HUMBOLDT STATE UNIVERSITY

ASCE

STUDENT CHAPTER
AMERICAN SOCIETY OF CIVIL ENGINEERS
ENVIRONMENTAL RESOURCES ENGINEERING

ERE MESSENGER

Volume 12, Number 1 Fall 1998

Panoche Burn Site Remediation

by
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Associate Waste Management Engineer
California Integrated Waste Management Board

We have all heard of Murphy's Law, a satiri cal proposition stating that if there is a possibility for something to go wrong, it will. I should have seen old Murphy coming when one million tires went up in smoke. The following article summarizes Phase II of the Panoche Burn Site Remediation performed by the California Integrated Waste Management Board (CIWMB) in cooperation with the U.S. Environmental Protection Agency (EPA), Region IX, Emergency Response Office.

The CIWMB Solid Waste Cleanup Program (SWCP) provides funds to remediate closed or abandoned solid waste sites and to clean up illegal disposal sites where the owner is unwilling or unable to do so. SWCP staff agreed to participate in the EPA's emergency removal action for the Panoche Burn Site at a meeting on August 29, 1996. On September 25, 1996, the CIWMB Board approved funding the remediation phase (Phase II) of the project by Resolution 96-400. Statutory authority for the project is in California Public Resources Code Section 48020, et seq., the Solid Waste Disposal and Codisposal Cleanup Program, which is administered and directed by the CIWMB.

On May 20, 1996, a fire broke out in nearly one million tires dumped in a box canyon in Fresno County, California. A major concern was the potential for pyrolytic oil to be generated and released down the canyon and into Little Panoche Creek. Because one tire can produce up to 2 gallons of oil, the potential existed for two million gallons to be discharged 300 yards into the creek. To minimize the release, the fire was allowed to burn and was contained up-canyon by an earthen berm. This decision was based on past tire fire fighting efforts where water accelerated the discharge of pyrolytic oil and caused massive runoff problems.

The smoke from the tire fire jeopardized the integrity of PG&E's electricity transmission lines that cross over the canyon. These lines carry more than 500,000 volts of electricity to the western half of the United States. According to a PG&E field representative, smoke has enough particulate matter to create an arc between transmission lines. A 1990 court action allowed PG&E to bury approximately 2 million tires in an area contiguous to the fire to protect the intertie lines that crossed directly over the tire pile. Approximately 1 million exposed tires were left outside PG&E right-of-way.

On May 22, 1996, the California EPA duty officer requested the U.S.

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In This Issue

Alumni Profiles

Tracy Nishikawa, PE
BS ERE 1981
Research Hydrologist
U.S. Geological Survey
San Diego, CA

I entered HSU in 1975 as an Oceanography major but soon switched to engineering, and received my B.S. in Environmental Resources Engineering in 1981. I passed the California PE exam in 1991.

Initially I was far from being a stellar student (I was terrible in Statics/Dynamics, Physics, and Chemistry) but in the last few years I found some classes I really enjoyed (Fluids, Numerical Methods, and Water Resources to name a few) and my GPA finally improved. Upon graduation, I was hired as a junior engineer by James M. Montgomery, Consulting Engineers (now Montgomery-Watson) in San Diego. To be honest, the skills I learned at Humboldt were poorly matched to my work at Montgomery because of the strict civil engineering nature of the projects I worked on. For example, I knew nothing of concrete mix designs or ductile iron pipe! I left Montgomery in 1983 to enter graduate school at UCLA. At UCLA, I joined other HSU alumni (James McCarthy, Klaus Rathfelder, LaDon Jones, Ted Cleveland, Bob McVicker, Karen Murphy, and Roger Putty) who were pursuing their graduate degrees. I was surprised to find how similar my major-field coursework was to my HSU coursework, so keep all your old homework and tests! At first, my goal was to earn my M.S. but after gaining teaching experience at UCLA as a teaching assistant I decided to pursue my Ph.D. I was conferred my M.S. and Ph.D. degrees in Civil Engineering (water resources systems) in 1985 and 1988, respectively. My dissertation topic was the optimal design of aquifer pumping tests.

In 1988, I accepted a faculty position with the University of Oklahoma. My duties included teaching graduate and undergraduate civil engineering courses, advising graduate students, and performing research in the numerical modeling of groundwater flow and transport. While at OU, I co-authored one of the first papers to apply a numerical method commonly used in supersonic flow (total variation diminishing) to the model advective-dominant solute transport. After two years in Oklahoma it was time to move on and I accepted a position with the US Geological Survey (USGS) in San Diego, California. I am currently a Research Hydrologist with the USGS.

As a research hydrologist, my duties include the numerical modeling of ground-water flow and transport, the simulation-optimization modeling of water resource systems, and publishing my findings in peer-reviewed journals and USGS reports. I recently completed a conjunctive-use optimization model in cooperation with the city of Santa Barbara. The city was interested in identifying least-cost water allocation strategies during a drought, and is using the model to manage their water resources. This work has resulted in a number of papers and reports. I am currently completing a ground-water flow model of Edwards Air Force Base in southern California. The model addresses excessive drawdown and land subsidence, and it will eventually be incorporated into an optimization model. I enjoy working for the USGS because it allows me to apply the knowledge I gained at HSU and UCLA to water-resources problems.

My wife, Gail, has her Ph.D. from UCLA in wastewater engineering. We have twin boys, Kyle and Connor, who are now 5 years old.

