Groundwater Contamination and Remediation at Lawrence Berkeley National Laboratory

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Lawrence Berkeley National Laboratory





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- Occurs virtually everywhere in the world at some depth





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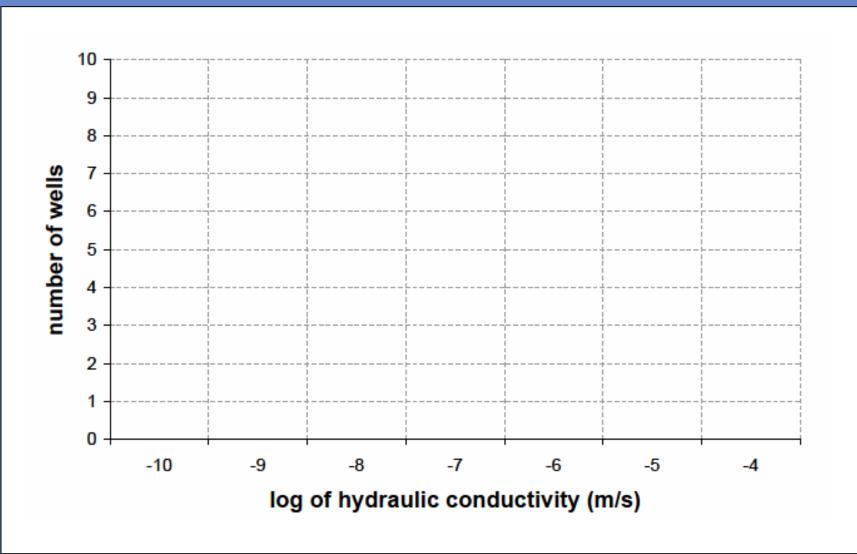


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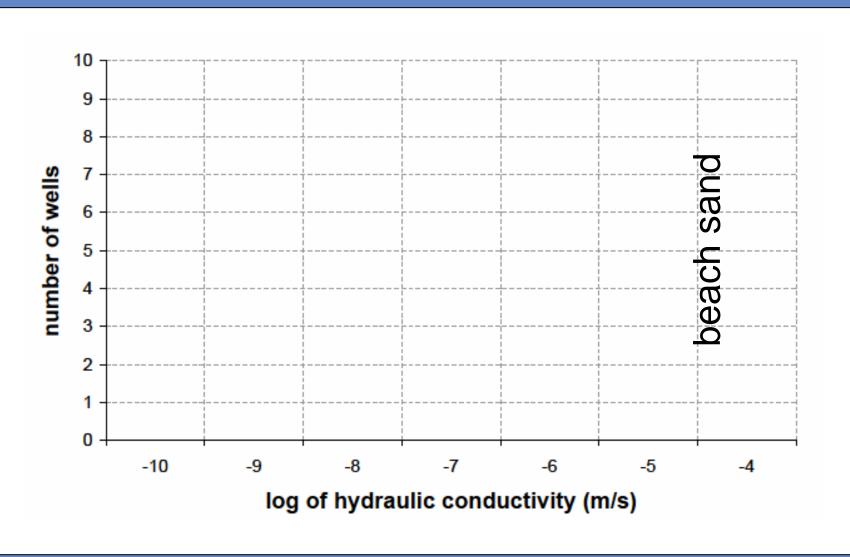


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- Groundwater velocity varies this much and more

