COURSE EVALUATION SUMMARY

COURSE EVALUATION SUMMARY:

ITRC/RTDF TRAINING COURSE:

NATURAL ATTENUATION OF CHLORINATED SOLVENTS IN GROUNDWATER

FIVE COURSE SUMMARY

-FINAL-

March 1999

Prepared by
The Interstate Technology and Regulatory Cooperation Work Group

In-Situ Bioremediation Work Team

ACKNOWLEDGMENTS

Numerous groups directed the development and execution of this course. The following provides credit to specific organizations for their role in the success of the training:

The ITRC is a state-lead, national coalition with the mission of creating tools and strategies to reduce interstate barriers for the deployment of innovative hazardous waste management and remediation technologies. They coordinate a regulatory partnership, which budgets its grants from DoD and DoE to the Western Governor's Association (WGA) and the Southern States Energy Board (SSEB). In turn, the WGA and SSEB distribute the funds to the different ITRC project workgroups. The ITRC Work Group recognizes the importance of training and education in regards to this technology, which is rapidly becoming a preferred remediation tool.

The Industrial Members of the RTDF Bioremediation Consortium developed the curriculum and prepared the training course workbook in cooperation with the ITRC. In addition, they allocated time to instruct the course and provided training models and exercises.

The SSEB prepares and mails advertisements for various courses, reserves conference rooms, conducts registration, collects fees, reimburses state expenses, and sends out surveys to participants. The SSEB also serves to assist state regulators, support contractors, and the WGA in preparing course evaluation questions.

The WGA is a state association responsible for providing grants to state faculty and providing contractor support for the compilation of survey data.

Coleman Research Corporation is responsible for coordinating proctors for each training course, preparing the course evaluation summaries, assisting in developing an organized format for the curriculum, and providing an effective framework for the training.

The ITRC In-Situ Bioremediation Work Team (made up of state and federal regulators, stakeholders, and support contractors) was responsible for developing an organized and logical format for the curriculum and providing an efficient framework for the course.

Appreciation is also expressed to the various universities and institutions that provided venues for each course.

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Natural Attenuation of Chlorinated Solvents in Groundwater
Course Evaluation Summary

1.0 INTRODUCTION

"The term "Natural Attenuation" refers to naturally-occurring processes in soil and groundwater environments that act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in those media. These in-situ processes include biodegradation, dispersion, dilution, absorption, volatilization, and chemical or biological stabilization or destruction of contaminants" (OSWER, 1996). Natural attenuation is an innovative remediation technology that is gaining acceptance around the country. In order for this technology to obtain widespread acceptance in remediation efforts, the environmental community must be able to sufficiently propose, evaluate and approve site remediation plans containing natural attenuation.

To achieve this goal, the Interstate Technology and Regulatory Cooperation (ITRC) Work Group and the Industrial Members of the Remediation Technologies Development Forum (RTDF) developed the Natural Attenuation of Chlorinated Solvents in Groundwater training course. In addition to educating government officials, regulators, consultants, site-owners, and stakeholders with timely and accurate information about the technical aspects of natural attenuation, the course also provided instruction in the use of screening tools for evaluating potential natural attenuation sites. The following summary evaluates results from five of the past courses. Data was collected from two surveys; one tailored to regulators, and another tailored to consultants/engineers, site-owners, stakeholders, and government officials. This summary includes responses from participants who attended courses held in Austin, TX, Sacramento, CA, Valley Forge, PA, Amherst, MA, and Berkeley, CA.

As a follow-up to the course, we have tried to measure (1) the attendee satisfaction with the quality of the information, and (2) the impacts of the course on the actual use of natural attenuation. Our initial survey suggests an overwhelming customer satisfaction with the course and an increase in confidence to properly evaluate and propose the use of natural attenuation when appropriate.

2.0 METHODOLOGY

In order to improve the training sessions and to determine their success, an evaluation is given out to all participants after the course. Learning from each course and striving to improve following courses is a continuous process. Not only does this course evaluation help to improve the content of the course, it also allows instructors to determine if the participants are able to comprehend what is taught and apply this knowledge in the field. If the participants aren't using the information, the instructors may have to rethink and adjust their teaching methods until improvements are observed. Thus, in the long run the course evaluations help the students tremendously. During this step, instructors and interested parties can also measure the progress