Wendy Humprhies
BS ERE 1996
Environmental Engineer
Winzler & Kelly Consulting Engrs

As an engineer at Winzler & Kelly, I work on a wide variety of projects ranging from traditional civil engineering to environmental contamination projects. Sometimes these projects can be very obscure and unusual. I also have begun specializing in the industrial hygiene field by becoming involved with lead-based paint issues and worker protection air monitoring. My main role at Winzler & Kelly is technical support. I analyze many different types of data, conduct field inspections, design systems, develop construction documents, perform various calculations, oversee field investigations, collect environmental samples and perform a wide array of other tasks.

I received my job offer from Winzler & Kelly the day before my graduation in May 1996, after sending out millions of resumes and interviewing during finals week. However, my efforts toward getting the job really began years before graduation day. I saw that work experience was the key to setting me apart from the rest of the crowd; and not only that, it was important to get exposure to the career that I thought I wanted. Therefore, I spent many summers as an intern for several different private companies and governmental agencies. These internships provided the invaluable experience and professional contacts that I needed.

My education at Humboldt State University also played a critical role in kick starting my career. I received an excellent education from all the engineering professors. They were always willing to put forth an extra effort. As it turned out, my education and experience made me well suited for the position at Winzler & Kelly, and I got the job.

I enjoy working on the wide variety of projects. Winzler & Kelly is a moderate size firm with six branch offices in Eureka, San Francisco, Santa

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My *Radioactive* Internship

by Anne Shatara, ERE Senior

Summer of 1997 was by far my most memorable, and the one filled with the most education about myself and the world I call home. Soon after the Spring 1997 semester came to close I was driving cross country to Illinois, getting away from everything that was wearing me down; the stagnant life of an engineering student who had lost all focus and all zest for classes and her future. I needed to get away from everything that represented school; Humboldt State, Humboldt County, California.

As I would have liked to throw caution to the wind, hop in my car and drive to a new place with no idea what the future would bring, that was not my plan. I had been selected to work under the supervision of an environmental engineer doing research at Argonne National Laboratory outside of Chicago, Illinois. My first job in something related to my major. At long last the end of summers full of fast-food and meaningless work.

The previous summer I had stumbled upon the US Department of Energy's web site and found my way to their national laboratory system. A few mouse clicks later I found myself at the Argonne National Laboratory Department of Educational Programs web page. Not only did they have a summer internship program, they offered students the opportunity to work with radioactive waste. Though this may not interest some, I was excited. I had held a strange interest in radiation, beginning with a 6th grade trip to the Los Alamos National Laboratory.

I sent away for information. By October, I had weeded through all the papers and picked two labs that offered work in radioactive waste. I filled out the applications, sent transcripts, and collected letters of recommendation. A few weeks later I received postcards from Brookhaven in New Jersey and Argonne in Illinois. My applications had been received and I would be notified of a decision by the beginning of April. And so began five months of waiting.

The end of March was rough. I was first presented with a rejection letter from Brookhaven. My heart sunk; rejection is never easy. The following week I received a thin envelope from Argonne. This time it was good news, actually it was great news. I was offered a position working with Cesium-137. The next day my acceptance letter was on its way to Illinois. I had a summer job and was on cloud nine.

The project involved working with contaminated milk. It sounded very interesting and right up my alley. My mind was racing with excitement as I drove the 2,000 miles to Joilet, Illinois. It was home for the next 10 weeks.

I was offered a position working with Cesium-137.

The first week in Joilet I met a multitude of students working on some of the most interesting projects. We were all studying different aspects of science and of varying levels. I was the old lady, being 22 years of age. It's hard to believe that this considered old, but the average age was 20.

About 100 of us lived in the dormitory of a small private college. We were bussed to the site every morning and back every night. We socialized during our lunch hours at the cafeteria, the pool, and volleyball nets, and played soccer and basketball after dinner. I think the most exciting part of those first few weeks was watching the Bulls take the championship. The males were slightly more excited than the females of the group, but it was very exciting nonetheless.

The weekends were ours for the taking. Chicago was a short drive or train ride away. A new city with such excitement. We hit all of the museums, the Shedd Aquarium, the Brookfield Zoo, and the Rock and Roll McDonalds (which was next door to the Hard Rock Cafe and across the street from Planet Hollywood). We drove up to Lake Geneva in Wisconsin for a day of jet skiing and playing on the beach. There was the Blues Festival and the Taste of Chicago. We viewed the city from the top of the Sears Tower. Those of us that were legal enjoyed the diversity of night life the city had to offer. The bar and dance club choices were endless.

Though we had fun during our off time, there was still a job to do. But, it was as fun and exciting as the city. I had a few training courses I had to take before I was left alone in the lab. I found it so interesting that it was more fun than work. During those two weeks of training classes I was also shadowing the women involved with the project until I was fully trained. There were many procedures, but they were all written down somewhere, so it wasn't too overwhelming

My supervisor, Linda, became pregnant early on during my stay. Thus, she did not spend much time in the lab with me. This meant I was even more on my own. We communicated daily via e-mail and the phone. She put a lot of responsibility and trust in my lap. Her office was on the other side of the site as well, so she rarely checked on me. For the most part I was on my own. This suited me fine, and made me feel very grown-up. It gave me a renewed sense of self.

