully implemented into the HDOT's daily operations, the Highways administration will be more than willing to provide additional funding to fund more research projects while providing sufficient funding for the very successful LTAP Training Program.

2002 Conference Gallery p. 4

Walter Lum's Rules of Thumb

Editor's Note: Walter Lum, consulting engineer, through many years of experience has developed quick and easy ways to solve complex problems. He has shared his rules of thumb with us.

Sheet Pile Walls



Cantilever Sheet Pile

A rule of thumb is to assume the depth of penetration "d" is equal to the depth of excavation "h" or

$$H = d(K_p/K_a)^{1/3} \cong 2d, \text{ when } \phi \cong 30°$$

Where,

H = length of sheet pile
K_a = active earth pressure coefficient
K_p = passive earth pressure coefficient
ϕ = friction angle of soil

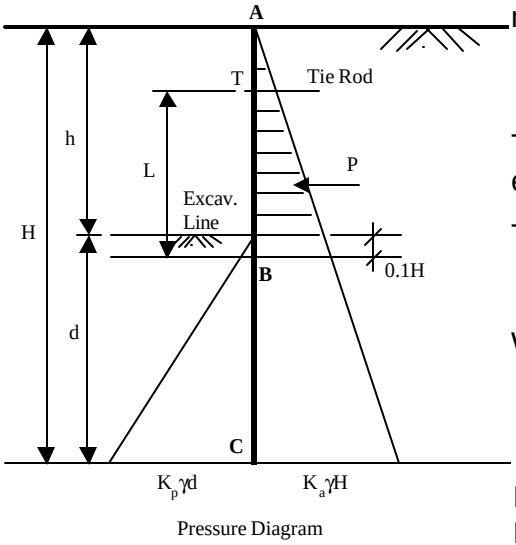
This equation can be derived by taking moments of the active and passive pressure diagrams about "C" the tip of the pile, or

$$K_a \gamma H^2 / 2 * H / 3 = K_p \gamma d^2 / 2 * d / 3$$

The design or maximum moment occurs where the shear is zero, approximately at D / 2, or twice the moment at the excavation line, $M_d \cong 2Ph / 3$.

CANTILEVER SHEET PILE

Depth of penetration d ≅ h
Design Moment Md ≅ 2 Ph / 3
≅ Ph / 1.5



Anchored Bulkhead

The depth of penetration is about 2 / 3 the depth of excavation "h" by the fixed earth method of analysis.

The design moment is approximately equal to

$$M_d \cong PL / 8$$

Where,

P = total lateral force from T to B
L = length from tie rod T to B

ANCHORED BULKHEAD

Depth of penetration d ≅ 2 / 3 h
Design Moment Md ≅ PL / 8

Lessons To Remember

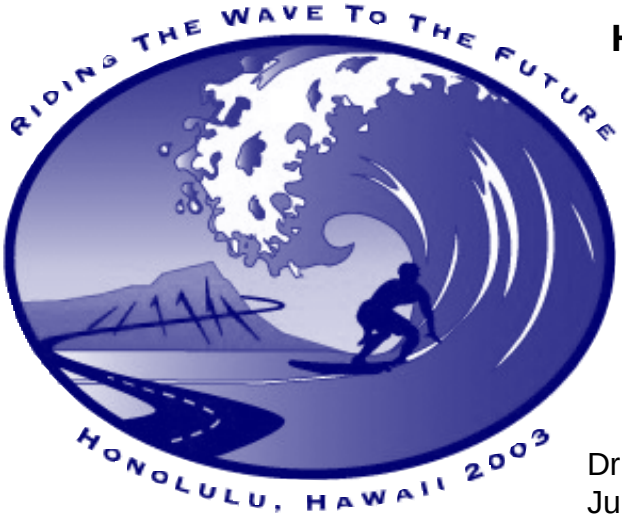
The cantilever sheet pile wall is not very efficient when comparing the design bending moments of the two examples presented above, Ph / 1.5 vs. PL / 8. Cantilever sheet piles are generally used for heights less than 10 feet and seldom over 15 feet.