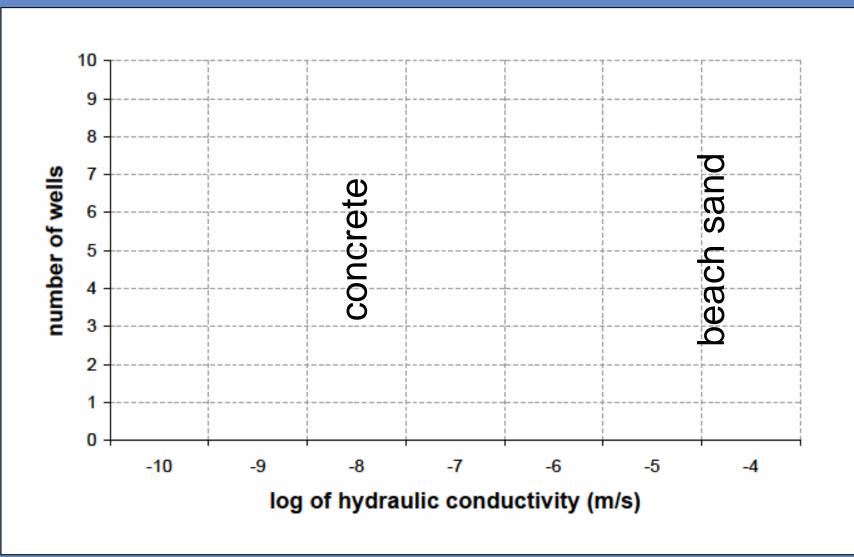
Hydraulic Conductivity



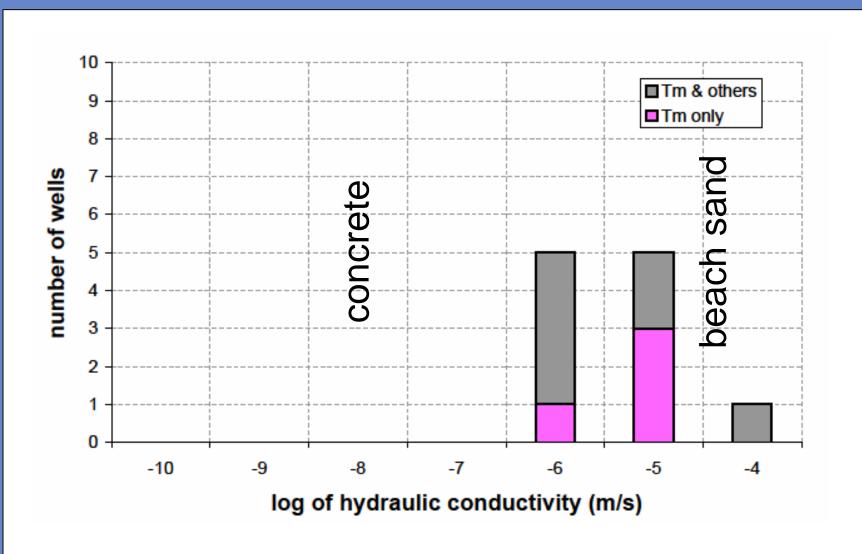
Hydraulic Conductivity



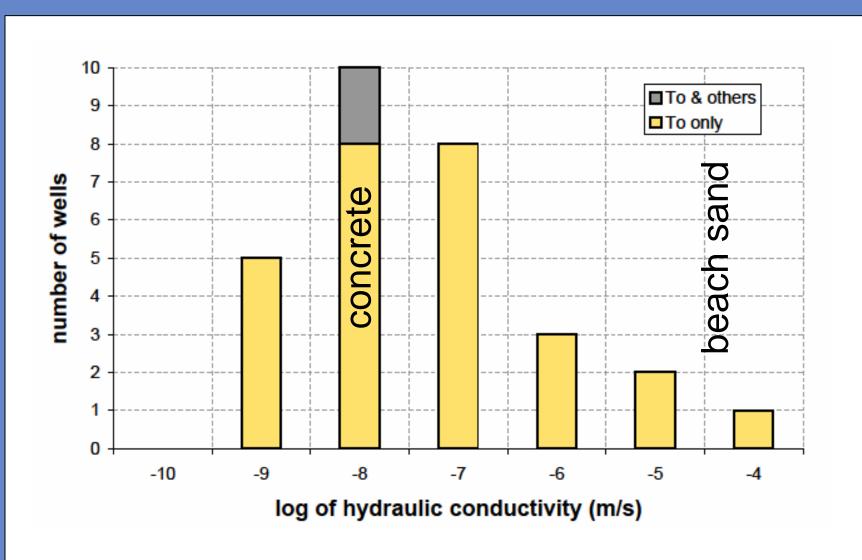
Hydraulic Conductivity



Volcanic Rock At LBNL



Orinda Formation At LBNL





Regulatory Agencies Overseeing LBNL

BAAQMD Bay Area Air Quality Management District

CalTrans California Department of Transportation

CARB California Air Resources Board

CCCSD Contra Costa County Sanitary District

COB City of Berkeley COO City of Oakland

DFG California Department of Fish and Game

DPH California Department of Public Health

DOE Department of Energy

DTSC Ca. Department of Toxic Substances Control

EBMUD East Bay Municipal Utility District

RWQCB S.F. Bay Regional Water Quality Control Board

SWRCB State Water Resources Control Board

UCOP University of California, Office of the President

UC Regents Regents of the University of California

USACE U.S. Army Corp of Engineers

USEPA U.S. Environmental Protection Agency

USFWS U.S. Fish and Wildlife Service



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- MCLs are the maximum allowable contaminant concentrations in drinking water
- CA MCLs are established by the CDPH
- CA MCLs are equal to or less than the MCLs established by the US EPA