The project I worked on was an environmental health based study. More than ten years after the Chernobyl nuclear reactor accident, milk produced in Ukraine had levels

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ERE and ABET 2000 Accreditation

by Beth Eschenbach, ERE Department of Environmental Resources Engineering

This fall, the Environmental Resources Engineering program at HSU will be visited by a team from ABET (Accreditation Board for Engineering and Technology). After reading our program Self Study document, the team will interview students, faculty and administration, review materials and visit our facilities. At the end of this visit, the team will make an accreditation recommendation to the ABET board which will approve or reject the recommendation in July of 1999. This article will summarize the accreditation process.

What is ABET Accreditation?

The Accreditation Board for Engineering and Technology (ABET) started in the 1930's as the Engineer's Council for Professional Development (ECPD). The ECPD began accrediting engineering education programs in order to assure that graduates were adequately prepared to enter and continue the practice of engineering. Currently there are:

- 1551 accredited engineering programs at 319 institutions,
- 753 accredited engineering technology programs at 242 institutions and
- 51 accredited related engineering program at 40 institutions.

In order for an engineering program to be accredited, the program has to show that it meets the ABET general and the program specific criteria. The general criteria are criteria that ABET believes that all engineers should meet. The program criteria are specific to the particular field of engineering. For example the ERE program needs to meet the "Program Criteria For Environmental and Similarly Named Engineering Programs". These criteria can be found at <http://www.abet.org>.

In the early 1990's, the Engineering Dean's Council told the ABET board that the accreditation process was too rigid and detailed. The process was "input" based, not "outcomes" based. Many referred to the process as "bean counting." The ABET criteria specified what a program should do (e.g. how many courses should be offered in design, engineering science, math, physics etc.). The accreditors would come and "count" how many courses a program had and decide if it met the requirements.

What is ABET 2000?

In the 1980's, TQM (Total Quality Management) and CQI (Continuous Quality Improvement) philosophies took hold in industry. These philosophies had an impact on engineering education as well. The Dean's Council said that the ABET requirements did not foster creativity and continuous improvement in engineering education, and stated that if ABET did not change the requirements, a large group of engineering colleges would no longer seek accreditation!

ABET 2000 Criteria arose from TQM and CQI philosophies and are based on "outcomes" of an engineering program instead of "inputs." The objectives of ABET 2000 are to:

- Assure that graduates of an accredited program are adequately prepared to enter and continue the practice of engineering,
- Stimulate the improvement of engineering education,
- Encourage new and innovative approaches to engineering education,
- Identify these program to the public.

In order for the ERE program to be accredited we need to show that our graduates meet the criteria set by ABET and by program criteria set by a number of professional societies including the AAEE (American Academy of Environmental Engineers). ABET does not specify what our program has to do in order to meet that criteria, but we must demonstrate to ABET that our graduates meet the general and program criteria found at <http://www.abet. org> .

A program demonstrates that it is meeting the ABET 2000 criteria by putting an assessment process in place. Information collected by the assessment process should determine if the criteria are met. The information should also be used to suggest improvements to the engineering program so that CQI can take place.

There are two cycles of assessment. One cycle shows that the programs' constituencies (students, employers, faculty, taxpayers etc.) should play a part of determining the program's educational objectives. These constituencies can provide data and help assess the data collected from the assessment process.

The second cycle shows that each educational objective is assigned outcomes that are required in order to meet that educational objective. For each outcome, there are strategies that are put into place in order to achieve an outcome. In addition, for each outcome, there need to be methods to assess if the outcome is achieved. For each of these assessments, there needs to be a performance criteria so that one will know if the outcome is achieved.

Once the assessment methodologies and the criteria are determined, the program uses its assessment methods to collect data. The data are evaluated and decisions are made about how the program should be changed so that it can improved.

How is ERE Preparing for ABET 2000?

On July 1, 1998 our program must submit a Self Study report to ABET, documenting that we have a process in place to assess the outcomes of our program. Here is a summary of some of the work that has occurred, in or-

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Environmental Resources Engineering: What's in a Name?

by Robert Gearheart, HSU Department of Environmental Resources Engineering

Good question. Where did the word "Resources" in the name of our program come from? It is certainly a legitimate question, especially when a potential employer asks a graduating senior," Why the 'Resources' in the Environmental ——— Engineering title of your program?"

Without backtracking too far, the answer is in the historic development of the ERE program. In the period from the mid 1940's to 1973 the HSU engineering program was a Civil Engineering program. During the period of the early 70's the Dean of Engineering at Stanford University, Dean Terman, was commissioned by the state to determine the minimum carrying capacity of an engineering department based upon numbers of graduates. At the time HSU was graduating about 10 CE's a year and was identified as a candidate campus for elimination of their engineering program. Coincidental at the national level with this local development was the bifurcation of what was classically referred to as Sanitary Engineering from the Civil Engineering Programs into new undergraduate and graduate Environmental Engineering. This was a response to the new societal and political awareness of environmental and natural resource issues. These new environmental engineering programs generally became adjunct programs to civil engineering, the differences being the senior elective courses in the media areas of air pollution, water pollution, hazardous waste, solid waste management, and radiological health. The emphasis in these early programs for the most part was in the contaminated media area.

Back to the survival of engineering at Humboldt State. HSU hired a retired faculty member, Professor McGaughey from U.C. Berkeley, to design an engineering program based on the special strengths in natural resources associated with HSU. Professor McGaughey, was a renaissance engineer in the true meaning of the word. He had three distinctly different distinguished careers, all of which produced direction and innovation in various areas of the environment. As a senior engineer for the then California State Health Department he initiated studies in water reuse, solid waste management/recycling, eutrophication studies, etc. On top of his "three professional careers" he was a recognized poet and man of letters.