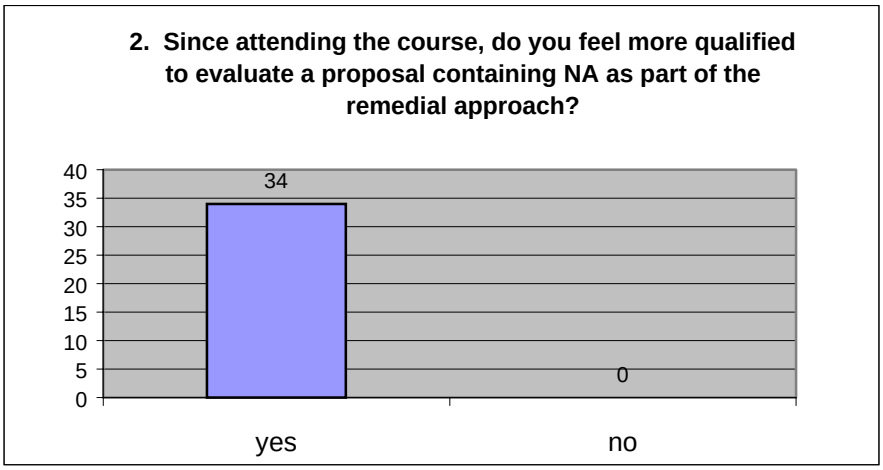
of the technology from evaluating the number of proposals submitted containing natural attenuation as part of the remedy and their approval/denial rates.

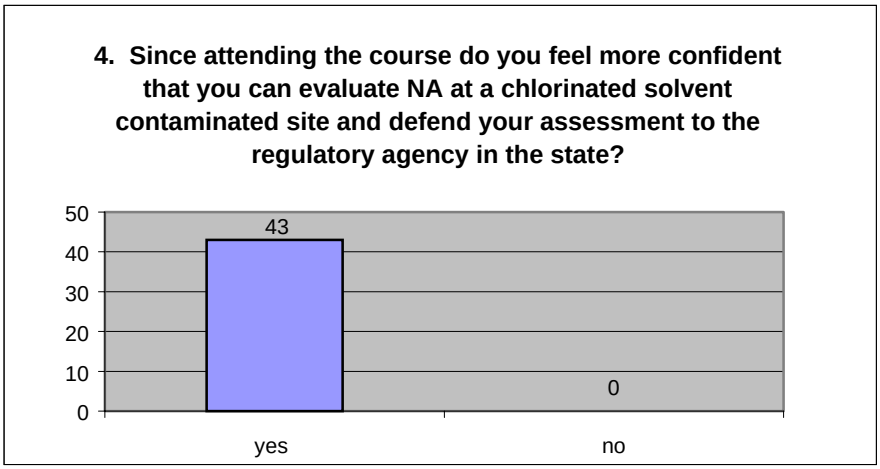
Members of state agencies, SSEB, WGA, and Coleman Research Corporation wrote questions in a combined effort. This group developed the questions to determine whether students understood both specific and general concepts from the course and evaluate whether they were able to digest and apply the information. Questions were also asked to get an idea of what other technologies the participants were interested in. This assists the ITRC in deciding whether future courses should be offered, and what subjected areas should be covered.

The survey was distributed by SSEB to all participants by mail approximately 6 months after the Austin and Sacramento courses; and approximately 3 months after the Valley Forge, Amherst, and Berkeley courses. Students were instructed to complete the evaluations and fax them to Coleman Research Corporation for analysis. The completed evaluations were then tabulated and compiled into spreadsheets. Graphs were created and conclusions were made based on trends and correlating survey questions. The conclusions drawn were also affected by the reasons the questions were asked.

3.0 SURVEY GRAPHS AND CONCLUSIONS

**** Question #2 was addressed by regulators; question #4 was addressed by consultants and engineers.*** *(The graph numbers correlate to the question numbers on the survey).*