The depth of penetration can be reduced to one half of the depth of excavation if the free earth is the free earth method of analysis is used instead of the fixed earth method, but the design moment is increased, about 1.3 times.

A deeper penetration is usually preferred (fixed earth method) particularly for water front structures where scour could occur from ship propellers, currents, wave action or over-dredging.

As we were going to press we heard about the untimely passing of Walter Lum. A fitting tribute will be included in our next issue.

2003 NATIONAL LTAP-TTAP CONFERENCE
SHERATON WAIKIKI HOTEL



July 27, 2003 to July 31, 2003

Hawai'i Local Technical Assistance Program

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Hawaii State Department of Transportation Funded Projects

PROJECT TITLE	Principal Investigator / Project Manager	Amount ($)	Completion Date
Creep Characterization of Residual Tropical Soils for Engineering Design and Analysis (3 Years)	H. Brandes / C. Miyashiro	187,460	Mar-02
Test of Prestressed Concrete Beam Repaired with Carbon Fiber (1 Year)	I. Robertson / P. Santo	84,542	May-02
Evaluation of Concrete Durability and Corrosion Resistance of Concrete Structures in Marine Environment Using Hawaii Cement and Aggregates (52 Months)	I. Robertson / M. Ando	307,998	Sep-02
Limited Ramp Closure Along the H-1 Freeway (3 years)	P. Prevedouros / D. Meller	188,305	Dec-02
Measurement of Asphalt Mix Design Parameters Using Image Analysis (2 Years)	H. Brandes / H. Nakamura	99,052	Jan-03
Correlation of Resilient Modulus (Mr) of Fine-Grained Soil with Common Soil Parameters for Use in Design of Flexible Pavements (3 Years)	P. Ooi / C. Miyashiro	206,533	May-03
Investigation of Traffic Detectors for Use in Hawaii (3 Years)	P. Prevedouros / G. Sulijoadikusumo	160,665	May-03
Use of Advance Composites for Hawaii Bridges with Application to Renovation of Historic Bridges (2 Years)	R. Riggs / P. Santo	122,693	May-03
Correlation of Resistance Value (R-Value) with California Bearing Ratio (CBR) for Use in Design of Flexible Pavements (2 Years)	P. Ooi / C. Miyashiro	106,627	Jul-03
Correlation of Aggregate Properties to Performance of Asphalt Pavements in Hawaii (3 Years)	H. Brandes / J. Nakamura	179,027	Sep-03
H-3 North Halawa Valley Viaduct Monitoring Program (5 Years)	I. Robertson / P. Santo	150,000	Dec-04
Instrumentation and Monitoring of Sand Plugging and Bridge Scour at Selected Streams in Hawaii (2 Years)	M. Teng / F. Nishioka	254,006 (pending)	May-05
Seismic Instrumentation of Kealakaha Bridge (5 Years)	I. Robertson / P. Santo	691,564	Sep-06

Gallery from the 2002 National LTAP-TTAP Conference
Burlington, Vermont

The Hawaii LTAP staff along with HDOT's, Casey Abe attended the 2002 National LTAP-TTAP Conference in Burlington, Vermont in late July. The theme of the conference was, "LTAP and TTAP in 2002, Celebrating Twenty Years of What We Do". It has been 20 years since the establishment of the first 10 LTAP Centers and today there are 58 Centers across the nation serving all 50 states, Puerto Rico and seven Tribal Centers. The annual conference will be held in Hawaii next year and as a gesture of our Aloha spirit, we presented a hula to the participants and invited them all to our great State!!

NEWS FROM OUR PARTNERS...

Concrete and Cement Products Industry (CCPI)

aloha LTAP Partners,

The Cement and Concrete Products Industry of Hawaii and LTAP partnered a very enthusiastic workshop on the Construction of Concrete Pavements. The two and one-half day workshop was well attended by participants from the City and State agencies as well as from private engineering firms and contractors. The forum created a very interactive atmosphere for discussions.