Professor McGaughey saw an opportunity at HSU to produce engineers who had more than speaking acquaintance with natural resources. He envisioned an engineer with a strong science background in biology and chemistry with upper division coursework in engineering and natural resource, and he laid out the framework for a new program in Natural Resources Engineering. At that time, however, Engineering was in the College of Science which was separate from the College of Natural Resources, and the latter did not want its "name" (Natural Resources) used in the title of a department in another college. The compromise title was Environmental Resources Engineering.

Initially the program had eight emphasis areas which were later reduced to six: water resources, water quality, air quality, geotechnical, ocean resources and energy resources. In those days the program was not accredited. In fact, there were no accredited environmental engineering programs then, only sanitary options within Civil Engineering.

New faculty were hired who were resource conscious and multidisciplinary: an ocean/river engineer, an air quality/mechanical engineer, a biologist/wastewater engineer, a chemist/alternative energy engineer, an operation research/water resources engineer, a soils/geotechnical engineer, a public health engineer, a water resource/hydraulic engineer, a water quality modeler, etc. By the early 80's, the ERE faculty was multidisciplinary and involved in a wide range of local, regional, national, and international resource management and environmental protection issues. It was at that time that the program was first accredited.

Just as old rivers leave their trace in the alluvial formation so does the early philosophy of ERE program leave its trace in our present program. Required courses such as environmental monitoring, system analysis, environmental impact, public health engineering, solid waste management, and transport phenomena are unique in combination to this program. Elective design classes in building energy analysis, groundwater, environmental geotechnology, water quality analysis, water resource management, etc. are courses normally found at the graduate level in environmental engineering. What has unfortunately been lost in 25 years is the flexibility of students to not only take nontechnical electives but also to be able to develop an academic strength in natural resources/science. On the other hand, the original program allowed students to focus narrowly on a single environmental resource engineering speciality; today all students must take a broad range of environmental resources engineering topics. Still, there remains today a compelling need to produce interdisciplinary and multidisciplinary engineers to assist in sustainable development that is resource wise and leaves only traces of a footprint.

Now you know where the word "resources" came from. **ERESA**

Why El Niño Meant More Winter Storms For Humboldt

by
Paul W. Blank
HSU Department of Geography

El Niño has been blamed for the incessant storms that battered the North Coast last winter. So, what is this El Niño phenomenon? It is not completely understood, but it involves the spread of unusually warm waters over the eastern Pacific Ocean. Some liken this to water tilting in a bathtub. When the Pacific waters tilt toward the Americas, warm surface waters override the usual cold currents that well up from the depths and run along the coasts of North and South America, devastating many fishing grounds in the process.

At the same time, on the other side of the Pacific, cooler waters are exposed by the migration of the warmer surface waters toward the American side of the basin. Cold water tends to cool the air traveling over it, which dissipates any tendencies for uplift. Since uplift is necessary for precipitation, the suppression of uplift by the unusually cold waters of the western Pacific has led to droughts in Australia and Southeast Asia. Drought combined with excessive clearcutting and burning led to the spectacular fires and smog that blanketed much of Southeast Asia this year.

On our side of the Pacific, the spread of warmer waters led to increased rainfall for two reasons. First, air has more of a tendency to rise when passing over the warm water. This tends to intensify rainfall at a local level, and can even cause some local thunderstorms or other so-called convectional precipitation events. The major reason behind the increase of storms, however, has to do with another phenomenon.

In general, winter storms are caused by the movement of the Jet Stream. The Jet Stream is a high-speed core of winds that blows from west to east at high altitudes in the midlatitudes (30-60 degrees) in both the Northern and Southern Hemispheres. Although a Jet Stream can be found in any season, it tends to be more intense in the winter because the temperature of polar regions drops dramatically with the loss of solar radiation during the polar winter night. As polar air loses incoming solar radiation, it cools and becomes more dense, sinking into a compact mass. Meanwhile, tropical air, receiving a more-or-less constant supply of solar radiation, remains warm and light. A vertical transect of the atmosphere at the boundary between cold, dense polar air and warm, light tropical air, would show a vacuum over the top of the polar atmosphere. And there is a tendency for high altitude winds to blow from the high tropical atmosphere toward the vacuum over the top of the low polar atmosphere.

But the winds never reach the poles. Why? Because the spinning earth deflects the air (to the right in the Northern Hemisphere, to the left in the Southern Hemisphere) so that winds, instead of blowing from tropics to poles, blow from west to east. That is why the midlatitudes are dominated by the so-called westerlies. The scientific term for the deflection of winds due to the spinning of the earth is the Coriolis Effect. The high-speed core of these winds is the Jet Stream. The Jet Stream is really a fast, high-altitude river of air that blows all the way around the planet from west to east in both the Northern and Southern Hemispheres.

But why does El Niño intensify winter storms? Because it is associated with the spread of warm surface waters over the eastern Pacific, and the air over this water, already warm, becomes even warmer. Thus, the atmosphere over the tropical Pacific becomes lighter than usual, while the polar air remains cold and dense, and the pressure gradient between tropical and polar air becomes more intense during an El Niño event. And now for the last piece of the puzzle: the steeper the pressure gradient between tropics and poles, the faster the Jet Stream. And the faster the Jet Stream, the more storms. Why is this?