Groundwater flow direction



Groundwater flow direction

Contaminant spill/leak/release





Groundwater flow direction

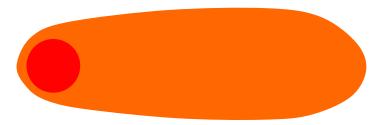
Contaminant dissolves in groundwater



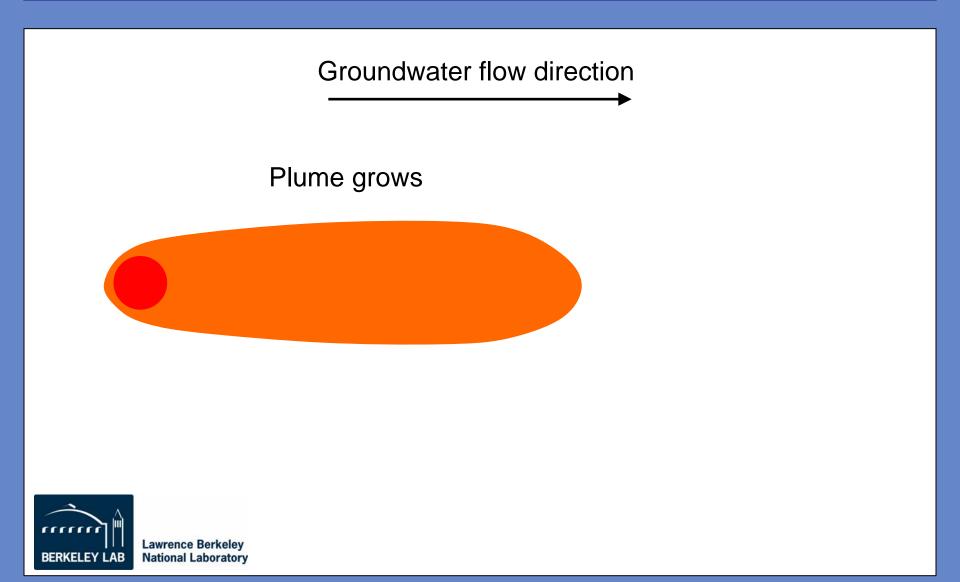


Groundwater flow direction

Contaminated groundwater moves away from source

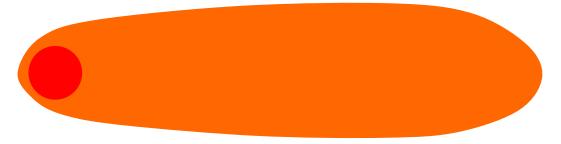




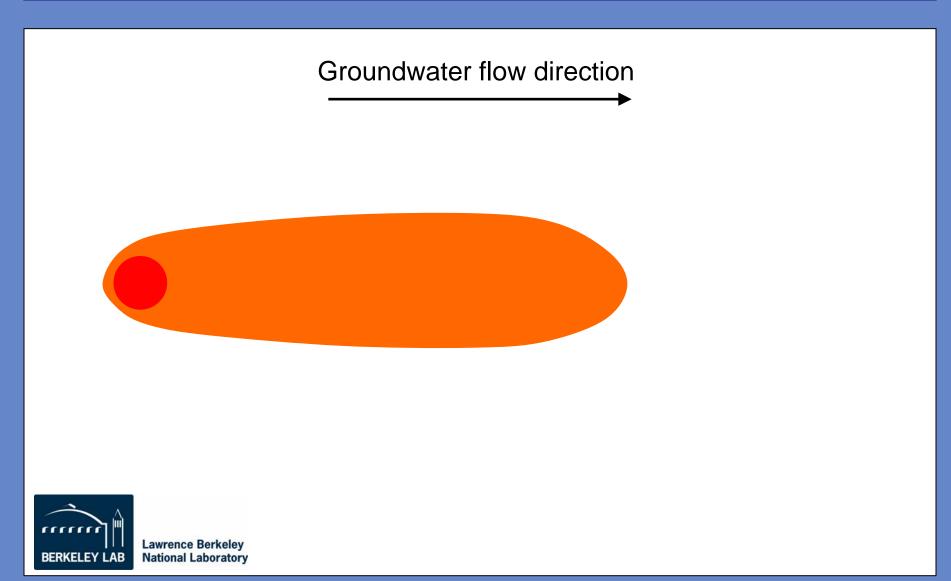


Groundwater flow direction

Plume growth often slows or stops due to contaminant degradation/transformation







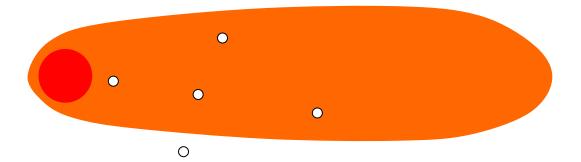
Groundwater flow direction



Install and sample a well based on some information



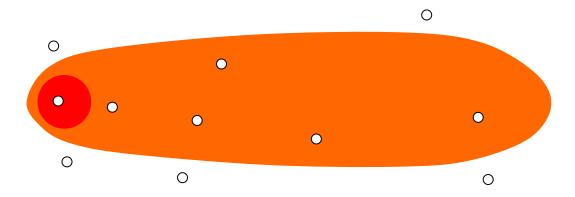
Groundwater flow direction



Install and sample more wells

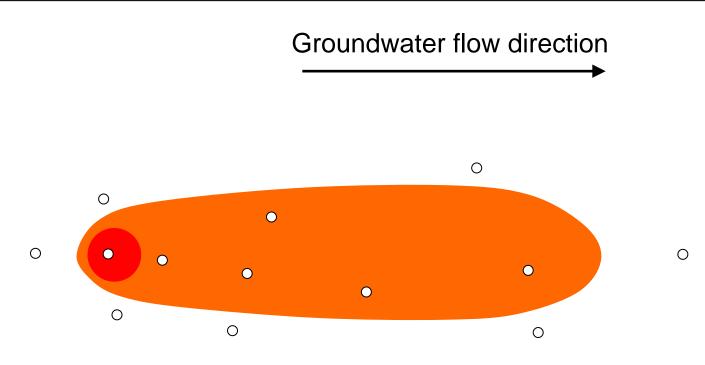






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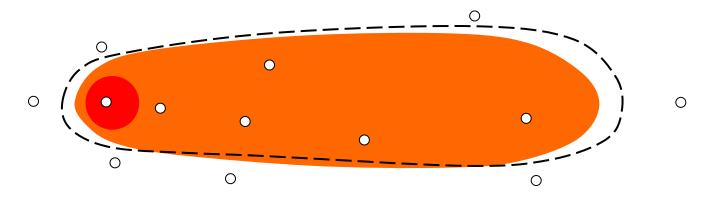




Enough wells to surround the plume



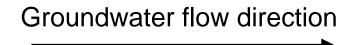
Groundwater flow direction

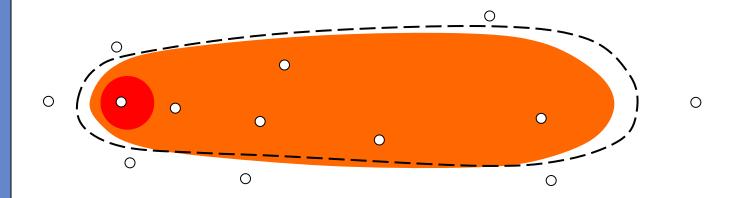


Then interpret the plume's boundary

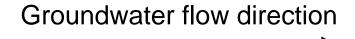


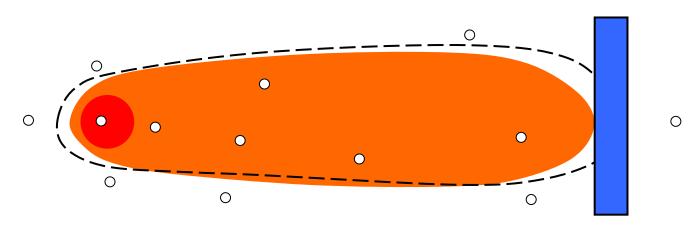
How To Clean Up A Plume?