Michael Ayers, from the American Concrete Paving Association, did a great job in sharing the most recent developments in concrete paving construction. Topics included concrete pavement designs, joint details, forming methods, saw cutting, restoration techniques (diamond grinding and cross stitching), and test evaluation procedures.

Of particular interest was the innovative development of ultra thin whitetopping (UTW) in the past few years. In Hawaii, UTW has already been used on a demonstration project (Sand Island Access Road) and as pilot projects for the DOT Highways and Airports. This is an excellent alternative to replacing deteriorated asphalt pavements with 4" of UTW concrete. The cost benefit of an extended pavement life will eliminate the costly need of short-term maintenance and resurfacing, not to mention the costly traffic delays for these repairs. An updated UTW design program will be available later this year.

Another industry development for pavement is the use of early setting concrete mix to open the road to traffic within a few hours after placement. Caltrans has already achieved concrete flexural strengths of 400 psi in 4 hours! Our local industry is confident in providing similar performances.

We certainly are enthused about our partnership with LTAP and look forward to future programs.

Mahalo!
Wayne

ENGAGING STAKEHOLDERS IN YOUR PROJECT: TOOLS AND TECHNIQUES

The **ASCE Hawaii Section** will again be teaming up with the **American Public Works Association** and **Hawaii Local Technical Assistance Program** to sponsor a one-day workshop. This workshop will present the basics on how to engage stakeholders in your projects. The workshop will be held on October 24, 2002 at the Ala Moana Hotel. Key stakeholders will share their concerns, and experts will share their tools and techniques for engaging the public in their projects.

For more information, please contact Walter Billingsley at 846-3232 or *wbillingsley@beltcollins.com*

Creep Characterization of Residual Tropical Soils for Engineering Design and Analysis

By Horst G. Brandes, University of Hawaii

The objective of this study was to investigate the time-dependent behavior of tropical soils from Hawaii through carefully controlled strength tests and long-term drained creep tests. Creep, or the slow and continuous movement of fine-grained soils in slopes, embankments, and below foundations, has been a recurrent problem that has led to extensive damages throughout the State. In Honolulu, creep is a major contributor to a series of slow-moving slides along the flanks of most of the valleys that cut into the Koolau Range. These slides continue to cause headaches to property owners and City and State engineers.

Four fine-grained volcanic soils with distinctive sets of geotechnical properties were selected for this study. The materials were mixed with water, reconstituted, and reconsolidated prior to testing. The experimental program consisted of short-term undrained strength tests, long-term drained creep tests, and post-creep undrained strength tests.

The short-term tests were conducted to provide general strength information for the creep tests and to investigate rate dependency issues. In terms of friction angles (Figure 1), it is interesting to observe that whereas residual silt and clay soils exhibited properties in line with that of most inorganic clays from around the world, **the Manoa colluvium clay and the Hilo ash soil show friction angles that depart from expected behavior**. The reason for this is likely the unique microstructure that has developed in these soils as a result of their oceanic-basaltic nature and the particular weathering processes associated with Hawaii's climate.

Long-term or creep deformations are usually analyzed with reference to strain rates and strain rate changes with time. Creep in most instance results in displacements, and rates of displacement, that decrease exponentially as time progresses. The following simple relationship is commonly used to express this behavior:

$$\log \frac{\dot{e}}{\dot{e}_o} = -m \log \frac{t}{t_o}$$

where $\dot{e}$ stands for strain rate, t for time, and $\dot{e}_o$ and t_o are a set of convenient reference values. The soil parameter m reflects the rate at which strain rates, and hence creep deformations, attenuate with time. In general, the larger the value of m, the quicker creep ceases. Since time dependency of this nature is closely associated with clay mineralogy, microfabric, and hence plasticity, it is reasonable to seek relationships between m and Atterberg limits, which reflect these same characteristics but are much simpler to determine. The linear empirical correlation indicated in Figure 2 was derived based on this study and other similar investigations. **It provides a useful reference to evaluate the creep nature of an unknown soil when time-consuming and expensive tests of the type conducted herein are not feasible**. It should be noted though that time-dependency in soils is a complicated issue that is not yet fully understood. Specifically, it would be incorrect to state, based on the results shown in Figure 2, that the higher the plasticity of a soil, the higher the total amount of creep deformation that would accumulate. The amount of deformation that develops over time depends on many additional factors such as insitu stresses, drainage, and moisture content, among others. A proper analysis needs to involve a comprehensive constitutive relationship, appropriate conservation equations, and a numerical solution technique such as the finite element method. An example of such an analysis for the Manoa slide area is presented in the study's final report.

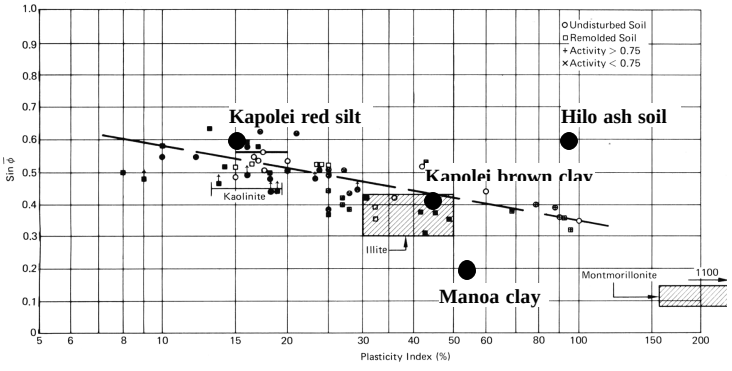

Figure 1. Relationship between sin ϕ and plasticity index for normally consolidated soils.

An associated time-dependency issue that is often of concern is whether the strength of a soil changes as

creep takes place. This is of practical importance since the stability of a soil structure or foundation needs to be evaluated over its entire service life. A number of post-creep strength tests were conducted on Manoa soil specimens following completion of the creep phase (Figure 3). These indicate that ageing resulted in an increase in undrained shear strength. In particular, strengths increased on average by approximately 10kPa, whereas the friction angle appeared to remain relatively unchanged. This makes sense since ageing is thought to contribute to the strengthening of interparticle bonds, which is reflected in a larger failure envelope intercept. Again, caution is necessary in applying these results to practical situations due to the reasons stated earlier and due to likely differences in the amount of ageing induced in this study as opposed to what can be expected in field settings.

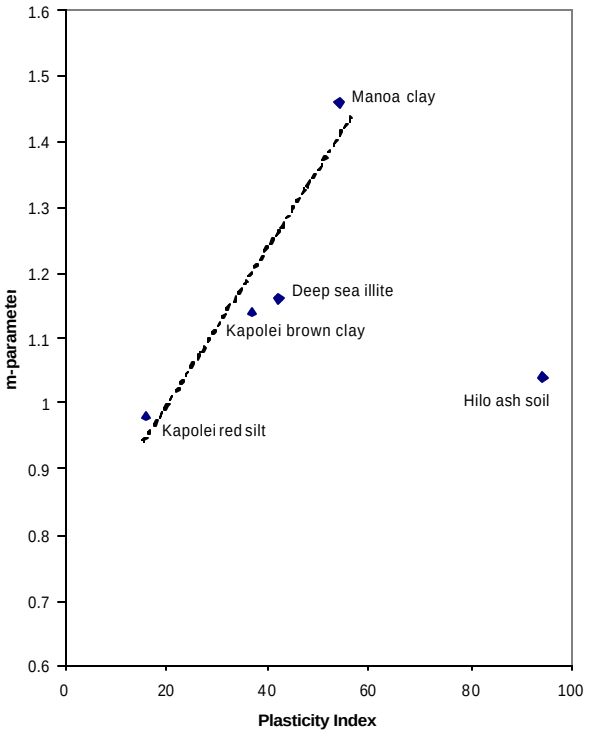

Figure 2. Creep strain rate attenuation versus plasticity index.