Picture a jump-rope tied to a fence post. If you swing the jump-rope lightly, it will begin to snake into sine curves. The faster you swing, the higher the oscillation of the rope. A similar thing takes place when an El Niño occurs. The steeper pressure gradient makes the winds blow faster. The faster the winds blow, the more sinuous the Jet Stream becomes. And it is the bends and curves in the Jet Stream that generate storms. The explanation for this is complex, and involves changes in vorticity as winds enter or leave the high-speed core of the Jet Stream, creating high-altitude vacuums in the poleward-moving bends of the Jet. Upper-level vacuums suck up air from the surface, which condenses into clouds and eventually creates precipitation. The fast-moving Jet Stream, by becoming more sinuous, generates more storms which are carried along by the vacuums aloft and bring in their wake heavy downpours, high winds, downed trees, power outages, flooded roads, and all the other delights we experienced last winter.

There is still much to learn about the El Niño puzzle. Some scientists are predicting that the powerful El Niño will be followed by its opposite – La Niña. In this case, the warm waters move to the other side of the Pacific, while our side experiences a more intense cold episode. This may mean a slacking off of storms for California, although the Pacific Northwest may still receive more rainfall in a La Niña event. Once again, the atmospheric mechanics are complicated. Perhaps it is best to wait and see what happens, and if we get a La Niña, another article will help explain that. **ERESA**

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EPA Emergency Response Office to respond to the tire fire. The U.S. EPA mobilized its Superfund Technical Assessment and Response Team (START) consultant and met with fire agencies to determine a course of action. At the time of the fire, the 1 million exposed tires were in contact with the 2 million buried tires because only soil was placed over the top of the tire pile. As a result, the fire spread from the exposed tires to the buried ones in the upper canyon. At the meeting, the agencies decided to allow the tire fire to burn and to control and contain the fire and pyrolytic oil runoff. During Phase I of the emergency removal action, the U.S. EPA authorized $200,000 for its Emergency Response Cleanup Service (ERCS) contractor to prevent the pyrolytic oil from discharging into the creek, excavate and extinguish the tires under combustion at the interface between the buried tires and the fire, and prevent the further spread of the fire into the buried tires.

After the fire, approximately 4 acres were covered with 1-5 feet of ash, metal debris, and pyrolytic oil residue. The ash contained high levels of zinc ranging from 32,000 milligrams per kilogram (mg/kg) to 156,000 mg/kg and other contaminants such as petroleum hydrocarbons. Zinc levels in the soil exceeded the EPA's preliminary remediation goal of 10,000 mg/kg for soil in industrial areas, and the California Department of Toxic Substances Control's criteria for hazardous waste of 5,000 mg/kg. Because of the proximity of the hazardous ash to the creek, the EPA requested the CIWMB to remediate the Panoche Burn Site.

The Site is approximately 2 miles west of Interstate 5 on County Road J1 (Little Panoche Road) in northern Fresno County, in the southwest quarter of Section 21, Township 13S, Range 11E, on Parcels 009-041-28 and 009-041-30 in Book 29 of Fresno County Records. It is in a Y-shaped canyon along the northern edge of the Panoche Hills. The canyon ranges from approximately 50 to 100 feet deep, and the slopes of the canyon walls average about 2:1 (horizontal:vertical) but range from 1:1 to 4.5:1. Numerous naturally occurring ravines carry water from the Panoche Hills to Little Panoche Creek.

The CIWMB began the tire ash remediation on October 17, 1996, and completed the project on December 20, 1996. The project encompassed removing ash from the side slopes and lower canyon, excavating oil-saturated soil, consolidating the ash residue in the upper western canyon, placing a compacted monolithic, 5-foot clay cover over the ash material, installing erosion protection devices, and constructing a retention basin. Approximately 18,070 cubic yards of burn ash and contaminated material were encapsulated in the upper part of the canyon. The total expenditure for the remediation project was $159,810 for engineering design, construction management, environmental sampling, and surveying and $487,994 for construction.

The project lasted 20 weeks and was completed on February 4, 1997, after repairing the erosion damage from the January 1997 storms. This is where I met Mr. Murphy. In addition to the usual equipment break downs, getting buried in the mud, consultant's 4x4's being high centered, class 4 thunder storm's, and daily ritual of cutting off the steel belts of the burn tires wrapped around both dozers with a blowtorch, many new experiences were gained.

On November 6, 1996, I discovered two new stains at the upstream side of the old check dam. While the contractor was removing the native clay material to increase the size of the retention basin, stains appeared as if groundwater had been reached or a layer containing moisture was exposed. These stains differed from the previous stains on the side slopes. All of the ash material and residue had been removed from this area during the week of October 28, 1996. Upon close examination, I discovered the soil was lightly coated with a heavy oil residue that had a faint odor of mothballs.

By November 19, 1996, approximately 3,000 cubic yards of oily material had been removed and placed in the upper canyon. Pyrolytic oil was observed seeping from the cut slope along the north face. The CIWMB and CH2M HILL engineers noted a strong odor emanating from the canyon bottom. Sample results showed the odor was due to aromatic hydrocarbons and naphthalene. By December 2, 1996, the excavation was ceased and a new design was quickly implemented.

