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| **Environmental Enlightenment #155**By Ami Adini - Reissued January 14, 2015

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| This is a SHORT, LIGHT and SIMPLE newsletter. Its purpose is to rekindle in the initiated terminology they have once learned, and enlighten the uninitiated on terms they may have heard but never knew the meaning of. |
| **Extracting Liquid Contamination from Soils and Groundwater**“Phase” in chemistry means, a discrete homogeneous part of a material system that is mechanically separable from the rest.

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| Example: In the material system of ice and water, the ice is a phase separable from the water; and the water is a phase separable from the ice. | http://amiadini.com/NewsletterArchive/150114-NL155/envEnl-155_files/envEnl-155_clip_image002.jpg |

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| http://amiadini.com/NewsletterArchive/150114-NL155/envEnl-155_files/envEnl-155_clip_image004.jpg | Example: In the material system of the oil and the water shown, we see two phases separable from each other. |

A “material system” is a sample of matter in which substances in different phases are in equilibrium. In the above illustrations we see different phases (oil and water, or ice and water) which are in states of equilibrium with each other.NAPL is an acronym of “Non-Aqueous Phase Liquid.” meaning, liquid that does not become a solution in water but rather floats on it, or sinks in it. (*Aqua* in Latin means *Water*).  In the above examples, the oil is a NAPL.  The iceberg is not a NAPL because it is solid.LNAPL is an acronym of “Light Non-Aqueous Phase Liquid.”  It means a NAPL that is lighter than water, and therefore will float.  The oil phase in the above example is an LNAPL.  Here are some LNAPLs that we meet in the contaminated soil and groundwater cases:http://amiadini.com/NewsletterArchive/150114-NL155/envEnl-155_files/envEnl-155_clip_image006.jpgUpon reaching groundwater, LNAPLs stay at the water table zone. unsaturated zone graphicLNAPLs possess low levels of solubility; only a small amount will dissolve into the water. When the amount present at the water surface is greater than the amount that can dissolve into the water, we get a free phase product lying on the water.

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| Groundwater table is seldom static, moving up and down seasonally.http://amiadini.com/NewsletterArchive/150114-NL155/envEnl-155_files/envEnl-155_clip_image016.jpg |

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| http://amiadini.com/NewsletterArchive/150114-NL155/envEnl-155_files/envEnl-155_clip_image018.jpg | As the water table fluctuates, the free phase smears up and down into the soil particles, creating a “smear zone.” |

In the LNAPL case illustrated above, we first act to remove the body; that is the free phase product that saturates the soil at and under the point of discharge and “pancakes” on the water table underneath.An efficient way to remove the LNAPL is by high vacuum extraction. Here is how it works:

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| We lower the water table.  In the diagram you see a well installed into the saturated zone.  The bottom of the well is slotted (screened) to allow the water in.  Inside we have a “stinger” tube. The stinger is perforated at the bottom.We apply high vacuum to the stinger. This create a strong suction at the tip which gets the water in. As the water flows in, its level in the soil surrounding the well drops in a shape of a cone. We’ve created a “cone of depression” in the saturated zone.http://amiadini.com/NewsletterArchive/150114-NL155/envEnl-155_files/envEnl-155_clip_image020.jpg |

Through the perforations in the stinger a vacuum (thus suction) is now induced through the exposed soil inside the depression. This pulls in a flow of air which evaporates the free phase liquid in the soil and carries it to the stinger and out. The evaporation works very well in the case of gasoline which is highly volatile. In the case of diesel that is less evaporative, the free phase diesel gets pulled in as liquid with the water and in the in the air stream; the operation produces good results but overall is less efficient than in the case of gasoline.The free phase floating “pancake” (see earlier illustration) is pumped in through the tip of the stinger with the extracted water.The picture below shows a similar system but with two stingers in the well: one for lowering the water table and one for inducing vacuum to pull in the product that is smeared in the saturated zone.http://amiadini.com/NewsletterArchive/150114-NL155/envEnl-155_files/envEnl-155_clip_image022.jpg |
| You can find past issues of our "Environmental Enlightenment" at [amiadini.com](http://www.amiadini.com/) Wealth of information about environmental site assessments in the real estate transactions and issues concerning assessment and cleanup of contamination in the subsurface soil and groundwater. |

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| Call me if you have any questions. There are **no obligations.**Ami Adini Environmental Services, Inc.Environmental Consultants & General Engineering ContractorsCalifornia Lic. #1009513 A B HAZ ASB**818-824-8102**; **mail@amiadini.com**[www.amiadini.com](http://amiadini.com/)Ami Adini is a veteran environmental practitioner with over 40 years of experience. He carries a Bachelor of Science degree (B.Sc.) in Mechanical Engineering including academic credits in Nuclear and Chemical Engineering and postgraduate education in these fields. His career includes design and construction of nuclear plant facilities, chemical processing plants and hazardous wastewater treatment systems. He is a former California Registered Environmental Assessor Levels I & II in the 1988-2012 registry that certified environmental professionals in the assessment and remediation of environmentally impacted land, and a Registered Environmental Professional (REP) since 1989 with the National Registry of Environmental Professionals (NREP). He is a California Business & Professions Code Qualifying Responsible Managing Officer (RMO) in the General Engineering Contractor classification with Hazardous Substance Removal and Asbestos certifications, and president of AMI ADINI ENVIRONMENTAL SERVICES, INC. (AAES), a general engineering contractor and consulting firm specializing in environmental site assessments, rehabilitation of contaminated sites and removal of environmental risks from real-estate transactions. (Contact Ami for a complete resume.) **AAES provides practical solutions to environmental concerns using the highest standards of ethics and integrity while providing its clients with maximum return on their investments.** |

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