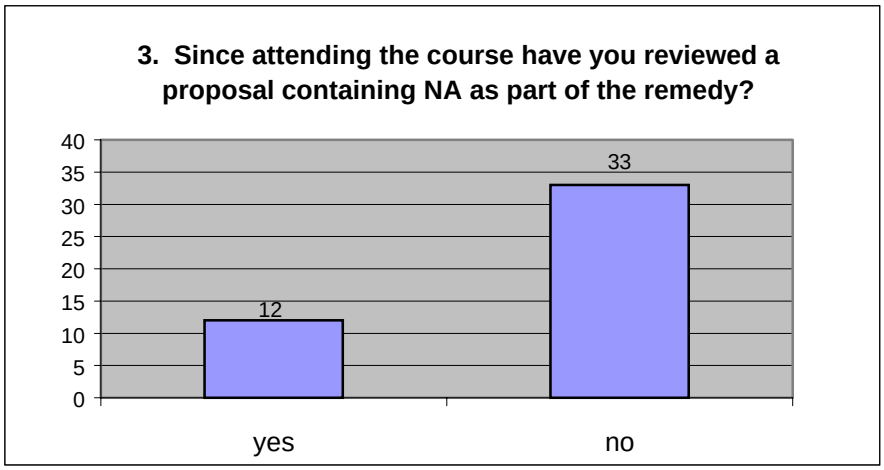


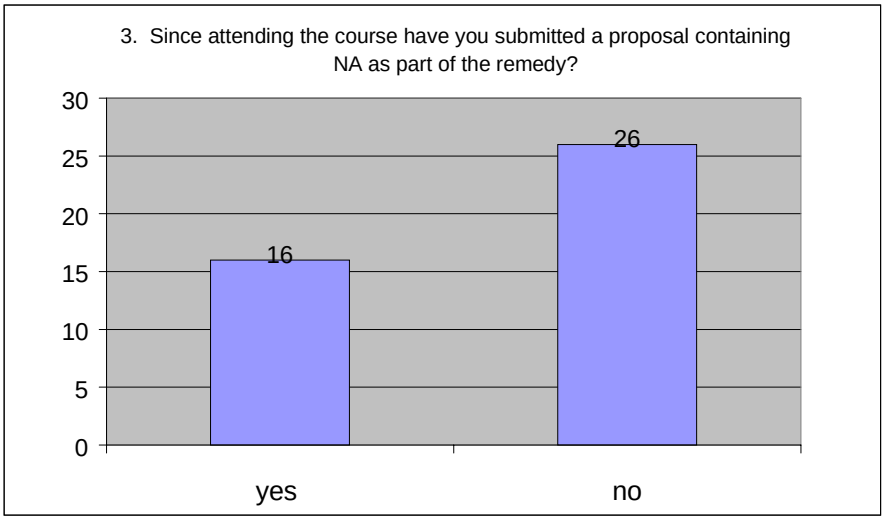


The course has helped consultants and engineers feel confident evaluating NA at a site as well as defending their assessment to regulatory agencies. Similarly, the regulators who attended the course feel more qualified to evaluate proposals containing NA as a remedial approach. This means that it is more likely that NA will be proposed as a remediation technique and these proposals will be objectively evaluated.

3.0 SURVEY GRAPHS AND CONCLUSIONS

**** Question #3 (top) was addressed by regulators; question #3 (bottom) was addressed by consultants and engineers.*** *(The graph numbers correlate to the question numbers on the survey).*