Initially, all or most of the pyrolytic oil was assumed to have been consumed during the fire. However, the CIWMB investigation showed the oil was 30 to 40 feet below the original surface, 50 to 100 feet long, and 25 to 30 feet wide. After examining the removed soil at the bottom of the retention basin, I determined the pyrolytic oil from the tire fire permeated through a gravel lens in the upper part of the canyon and traveled downward toward the creek. The lens acted as a conduit allowing the oil to ad-

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CALENDAR

Join us and take part in these Fall 1998 ERESA activities.

AUGUST
Welcome Picnic
Fall Tutoring Program Begins

SEPTEMBER
Monthly Speaker Program Begins
Field Trip to be Announced

OCTOBER
ASCE One-On-One Dinner

NOVEMBER
Thanksgiving Dinner & Follies
Election of New ERESA Officers

DECEMBER
Happy Holidays!

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vance and bypass the above clay layers. Because the oil stain migrated along a gravel lens down the canyon, the contractor was directed to perform exploratory trenching to locate the extent and depth of the contamination. Trenching indicated the oil migrated under the majority of the old check dam and ended at a natural clay barrier in front of the new retention dam. The natural barrier prevented the oil from contaminating Little Panoche Creek. To reduce the possibility of the oil contaminating the surface water within the basin, the design team elected to remove as much of the stained soil as feasible. When the excavation was stopped, pyrolytic oil was observed in a gravel lens located at the bottom of both slopes and at the toe of the fill. The excavated material was placed in the upper region of the fill on top of the ash and then capped with soil. Based on actual scraper counts, a total of 5,600 cubic yards of oil-contaminated soil was placed on top of the fill area under the foundation layer.

Unfortunately, not all of the pyrolytic oil material could be safely removed. Removing all the contaminated gravel would have required a massive construction effort. First, the entire 15,000 cubic yards of burn ash would have to be temporary relocated. The pyrolytic oil could then be excavated from the bottom of the canyon. Next, both of the 180-foot slopes would have to be cut back from a 1.5:1 (horizontal:vertical) to at least 3:1 above the stains to safely excavate the material, or extensive shoring would be required. Plus it was December and very heavy, expensive equipment was being "consumed" by the clay cover.

After reviewing the condition of the stain with the design team, EPA on-scene representative, and the contractor, I decided to place a clay plug throughout the stained area and a 60-mil co-extruded textured HDPE geomembrane over the clay fill. This option was the best available alternative considering the weather limitations, expenditure limits, technical situation (e.g., slope stability, excavation limits, shoring requirements, and slope steepness), and that free product (oil) was no longer flowing from the stained areas.

So remember, the aparent best designs may need to be thrown out the window on the first day you are remediating solid waste, hazardous waste, or oil spills projects. Some day you will need to step back from the problems you encounter and use your education, intuition and experience to complete your project, because Mr. Murphy will stop by.

I received my BS in Environmental Resources Engineering from HSU in 1992, and I am a registered professional engineer. I have worked the past four years for the California Integrated Waste Management Board's Solid Waste Cleanup Program as an Associate Waste Management Engineer. My responsibilities include project management for solid waste remediations, construction management duties, and solid waste and illegal disposal sites investigation throughout California. I provide technical assistance and landfill fire investigation services when necessary, and I have supervised the remediation and investigation of a number of underground landfill fires in California. **ERESA**

If Dr. Seuss Were a Programmer

Here's an easy game to play.
Here's an easy thing to say.

If a packet hits a pocket on a socket on a port,
And the bus is interrupted as a very last resort.
And the address of the memory makes your floppy disk abort,
Then the socket packet pocket has an error to report!

If your cursor finds a menu item followed by a dash,
And the double-clicking icon puts your window in the trash,
And your data is corrupted 'cause the index doesn't hash.
Then your siutation's hopeless and your system's gonna crash!

You can't say this?
What a shame, sir!
We'll find you
another game, sir!

If the label on the cable on the table at your house
Says the network is connected to the button on the mouse,
But your packets want to tunnel on another protocol,
That's repeatedly rejected by the printer down the hall,
And your screen is all distorted by the side affects of Gauss,
So your icons in the windows are so wavy as a souse,
Then you may as well reboot and go out with a bang,
'Cause as sure as I'm a poet, the sucker's gonna hang!

When the copy of your floppy's getting sloppy on the disk,
And the microcode instructions cause unnecessary RISC.
Then you have to flash your memory and you want to RAM your ROM.
Quickly turn off the computer and be sure to tell your mom!

"The most beautiful thing we can experience is the mysterious. It is the source of all true art and science."
—Albert Einstein

"Life shrinks and expands in proportion to one's courage."
—Anais Nin

Alumni

• *continued from page 2*

Rosa, Saipan, Guam and Palau. Work often gets distributed among the six offices according to expertise and work loads. In addition, new and interesting local projects are always coming in. You never know what will be next, and this makes work interesting and challenging. I also enjoy the environmental and industrial hygiene projects because they are like detective work. It is fun to begin with a hypothesis, and then investigate and collect data to see if it is correct.

Consulting can be a fun and challenging career. However, it is not for every one. Consulting firms thrive on competition, and more importantly, they survive on team work. If you are considering consulting, I highly recommend taking initiative early on. The best path is the one that feels right for you. Develop the skills and talents that you have, and think about how you can apply them to your career. I recommend getting an internship to develop your work experience and see whether consulting (or engineering for that matter) is really what you want. Developing other related experiences in construction or AutoCAD drafting can also be very beneficial, and you can never underestimate the importance of your written and verbal communication skills. Finally, don't take your time in school for granted. The time to study and learn the engineering material will never get any better than when you are in school full-time. I don't believe the saying, "forget everything that you learn in school because you really learn everything in the real world." It is not true! Although I have learned a great deal since graduation, I still need to draw on much of the material that I learned from the engineering professors at Humboldt State University.