This study supported two graduate students, who published M.S. thesis reports on this project, as well as two part-time undergraduate students that assisted with various aspects of the research. Two articles resulting from this study have appeared in press and a third one has been recently submitted to a journal for publication. Finally, the study resulted in a technical report to the Hawaii Department of Transportation, Report No. HWY-L-UH-97-01. This study was supported in part by a grant from the Hawaii Department of Transportation and the Federal Highway Administration. Their support is gratefully acknowledged.

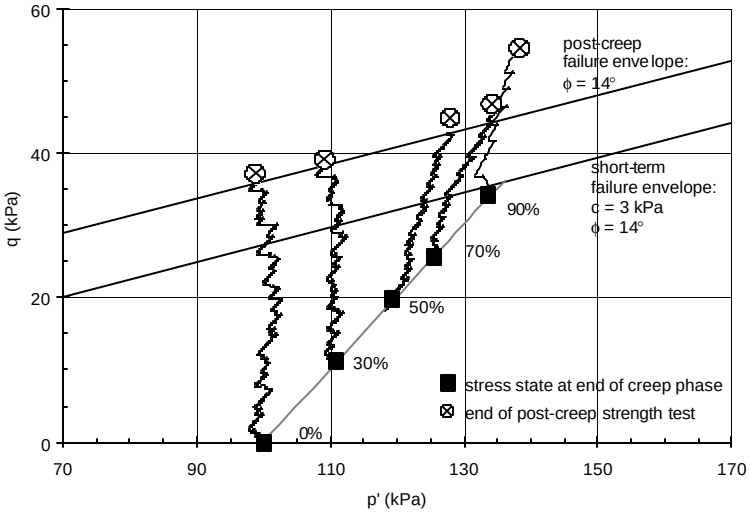

Figure 3. Post-creep strength tests.

Refer to page 3 for a listing of other DOT funded projects by faculty of the Department of Civil and Environmental Engineering Department at the University of Hawaii at Manoa.

THIRD QUARTER WORKSHOP SUMMARY

By Matthew Alonzo, Hawaii LTAP

Hawaii LTAP worked with its partners, Federal Highway Administration (FHWA), the Oahu Metropolitan Planning Organization (OMPO), Hawaii State Department of Transportation (DOT), CCPI and HAPI during the third quarter.

Starting off the quarter was the **Construction of Portland Cement Concrete Pavements** held July 9 - 11. Dr. Michael Ayers, the Director of Pavement Technology Services for the American Concrete Pavement Association, instructed the Construction of Portland Cement Concrete Pavements (PCC) workshop. The course provided an overview of the PCC paving process and presented it in 4 modules: Plant, Paving, Saw and Seal and Concrete Pavement Restoration Operations. Proper methods of constructing concrete pavements were covered. Differences between truck- and ready-mixed concrete were described. Also, factors that attribute to a smooth ride were identified, describing differences between slip- and fixed-form paving, identifying factors that influence saw timing and crack control, recognizing key features in joint sealant materials and recognizing components of pavement restoration application and construction were key skills participants obtained. There were 53 participants.

The **NAPA's Guide for HMA (Asphalt) Pavements** workshop help on July 30, in partnership with the Hawaii Asphalt Paving Industry (HAPI). A general overview of all Hot Mix Asphalt (HMA) pavements and improved connections between HMA mix design, structural design and construction were presented. Dr. Joe Mahoney from the University of Washington's Department of Civil and Environmental Engineering and graduate student Mr. Steve Muench instructed this workshop. They created the NAPA Guide that covers topics of materials, design parameters, mix types and designs, structural design, construction, pavement evaluation and maintenance and rehabilitation. 44 participants were trained during this course.