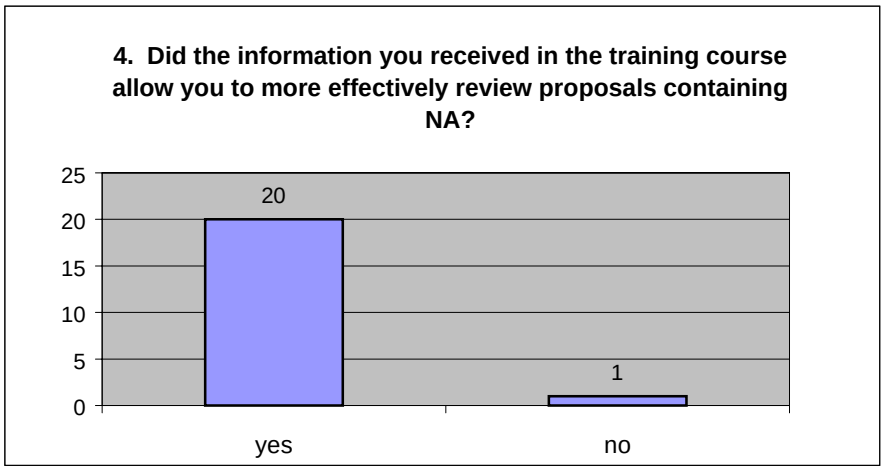


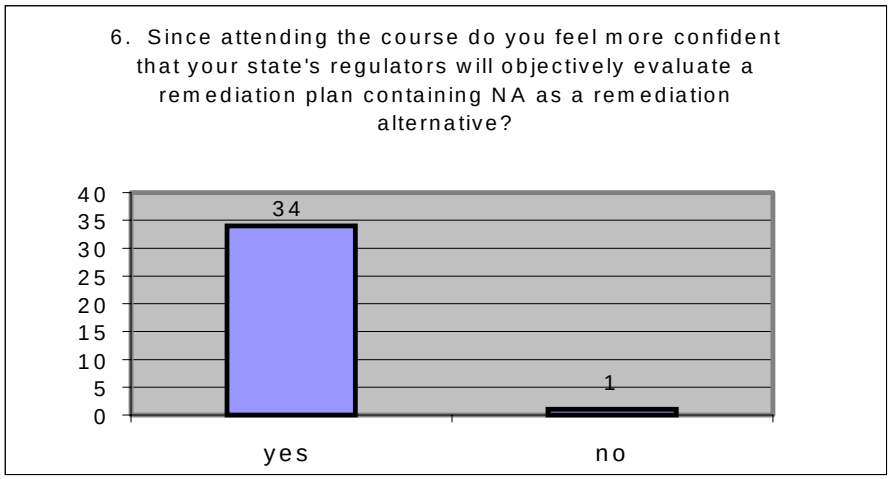


Since attending the course, over 35% of the consultants and engineers have submitted proposals containing NA as part of the remedy. Similarly, almost 25% of the regulators have reviewed proposals containing NA. The large number of regulators that have not reviewed proposals (73%), directly correlates to the fact that 62% of the consultants and engineers have not yet submitted proposals containing NA as part of the remedy. This correlation shows that as more proposals containing NA are submitted, a related percentage of proposals are likely to be approved.

3.0 SURVEY GRAPHS AND CONCLUSIONS

**** Question #4 was addressed by regulators; question #6 was addressed by consultants and engineers.*** *(The graph numbers correlate to the question numbers on the survey).*

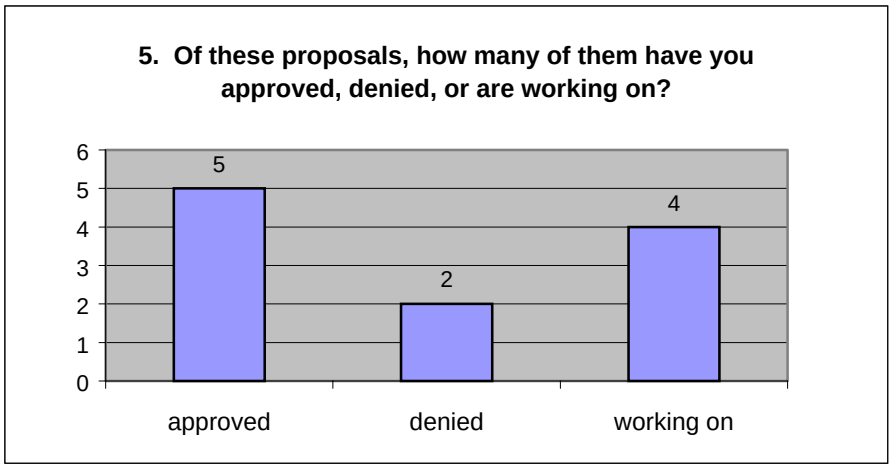


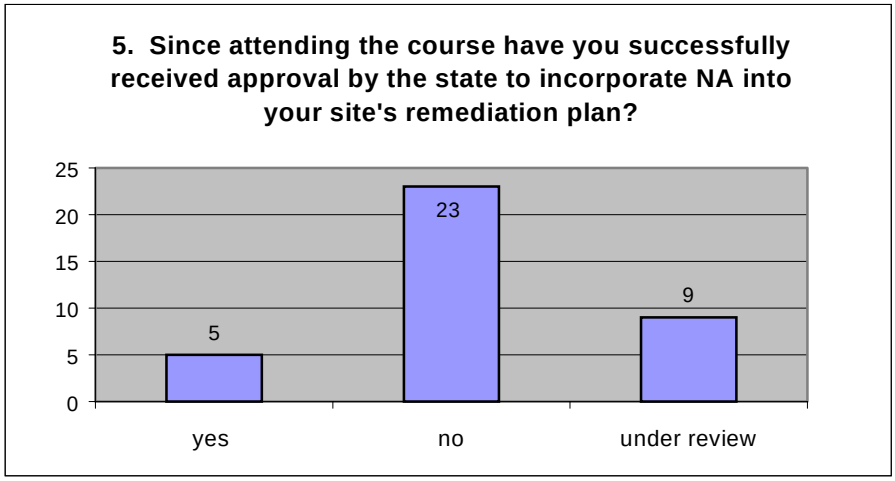


The course also helped consultants and engineers feel more confident that their state regulators will objectively evaluate remediation plans containing NA. Likewise, the regulators attending the course in deed do feel that the information in the training course will allow them to more effectively review proposals containing NA. This reveals a critical success of the course: effectively increasing the confidence of all of the involved groups about the use of NA as a remediation alternative.