On a larger note, it is most important to pursue your own passions in life. Engineering will not get you rich, but it can be a very rewarding career if it is right for you. GOOD LUCK! **ERESA**

What's Happening in Water Resources?

by Brad Finney, HSU Department of Environmental Resources Engineering

The current work being done in the ERE water resources graduate program is focus ing on the problem of saltwater intrusion. Our primary interest is in increasing our understanding of the nature and behavior of coastal groundwater systems. Specifically, conceptual groundwater management models are being developed for aquifers located on the islands of Oahu and Hawaii. We use advanced numerical models capable of simulating complex situations common in coastal aquifers such as, density dependent flow and mass transport, areal recharge, and complicated geology and boundary conditions.

Two-dimensional and three-dimensional studies are presently under way. The two dimensional studies involve cross sectional models based on actual Hawaiian aquifers. The objective of the two dimensional models is to simulate the effects on the hydraulics and transport of the groundwater resulting from pumping over time. SUTRA, a density dependent finite element groundwater model, is being used for these analyses.

The three dimensional investigation, due to the computational demands of such models, is limited to a laboratory scale model of a hypothetical coastal aquifer. The objective of these analyses is to quantify the impacts that spatial averaging of the governing equations has on the predictive behavior of two dimensional simulation models. The predictive ability and computational tradeoffs of 2D vs. 3D modeling efforts is also under investigation. **ERESA**

Humboldt State University SWE Student Section

by Randi Field and Alexis Phillips

HSU Society of Women Engineers Student Section was honored to accept the charter certificate at the Chartering Banquet on December 6, 1997. Claire Thielien, Golden West Region Director, presented Humboldt's SWE officers with the chartering certificate. She also emphasized the importance of SWE by relating the formation of the national SWE and the mission statement,"SWE stimulates women to achieve full potential in careers as engineers and leaders, expands the image of the engineering profession as a positive force in improving the quality of life, and demonstrates the value of diversity."

The mission of SWE at HSU is,"To support women in science and engineering, encourage awareness of environmental engineering, and provide opportunities to develop professional skills."

The vision of SWE at HSU is,"To become a key stepping stone for ERE students' professional development, and to develop a significant outreach program for young women."

You Might be an ERE Major if ...

you know the direction the water swirls when you flush.
you know vector calculus but can't remember long division.
it is sunny and 70 degrees outside, and you are working on your computer.
you'll assume a "horse" is a "sphere" in order to make the math easier.
you introduce your wife as "mylady@home.wife".

ABET 2000

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der to prepare this document:

• Last Spring, the ERE faculty developed the ERE program Mission Statement and Program Objectives. Professors Chamberlin, Eschenbach, Gearheart and Lehman worked as a subcommittee preparing this document with input from the other faculty members. These objectives are now being reviewed by the ERE advisory committee. They will soon be published on the web.

• I attended several conferences and workshops in order to understand the ABET 2000 requirements.

• In the Fall of 1997, the ERE Advisory Committee was formed. (Watch the ERE web pages for a list of these people). This committee has been completing surveys regarding the efficacy of our program.

• At the beginning and ending of each semester, the faculty have met at "faculty retreats" in SD 23 to review the program.

• ERE students Bradley, Bundy and McGregor have been revamping the ERE web pages. I encourage you to review the pages at <http://www.humboldt.edu/~ere_dept> and suggest improvements.

Here is an example of how the assessment process is improving our program. This fall I sent a survey to the ERE Advisory Committee, asking the committee to identify the program's strengths and weaknesses. (The committee is a representative of our constituencies). Overall, the committee gave the program excellent reviews, but agreed that one of our educational objectives, developing technical communication skills, is not addressed well. So this January, the faculty met and reviewed how we teach technical communication in each of our courses. We each committed to try something different this semester. At the end of the semester, the faculty will meet again to determine if we thought the program improved. You will also be asked in your courses if you think your technical communication skills improved at all this semester.

This example of using the assessment process to identify an area of improvement is exactly what ABET 2000 wants to encourage.

What Can You Do?

If you have any questions about the accreditation process, please contact me. If you have suggestions about how to improve our program, pass them on to any ERE faculty member. Hopefully you can see that input from ALL our constituencies is very important. Just as each of us has room to grow and change, our program will always have room to improve. Please get involved! **ERESA**

Radioactive

• *continued from page 3*

of cesium-137 that often made it unacceptable for human consumption. Finding a way removing the radioactive material from the contaminated milk is crucial to the health of the Chernobyl-area people, since it alone is the source of 80% of the diet-related radiation.

Argonne National Laboratory (ANL), under U.S. Department of Energy funding, has been evaluating a magnetic separation technology, MAG*SEPSM, developed by Selective Environmental Technologies, Inc. This technology consists of magnetic-core particles coated with a selective resin. The particles selectivity adsorb radioactive ions and heavy metals from a liquid matrix onto the resin. Those with the absorbed contaminant are then retrieved from the liquid medium via electromagnetic filtration and regenerated for reuse.