In cooperation with FHWA, the **Synchro Training** course was held on August 9, 12 and 14 at the University of Hawaii's Donald Kim multimedia laboratory. John Albeck, PE, PTOE and Jeff Gerken, PE, PTOE instructed the three day course. The course was split into three levels. The beginning level described the inputs for Synchro and SimTraffic. Basic terminology of traffic engineering was covered. Other topics included input requirements, analysis of individual intersections, network analysis and optimization and introduction to SimTraffic. The second day at the intermediate level focused on the outputs from the traffic models, Synchro and SimTraffic. Synchro time space and platoon dispersion diagrams, program reports were covered during this session. The advanced level section provided participants with phase templates, link OD volumes, ring and barrier design, cluster editor, advanced timing examples, advanced RTDF, optimization and calculations and advanced features in Synchro and SimTraffic. 22 participated in this useful transportation application.

In cooperation with FHWA, Hawaii DOT and OMPO, the **Emergency Transportation Operations Preparedness and Response Workshop** was held on August 21 - 22 at the Sheraton Waikiki Hotel. The workshop was intended to assess Honolulu's ability to respond to potential terrorist threats and catastrophic events, and to recover critical transportation functions. Participants worked together to develop responses to a realistic terrorist scenario in a two-day tabletop exercise that was designed by anti-terrorism experts from Booz Allen Hamilton, Inc. Participants included senior operations managers from area transportation, public works, police fire, emergency medical services, state and federal emergency management, public health, hospital, military, National Guard and other relevant agencies and organizations.

In the final month of the third quarter, the **Load and Resistant Factor Design (LRFD) for Prestressed Concrete Beam Design** workshop was held on September 3, 4 and 5. The AASHTO-LRFD Bridge Design Specifications for designing common types of prestressed concrete I-Girders and bulb-Tee girders for flexure and shear was presented. Design examples using AASHTO Types IV and VI Girders in the application of the LRFD Specifications were exercised. Participants were presented the background and advantages of the LRFD Specifications, they learned to recognize the AASHTO-LRFD loads relevant to prestressed concrete members, the unified approach for design of reinforced and prestressed concrete component in flexure, the design equations for concrete in shear and in flexure, and stress limits in the concrete and prestressing steel. Also, participants would be able to determine the required prestressing strands for pretensioned I- and bulb-T girders, short-term and long-term prestress losses, additional force in the longitudinal reinforcement caused by shear near the ends of the spans, the required shear reinforcement and the deflection and camber of prestressed beams.

The **Hazardous Waste Management Training Workshop** was in cooperation with the Hawaii DOT. It was held on September 10 and 11 at the Waikiki Beach Marriot Hotel. The DOT requested an environmental training consultant to instruct two courses in management of hazardous waste for generators and transporters of hazardous waste. 244 participants from the state, the counties and the private sectors were trained. Topics covered included identification and labeling of hazardous waste, storage/management of waste that included storage time, containers for storage and labeling, waste and pollution minimization techniques, record keeping, disposal and spill prevention and response of hazardous waste. For transporters of hazardous waste topics included transport time period of hazardous waste, storage of waste, using hazardous waste manifests and spill prevention and response. Other topics pertaining to storm water include the Clean Water Act, NPDES permit, Construction permit, Industrial facility permit and BMPs for construction.

Ending the quarter was the series of **Workzone Safety Workshop** being held on Maui, Kauai, Hilo and Oahu. The instructor, Gene Wilson, is an emeritus professor at the University of Wyoming and is the director of the Wyoming Technology Transfer Center. Safety features, worker safety and the new MUTCD were covered. In the safety features portion topics included clear zone and sight distance issues; roadside slopes and drainage facilities issues; traffic control issues associated with signing and sign supports; and pavement markings, delineation and road surface issues. This workshop develops the essential skills to protecting workers, the traveling public, and other employees while being involved in activities on the roadway. Improving on the job safety for the road and street crews is the primary purpose of the workshop.