3.0 SURVEY GRAPHS AND CONCLUSIONS

**** Question #5 (top) was addressed by regulators; question #5 (bottom) was addressed by consultants and engineers.*** *(The graph numbers correlate to the question numbers on the survey).*

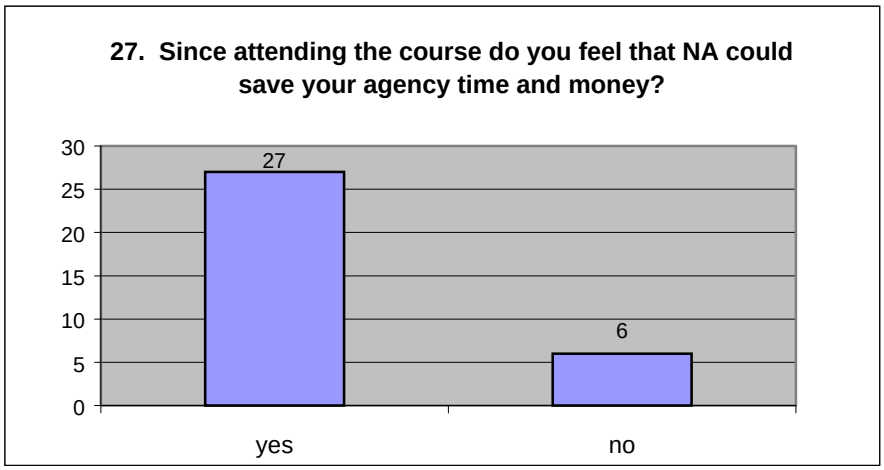


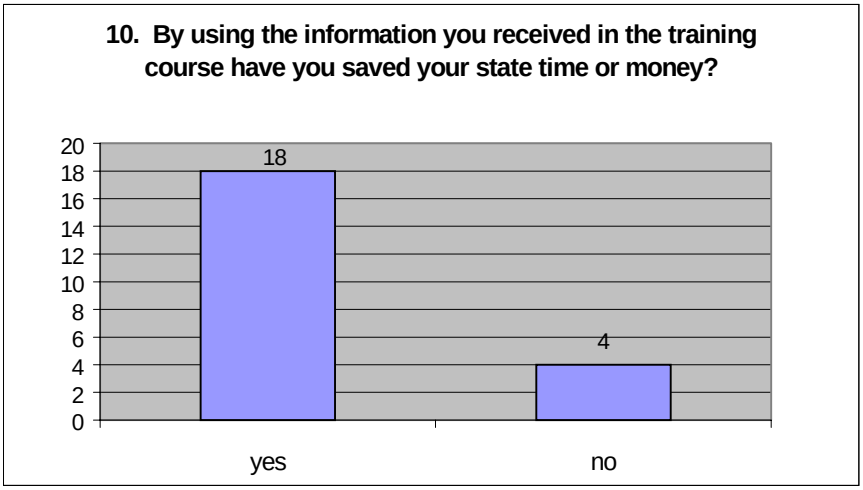


Since attending the course, over one third of the consultants and engineers have submitted proposals containing NA as part of the remedy, and almost all of these have either been approved by regulators or are currently under review.

3.0 SURVEY GRAPHS AND CONCLUSIONS

**** Question #27 (top) was addressed by regulators; question #10 (bottom) was addressed by consultants and engineers.*** *(The graph numbers correlate to the question numbers on the survey).*