In 1993, ANL conducted a series of tests to evaluate the ability of MAG*SEPSM to remove Cesium-137 from milk spiked to levels approximating those found in Ukrainian milk. These tests, witnessed by Ukrainian authorities, generated preliminary data that confirmed the potential for successful treatment of milk and provided direction for further studies.

I worked with these particles and used them to decontaminate milk I had spiked with radiation. I was able to use my research to write my senior project. In the process I learned more about what radiation can due to the human body and the adverse effects of a nuclear meltdown.

I was given the opportunity to stay on through the fall semester and finish up the phase of the project I was working on. Though I was anxious to complete the remainder of my coursework and graduate, I just wasn't ready to return to the daily grind of the life of a student. It was a hard decision to make, especially without my parents support. My academic advisor wouldn't commit to "y es" or "no" advice. I was told if it is in my best interest in the long run, stay, otherwise come back to school. It was ultimately my decision and I decided it would benefit me to stay through December.

In retrospect, I am glad I stayed on. I was able to finish up the work on the milk project and was given the opportunity to work in a mobile lab out at a dump site. I was working with analytical chemists looking at soil samples, and was able to work with others and learn a little something about gas chromatography. This work really peeked my interest in soil remediation and geology. It was an area of study I had never really considered before.

Alas, this great opportunity came to a close in December of 1997. I had to come back to California and Humboldt State to finish up my degree. I returned to classes with a new outlook. I had always seen the light at the end of the tunnel as an oncoming train. I had doubts about my major and about my ability to work in the engineering field. After completing six months of work, I can honestly say I see the light at the end of the tunnel as my future and am ready to take it on! **ERESA**

Ambition Brought Me from Ghana to HSU

by Merci Lawson-Doe, IDT Graduate Student

My academic goals and my desire to support the development of human resources to solve local problems in developing countries are what brought me to HSU and the International Development Technology (IDT) graduate program. I am from Ghana, West Africa, and I have lived through different types of cross cultural challenges in Ghana, Europe and the US.

My parents separated when I was two years old, and my mother, who died last year, took custody of me. Though my mom was a Home Economist and the Headmistress of a Junior Secondary School, her pay barely saw us through the month. My father, who is an educationist and a Headmaster, was not interested in my education at all. You see, girls in Ghana before the 1990's were not encouraged to go to school at all. They were supposed to stay at home and learn from their mothers how to take care of the home. The girl child was supposed to be given away in marriage, and parents did not waste resources on her education. However, the ambitious ones, like my mother, were able to cut through the traditional stereotypes. She managed to get her undergraduate degree in Home Economics. She was the one who encouraged and motivated me to make sure that I had a good education. She supported me with whatever resources she had to see me through my pre-school, primary and high school education. When I completed high school in 1989, I taught general science for one year at the Esikadu Junior Secondary School as part of the Ghana government national service scheme. During this time I joined the 31st December Women's Movement which is a non-governmental organization involved in motivating and empowering women to participate in the development of their communities and the country as a whole. The group encouraged women to be involved in water supply, sanitation, and other community development oriented projects. This was were I found the desire to develop the skills necessary to solve problems involving basic needs in Ghana. I was motivated to further my education and start a profession that would provide me with the financial support I needed to accomplish these goals. Through the organization I received a scholarship in 1990 to study petrochemical engineering in Russia.

I had no knowledge of the Russian language or the country at that point. However, I accepted the scholarship and the challenge to leave my home and live in a foreign country for six years. The scholarship was for undergraduate and graduate programs. It took me one academic year to study the language at the Moscow Chemico-Technological Institute in Novomoskovsk, Russia. In September 1991, I was admitted to the Moscow State Institute of Oil and Gas and, in June 1996, I completed my Masters in petrochemical Engineering. The topic of my thesis was Research and Synthesis of Antiwear and Anti Corrosive Additives to Hydraulic Fluids. This completed the first part of my academic goals.

The next part is what brought me to the U.S. in 1996. I received a sponsorship to study in Midland College, Texas for one year. There I had the opportunity to refine my language (English and French) and computer skills. I was involved in Students in Free Enterprise, Phi Theta Kappa, and Toastmasters club activities. I also used that year to search for the academic institution that would provide me with the direction and support I needed to pursue a career in my areas of interest. Humboldt State University, with its strong and well known Environmental Resources Engineering program, became my final choice. In 1997, I was introduced to Dr. Gearheart through a good friend and benefactor. I interviewed with Dr. Gearheart, who on the basis of my career interests, encouraged me to apply for the Masters Program in International Development Technology at HSU. So far, the program has been a very educational and informative one in terms of my interests.

I think I made the right decision coming to HSU. I am now in my second semester of the program and hope to complete my degree in the fall of 1998. I am also confident that, at the end of the program, I will be able to help solve the basic needs and problems with a developmental oriented job either in Ghana or another developing country. **ERESA**

Top Ten Reasons to
Date an Engineer

1. Complimentary Tutoring
2. Large Earning Potential
3. Can handle stress and strain in relationships
4. Know all the dynamics of relative motion
5. Learn about the benefits of friction and viscosity
6. FREEBODY analysis
7. Always back up their hard drives
8. Trained to do it right the first time
9. Specialized in experimentation
10. Can go all night with no hint of fatigue

"Too much of a good thing can be wonderful."
—Mae West

"Like a kite
Cut from the string
Lightly the soul of my youth
Has taken flight."
—Ishikawa Takuboku

Thanks for Making It Possible...

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