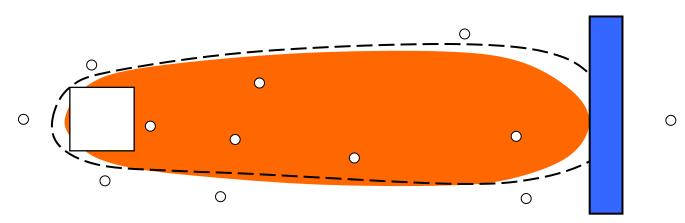




Install a system to keep it from growing



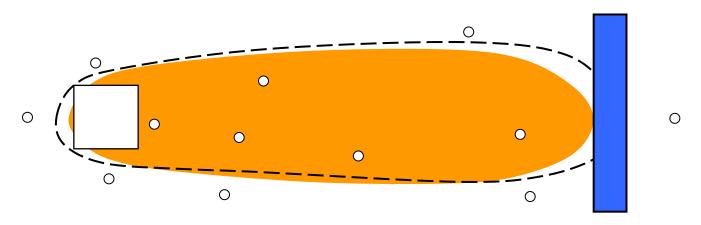




Eliminate undissolved contaminant



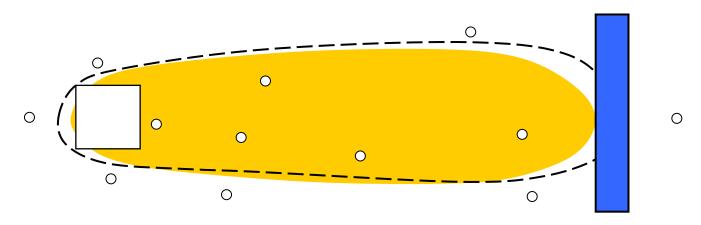
Groundwater flow direction



Flush, degrade or immobilize remaining contaminant



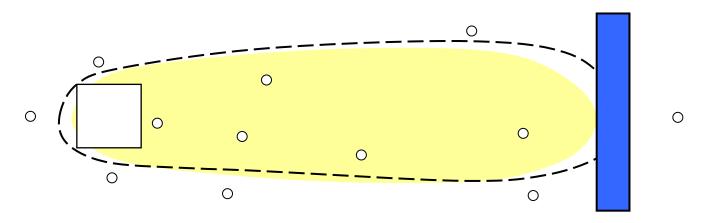
Groundwater flow direction



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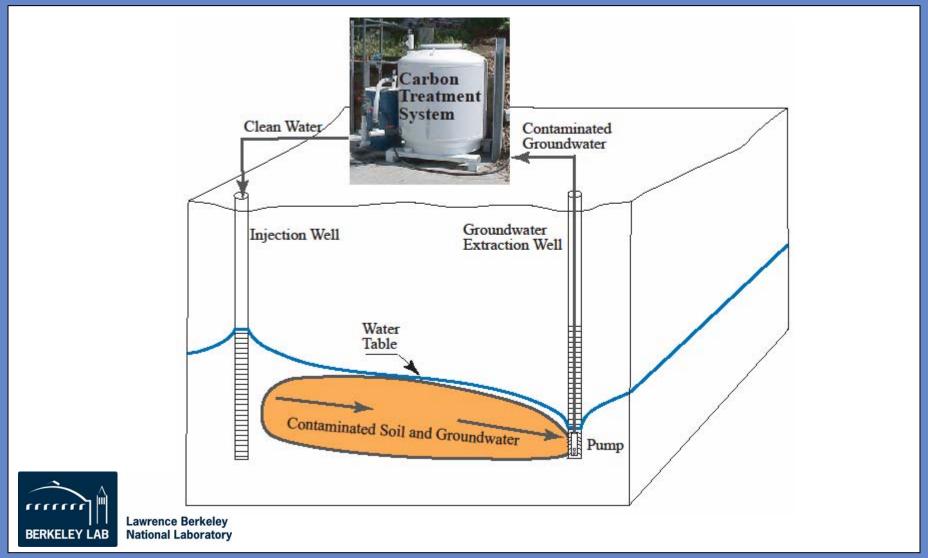
Groundwater flow direction



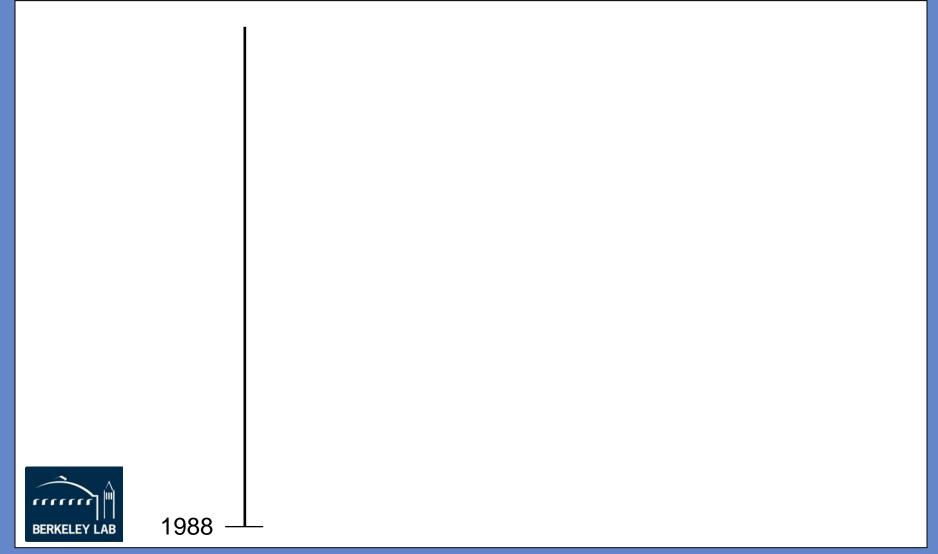
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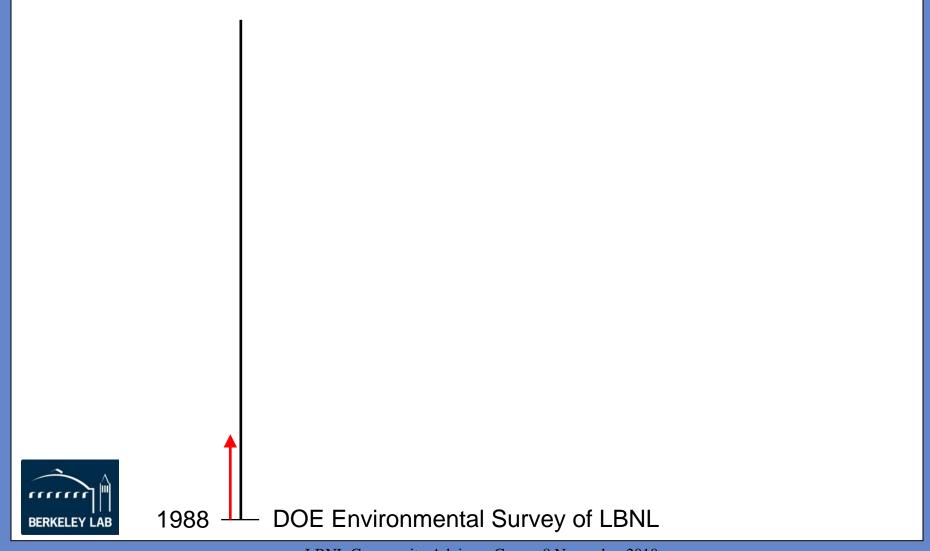
Soil Flushing