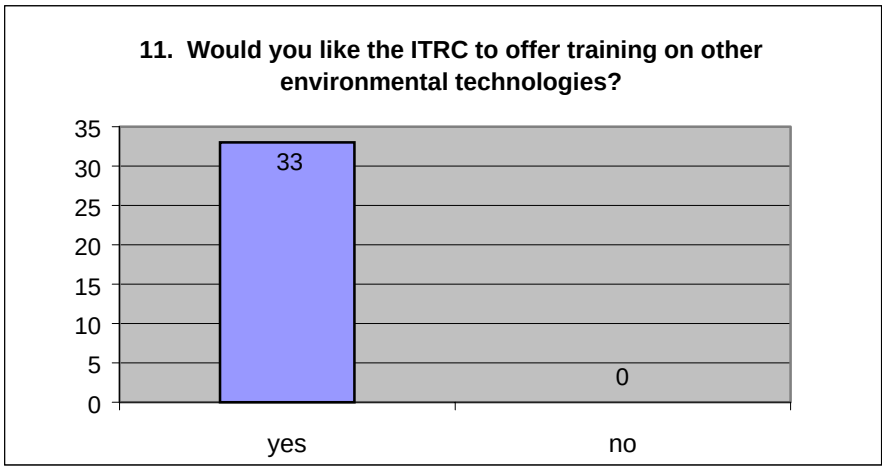


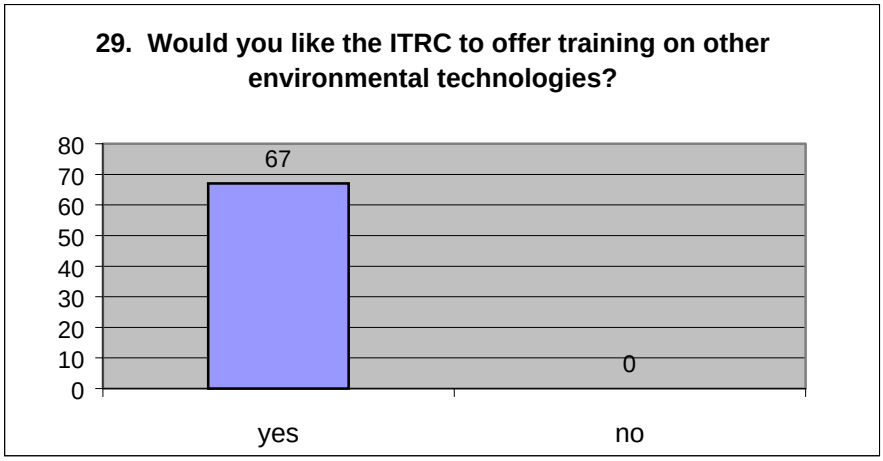


Since the course, 82% of government officials feel that NA could save their agencies time and money. Similarly, 82% of the regulators have actually saved their state time and/ or money since attending the course. The "no" answers may be explained by the fact that several participants expressed a desire to see more examples of how NA can actually save their state time and money.

3.0 SURVEY GRAPHS AND CONCLUSIONS

**** Question #11 was addressed by regulators; question #29 was addressed by all of the attendees.*** *(The graph numbers correlate to the question numbers on the survey).*