For upcoming workshops and past newsletters, visit our webpage at:
www.eng.hawaii.edu/~hltap

Director's Note

by C.S. Papacostas

I am proud to announce that I have recently been elected on the Executive Board of the National LTAP Association to represent Hawai'i, Arizona, Nevada and California.

This election, along with Juli Kobayashi's continued service on the National Clearinghouse Advisory Committee, clearly place our relatively new program in a position of national prominence.

Also, at this year's national meeting in Vermont, our program received special recognition for establishing innovative partnering agreements with various industrial and professional groups.

This past quarter we were able and nimble enough to respond to two special training requests: the first was in response to a hazardous materials consent decree and the second was a special workshop on homeland security in response to the 9-11 terrorist attack.

With the help of our new executive and advisory committee chair Casey Abe, we expect to further strengthen HLTAP for years to come (see p. 1).

To help us identify your special training and technical assistance needs, please complete and return to us a copy of our workshop request form that is printed on page 11.

Me ke aloha!

Program Manager's Note

by Juli Kobayashi

It has been a very busy quarter with all the workshops that were held in July - September and the 2002 National LTAP-TTAP Conference in Vermont. We were very fortunate to have our staff attend and we really learned what it takes to put on a national conference. Yes, Hawai'i along with the rest of Region 9 (Arizona, California, and Nevada) will be hosting this grand event in July 2003. The theme will be, "Riding the Wave to the Future" and held at the Sheraton Waikiki Hotel. We are looking forward to having everyone come to our beautiful State and meet with some of our friendly local transportation personnel.

Casey Abe with the DOT's Highway Materials Testing Laboratory gave the formal invitation to the participants and the Hawai'i LTAP staff danced two very special hulas. Although we were all amateurs, I am really proud of the rest of the LTAP staff for trying their very best on stage. We were glad that no one seemed to notice the mistakes we made and we even received a standing ovation. Everyone is looking forward to the conference in Hawai'i!

Finally, we were surprised and heartbroken to hear of the passing of Walter Lum. He contributed to our newsletter since Summer 1999 and was one of our greatest supporters. We will miss his wisdom and kindness and wish to extend our deepest sympathy to his family.

STAFF

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http://www.eng.hawaii.edu/~hltap/

2002 National LTAP-TTAP Conference

HAWAII LOCAL TECHNICAL ASSISTANCE PROGRAM

REQUEST FOR WORKSHOP/TRAINING FORM

Please complete the form and fax to 956-8851. Attach additional information as needed.

We will canvass our clients to identify their level of interest in the proposed topic(s). Our Executive Board will consider your request at its monthly meeting. We will then inform you of the Board's decision and, if needed, request additional information.

Date: _____

Name/Title: _____

Organization: _____

Address: _____

City: _____ **State:** _____ **Zip Code:** _____

Phone: _____ **Fax:** _____ **email:** _____

Proposed Topics(s): _____

_____

_____

Target Audience: _____

Justification: _____

_____

Expected number of attendees from your organization: _____

Estimated number from: **State:** _____ **County:** _____ **Private:** _____

Number of Days: _____ **Preferred Dates:** _____
(list in order of priority)

Preferred Location: _____

Potential Instructors: _____
(include contact information ie. phone, e-mail, etc.)

Estimated cost: _____ **Your cost share (if any):** _____

HAWAII LOCAL TECHNICAL ASSISTANCE PROGRAM

The Hawaii Local Technical Assistance Program (LTAP) is a cooperative program of the University of Hawaii Department of Civil Engineering, the Hawaii Department of Transportation, Highway Division, State of Hawaii and the U.S. Department of Transportation Federal Highway Administration, Hawaii. The LTAP program provides technical assistance and training programs to local transportation related agencies and companies in order to assist these organizations in providing cost-effective improvements for the nation's highways, roads and bridges. Our office is located at:

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