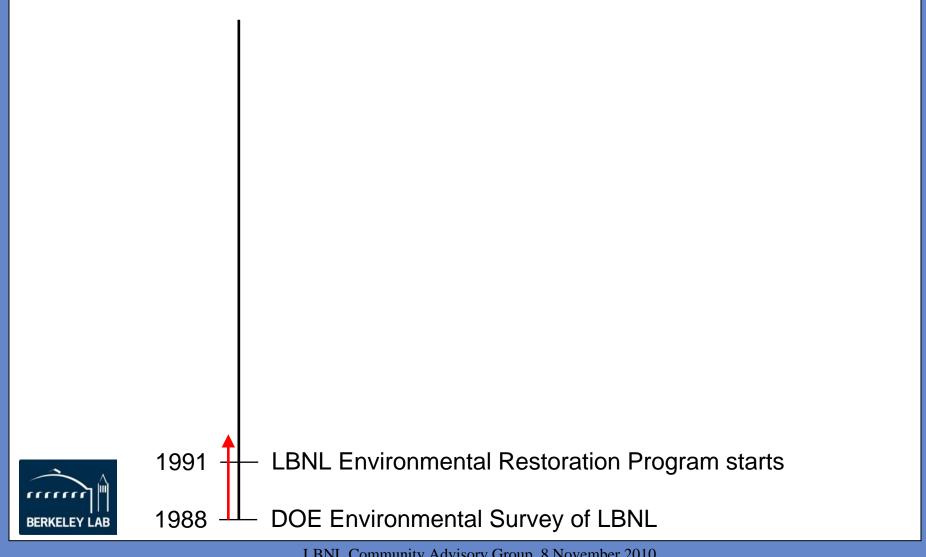
Groundwater Assessment at LBNL



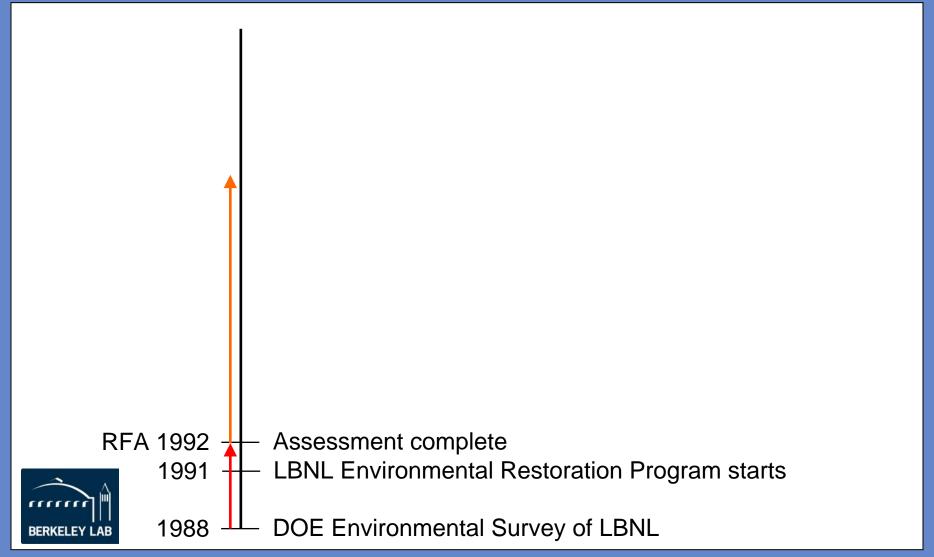
Groundwater Assessment at LBNL



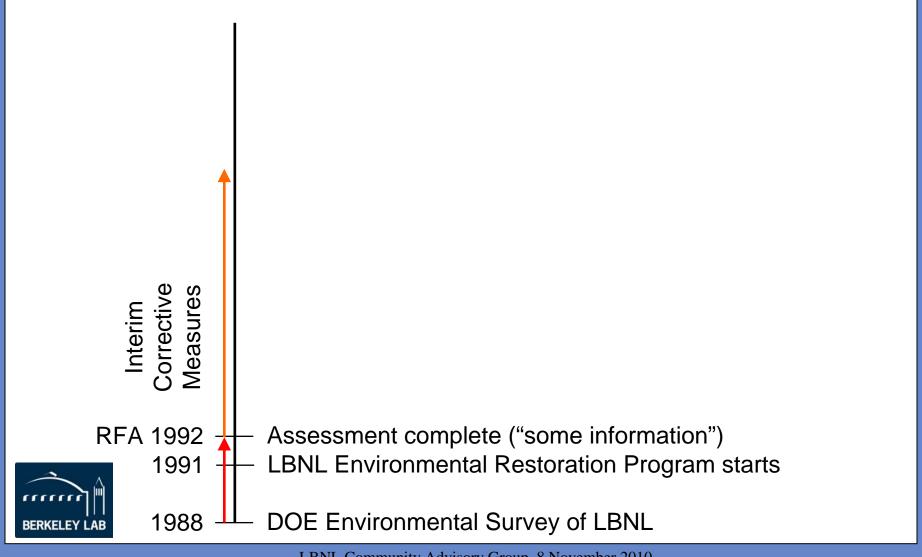
Groundwater Assessment at LBNL