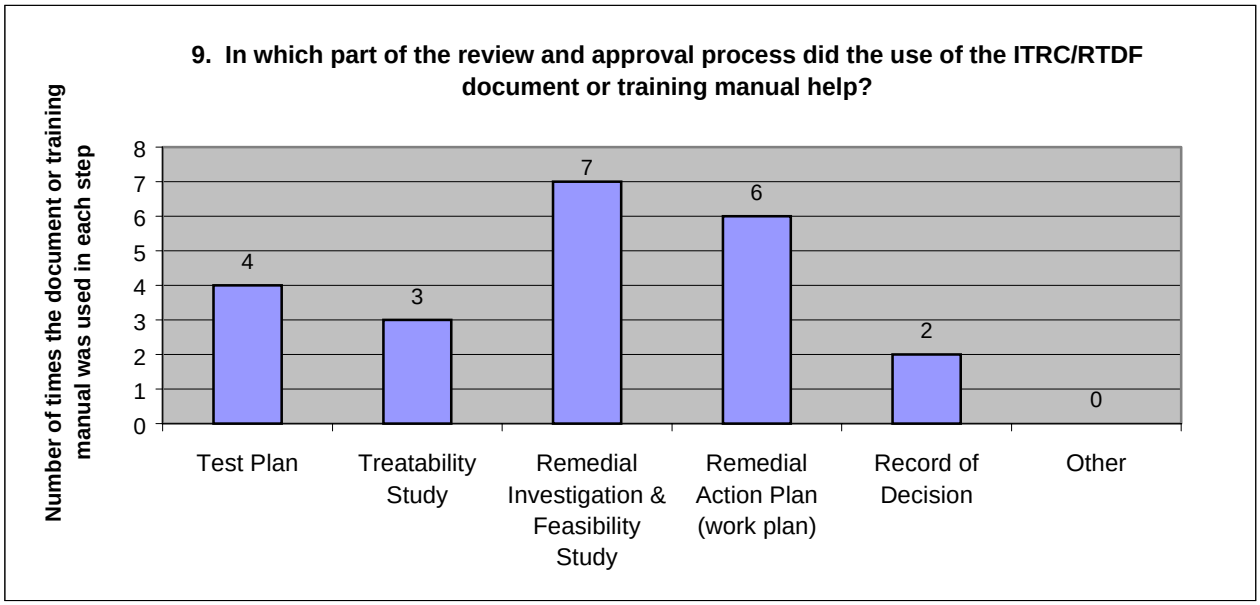




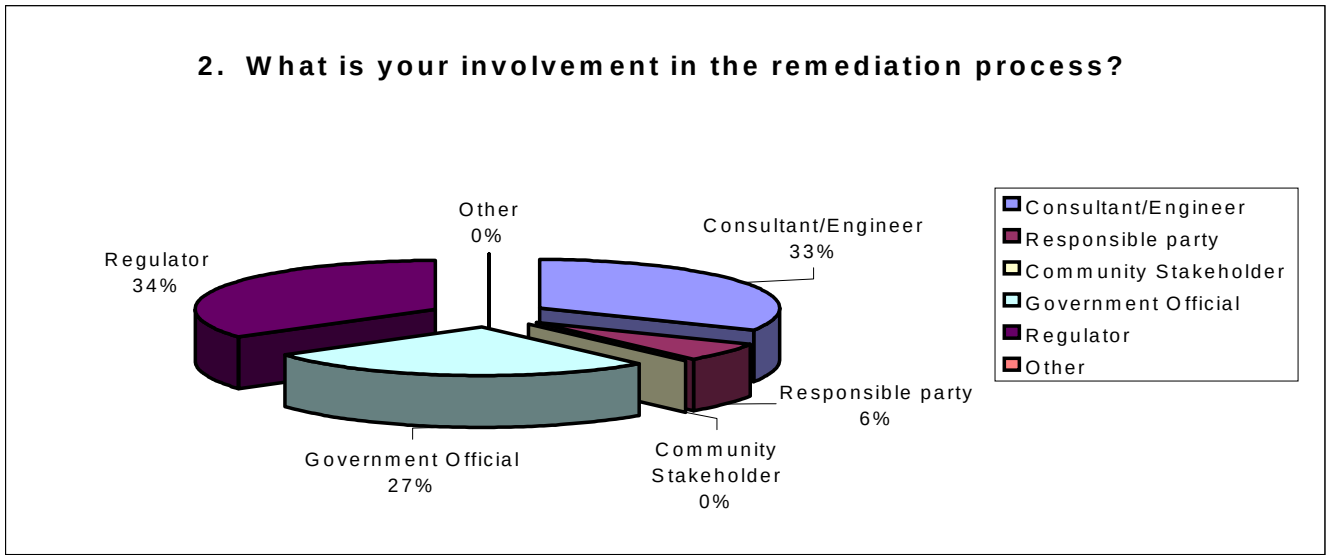
Both of the above graphs show that 100% of the attendees who completed surveys have a strong interest in attending future ITRC training courses. This demonstrates the success of the course as well as reveals future opportunities for the ITRC.

3.0 SURVEY GRAPHS AND CONCLUSIONS

**** Question #9 was addressed by regulators; question #2 was addressed by all of the attendees.*** *(The graph numbers correlate to the question numbers on the survey).*



This demonstrates that the document has proven to be useful throughout the entire review and approval process.



The dominant groups who completed surveys are consultants and engineers and regulators.

4.0 IMPROVEMENTS FOR FUTURE SURVEYS

The NA training course survey is the first one of its type to be offered. Accordingly, there are many things to continually improve. In creating this summary of course surveys, many strengths and weaknesses became apparent. This section will focus on those weaknesses and will attempt to discuss possible improvements that could increase the quality of future surveys.

1. *Clarify whom each survey is intended for, improve the structure and wording of survey questions, and make the survey easier to navigate.*

    * Many of the course attendees had a difficult time determining which questions applied to them, and whether to fill out both surveys or just one. Therefore, some participants answered the incorrect questions or filled out the wrong survey.

    * Example: The title on the survey should clearly indicate whom the survey is directed toward. The questions and overall survey could be easier to understand and navigate if each question had directions on what the respondent should answer. If the question did not apply to the respondent, the question could direct them to "go to question XYZ".

2. *Add new questions to more accurately analyze the survey data and determine the success of the course.*

    * Example: Adding a question such as: "Before attending the training course, how many proposals containing NA as part of the remedy did you submit?" This would allow a more accurate interpretation of the responses to the question: "Since attending the course, how many proposals have you submitted containing NA as part of the remedy?". The increase in proposals submitted since the course and the actual impact of the course would be more accurately shown.

3. *Expand the choice of responses to the questions.*

    * Most of the questions only offered a "yes" or "no" response, while many of the respondents had proposals "in progress" or "under review".

    * Example: Providing people a wider selection of response choices will improve the accuracy of the survey. Since several respondents actually added "under review" rather than simply checking the "yes" or "no" boxes, these were added to several graphs to provide a more complete picture of the success of the course and how the course participants felt.

