

COURSE TITLE Water Industry Aquifer Remediation

COURSE DURATION 1 hour

# OVERVIEW

This course is divided into two key chapters. First, we are going to review some of the most common sources of groundwater contamination. And, in the second half, we are going to review some remediation alternatives to help restore the water quality of the impaired underground water resources. Through this course, engineers, architects, planners, and contractors will learn about the most common contamination sources and the industry best practices used for groundwater aquifer remediation.

This training course has 4 learning modules with a 10-question exam.

PREREQUISITES No prior knowledge is required.

### BEHAVIORAL OBJECTIVES

After successfully completing this course, you will be able to:

- List the six main categories of groundwater contamination sources
- Describe at least three common sources of groundwater contamination
- Identify the three principal remediation goals for the restoration groundwater aquifers to safeguard the health, safety and welfare of the public.
- Define the three general strategies used for cleanup and remediation of groundwateraquifers

# COURSE OUTLINE

- Introduction 5 minutes
- Common Sources of Groundwater Contamination 30 minutes
- Remediation Alternatives 20 minutes
- Conclusion 5 minutes

### AVAILABILITY

This course is offered online and is available 24 hours a day, 7 days a week, 365 days a year.

### TRAINING METHODOLOGY & EVALUATION

This course is self-paced online training. Review exercises reinforce the content, and students are evaluated with a multiple-choice exam. Upon completion, students are prompted to submit a course evaluation.

## REFERENCES

- Environmental Protection Agency (EPA). 2015. Federal Register, Vol 80. Number 135. Revising Underground Storage Tank Regulations—Revisions to Existing Requirements and New Requirements for Secondary Containment and Operator Training. 40 CFR
- 2. Parts 280 and 281. July 15, 2015. U.S. National Records and ArchivesAdministration. Washington, D.C. Link:
- 3. https://www.gpo.gov/fdsys/pkg/FR-2015-07-15/pdf/2015-15914.pdf

- 4. Cortez-Davis, Evelyn. Groundwater Basin Remediation in the City of Los Angeles. (2016). Groundwater Resources Association Conference. Concord, CA
- 5. Link: <u>https://www.grac.org/files/635/</u>
- 6. Environmental Protection Agency (EPA). 1995. Light Nonaqueous Phase Liquids. Office of Research and Development. EPA/540/S-95/500. Washington, D.C. Link:
- 7. https://www.epa.gov/sites/production/files/2015-06/documents/Inapl.pdf
- 8. Environmental Protection Agency (EPA). 1991. Dense Nonaqueous Phase Liquids. Office of Research and Development. EPA/540/4-91-002. Washington, D.C. Link:
- 9. https://www.epa.gov/sites/production/files/2015-06/documents/dnapl\_issue\_paper.pdf
- 10. Cooper, H. H., Jr., J. D. Bredehoeft, and I. S. Papadopoulos, "Response of a Finite-Diameter Well to an Instantaneous Charge of Water," Water Resources. Res., vol. 3, pp. 263-269, 1967.
- 11. Han, J.; Xin, J.; Zheng, X.; Kolditz, O.; Shao, H. Remediation oftrichloroethylene-contaminated
- 12. groundwater by three modifier-coated microscale zero-valent iron. Environ. Sci. Pollut. Res.2016, 13. doi:10.1007/s11356-016-6368-z
- 14. King, A., Jensen, V., Fogg, G.E. & Harter, T. (2012) Groundwater Remediation and Management for Nitrate. Technical Report 5 in:Addressing Nitrate in California's Drinking Water with a Focus on Tulare Lake Basin and Salinas Valley Groundwater. Report for the State Water Resources Control Board Report to the Legislature. Center for Watershed Sciences, University of California, Davis.
- 15. Lien, P.; Yang, Z.; Chang, Y.; Tu, Y.; Kao, C. Enhanced bioremediation of TCE-contaminated groundwater with coexistence of fuel oil: Effectiveness and mechanism study. Chem. Eng. J. 2016, 289, 525–536
- 16. Wilkin, RT, Acree, SA, Ross, RR, Puls, RW, Lee, TR, and Woods, LL (2014). Fifteen-year assessment of a Permeable Reactive Barrier for treatment of chromate and trichloroethylene in groundwater. Science of the Total Environment, v. 468/469, p. 186- 194.
- Yoo, K.; Shukla, S.K.; Ahn, J.J.; Oh, K.; Park, J. Decision tree-based data mining and rule induction for identifying hydrogeological parameters that influence groundwater pollution sensitivity. J. Clean. Prod. 2016, 122, 277–286.