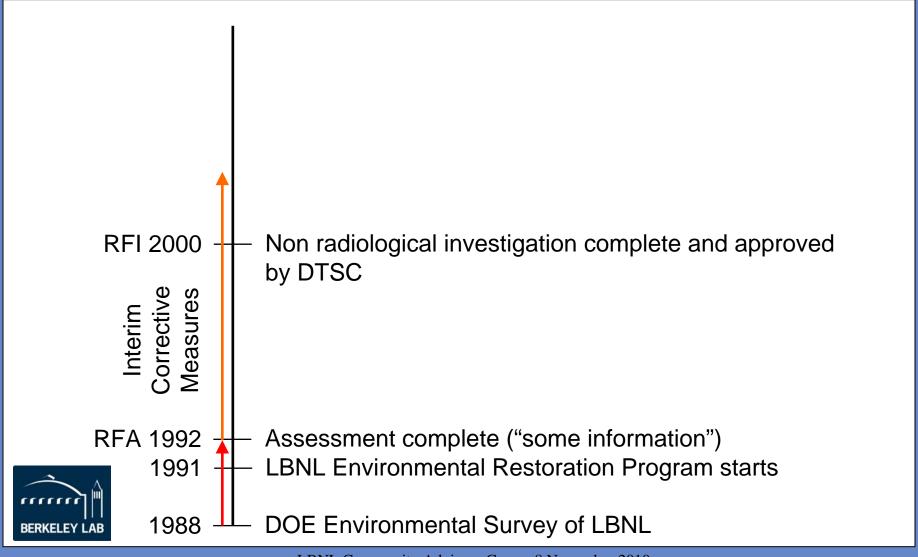
Groundwater Investigation at LBNL

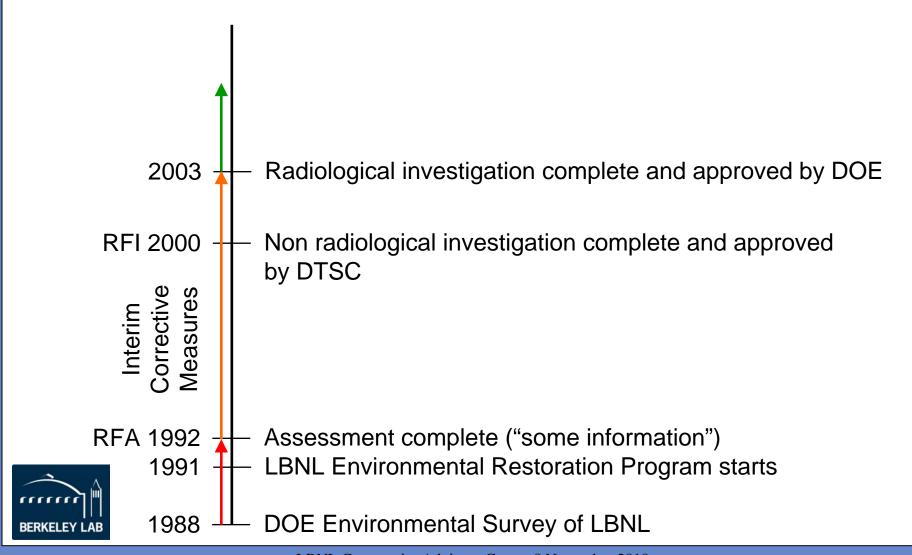


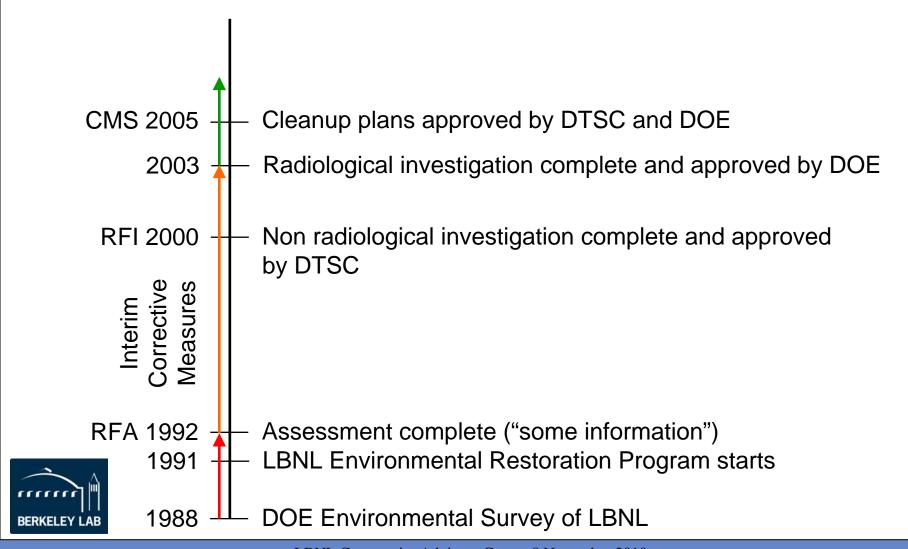
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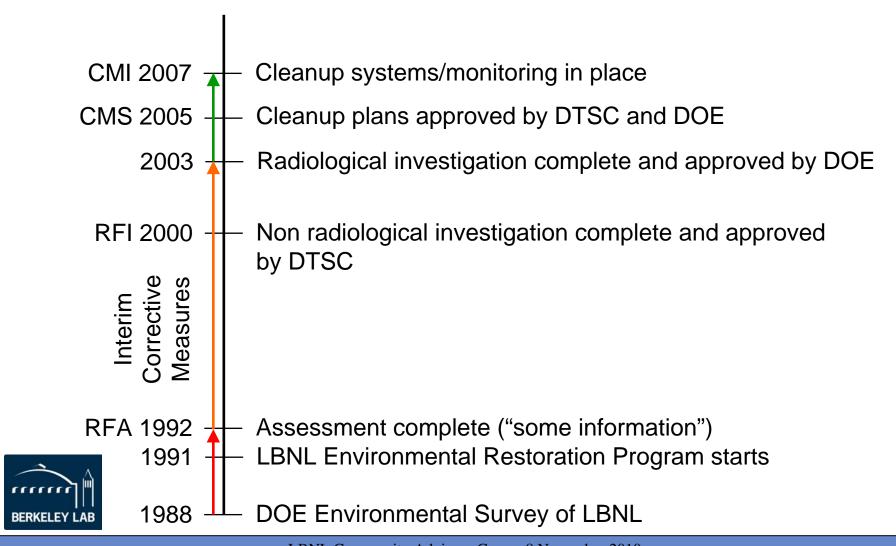