Together, these improvements will provide a better understanding of the strengths and weaknesses of the course, and will improve the quality, accuracy, and clarity of future training course surveys.

5.0 CONCLUSIONS AND SURVEY HIGHLIGHTS

Of the surveys sent out, the following were returned: 9.9% of the Regulator Survey and 8.7% of the Consultant/Engineer, Stakeholder, Site Owner, and Government Official Survey. Thus, a combined total of 9.1% of all surveys were returned. On future surveys, we will attempt to reach a goal of at least 20% of the surveys returned.

Since attending the course, over a third of the consultants and engineers have submitted proposals containing NA as part of the remedy, and almost all of these have either been approved or are currently under review. This group also feels more confident about evaluating NA at a site and defending its use. The consultants and engineers also now feel that their risk of using NA as a remediation tool is lower, and that NA can be a cost-effective technique.

After attending the course, all but one of the government officials who completed a survey feel that NA may be used effectively to remediate chlorinated solvents. In addition, they feel that NA is not in conflict with environmental statute, regulation or policy, and that NA could effectively be approved as a remediation method in their agencies. The government officials also now feel that NA could save their state agencies time and money.

The course was also successful in helping the regulators feel more qualified to evaluate proposals containing NA, and almost a third of them have actually reviewed proposals containing NA.

Furthermore, all of the course attendees who completed surveys expressed a strong interest in attending future ITRC training courses. The most popular technology of interest was Metals in Soils (Electrokinectics/Phytoremediation). This was followed closely by a strong interest for courses in Permeable Barrier Walls – a training course which is scheduled to begin in March 1999. Similarly, a strong desire for Accelerated Site Characterization Methods and/or Technologies was also expressed, in addition to a wide variety of other subject areas that were written down and can be found in Appendix A of this report.

Clearly, the objectives of educating and training regulators, site owners, consultants and engineers, government officials, and stakeholders on the use of NA as a remediation tool have been successfully met. Conducting a post-course survey and analyzing the data are crucial elements in creating an understanding of the strengths and weaknesses of the course, and helping the ITRC and other involved organizations focus on how future courses and surveys can be continually improved.

To conclude, the success of the NA training course is unanimous. The ITRC has had a significant impact in increasing the awareness and use of NA as a remediation technique. For example, the ITRC/RTDF Document: “NA of Chlorinated Solvents in Groundwater: Principles and Practices” has been used by many regulators who feel that it is useful throughout the entire review and approval process. These accomplishments together provide optimism and act as stepping stones for the success of future training courses.

Appendix A

Survey Written Comments

Comments from Regulator Survey

(Numbers Coordinate to Question Numbers on Survey)

6. *What didn't you learn from the class, which could have been helpful?*

- How to support biodegradation
- What the public acceptance of Natural Attenuation is
- Need more model sites/case examples
- Criteria for denial of the technology if it doesn't seem applicable
- Information on bioremediation
- How to start and accelerate the NA process

7. *Have you used the ITRC/RTDF Document titled "Natural Attenuation of Chlorinated Solvents in Ground Water: Principles and Practices", or NA Training information, to establish guidance, policy, or checklists for your agency? If so, please identify.*

- Used as a reference to prepare guidance material on the application of NA
- Used as a training tool
- Used in the development of a Remedial Investigation Sampling and Analysis Plan that contains NA parameters
- Used as a general reference for supporting biodegradation at a site

8. *How many other sources of information have you used for background information of natural attenuation?*

- Range of other sources used: 0-10
- Listed responses include: EPA materials
  Research on the Internet
  Bio course by INET
  McCarty et. al.

12. *In what <u>other</u> areas would you like the ITRC to offer training?*

- Landfill Cap Construction
- Multiphase Remediation Design

Comments from Consultant/Engineer, Stakeholder, Site Owner, and Government Official Survey

(Numbers Coordinate to Question Numbers on Survey)

#30. *In what <u>other</u> areas would you like the ITRC to offer training?*

- Bioremediation & Enhanced Bioremediation
- In-situ Chemical Extraction
- Biodegradation of MTBE and other constituents
- Geostatistics
- Bioremediation of Petroleum Hydrocarbons and Chlorinated Solvents
- In-situ Bioinjection of Molasses
- In-situ Oxidation
- Phyto for Chlorinates
- Chromium VI in Ground Water
- Landfill Cap Construction
- In-situ Fixation
- Horizontal and Angle Drilling Techniques
- Multiphase Remediation Design
- Horizontal Wells
- SUE Implementation
- Policy/Case Studies in the Implementation of Innovative Technologies
- Refresher Chemistry Course