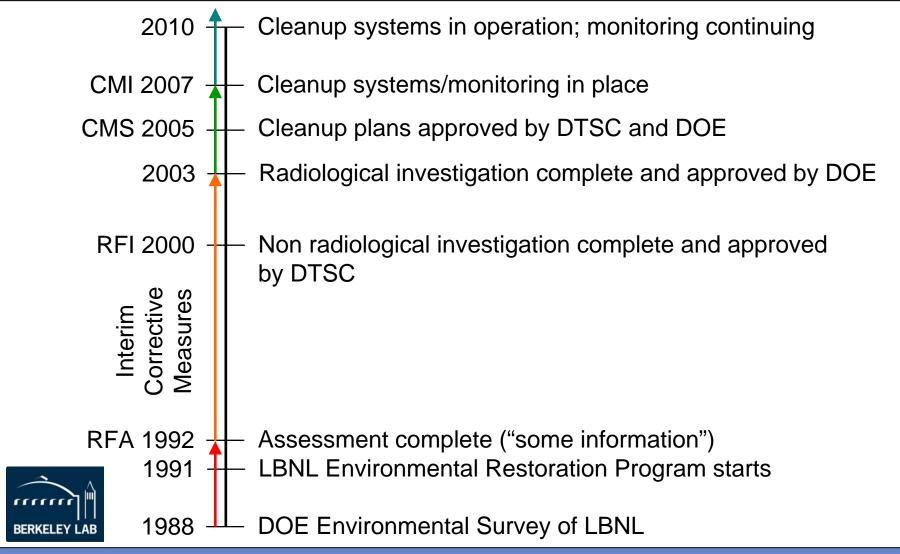
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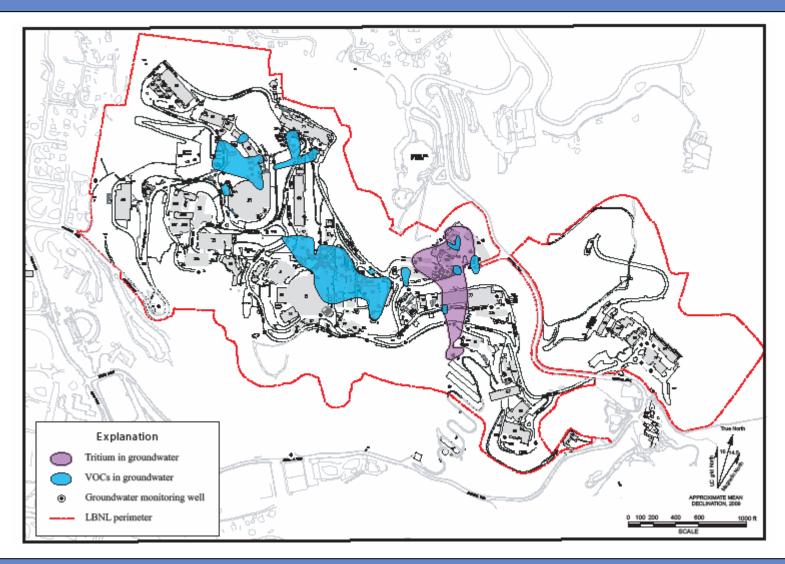




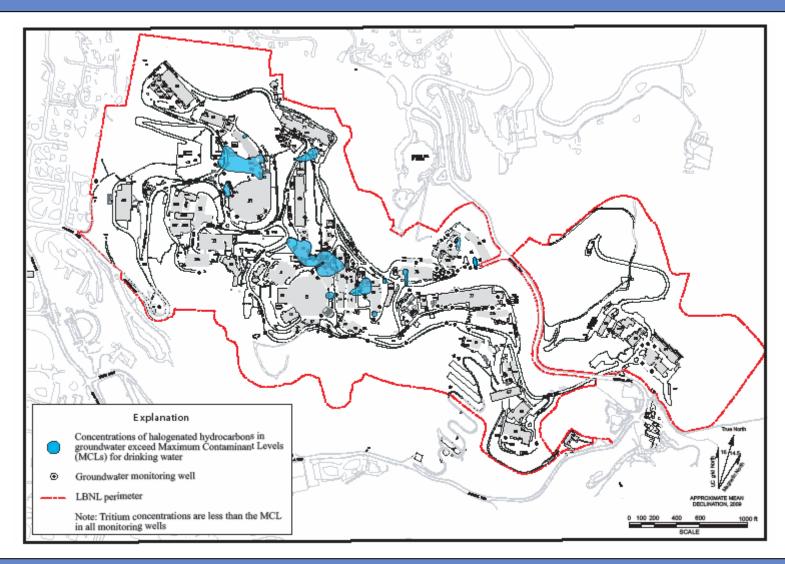




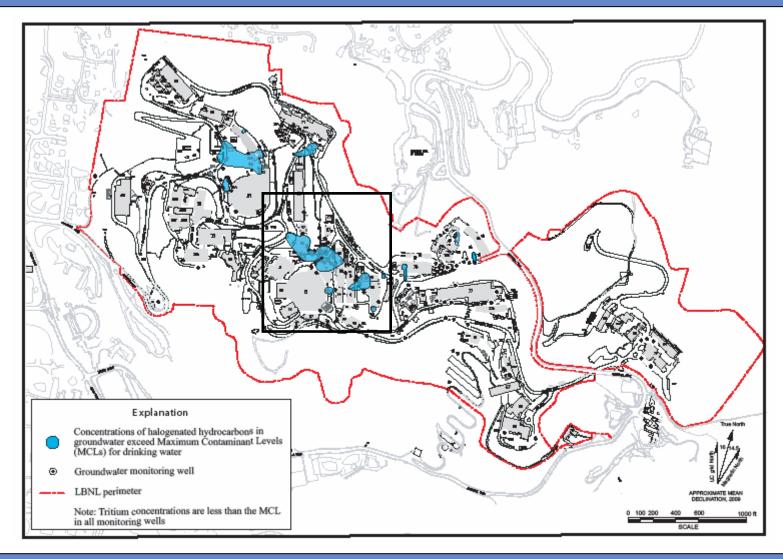
Groundwater Plumes at LBNL in 2010



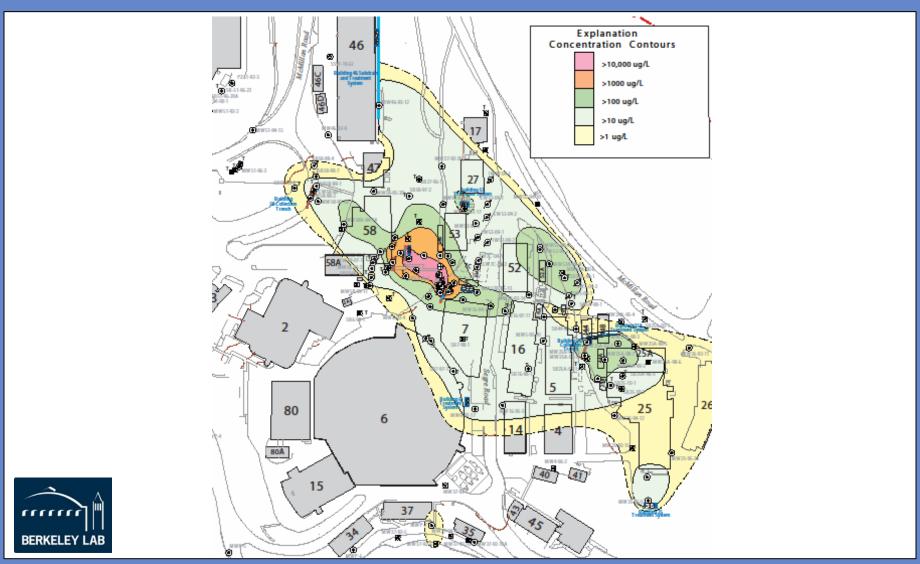
Groundwater Above MCLs at LBNL in 2010

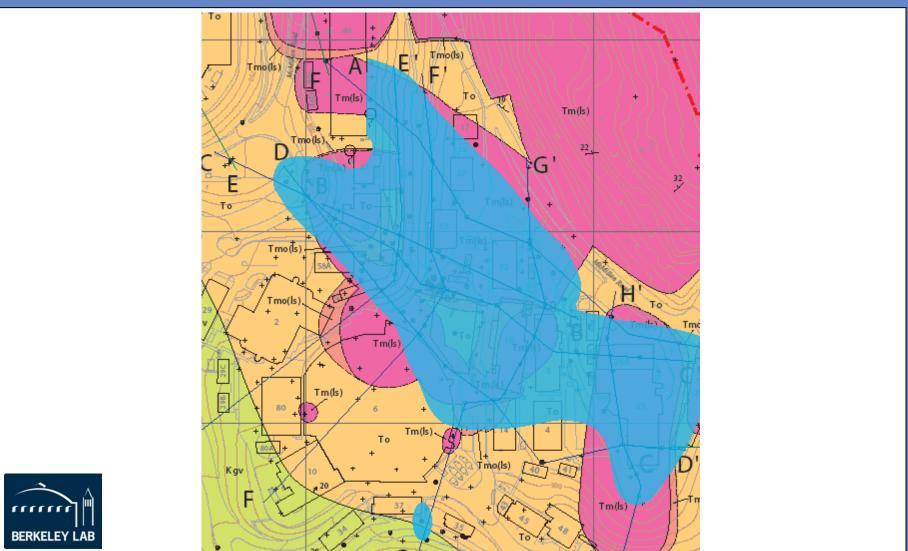


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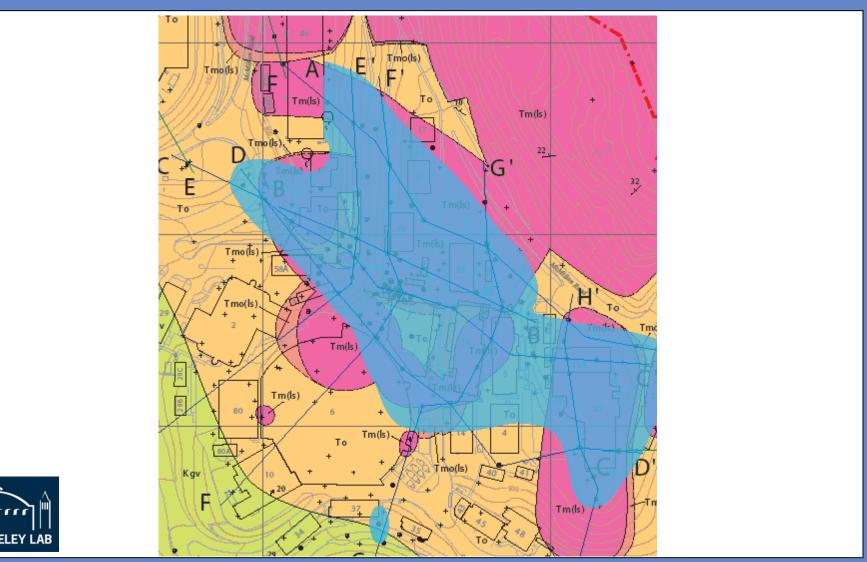


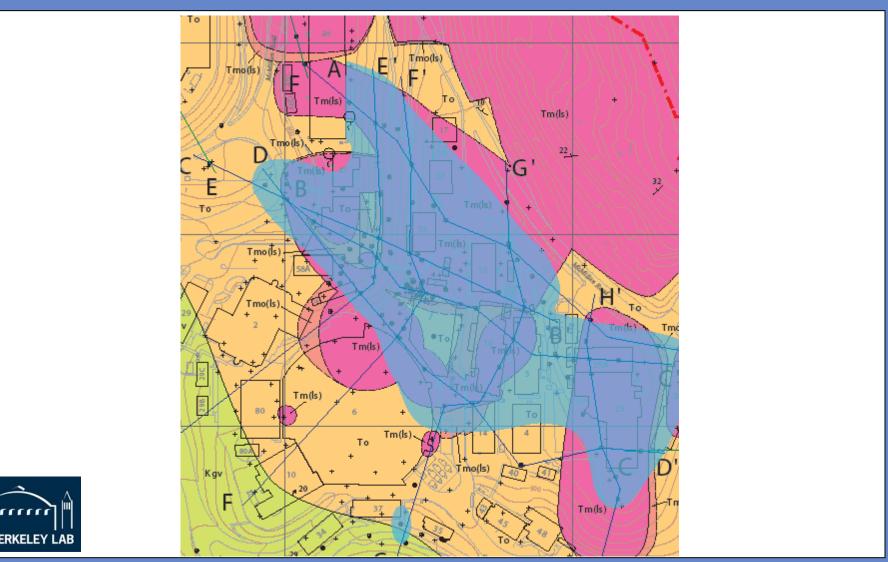
Old Town Total VOC Plume In 1999

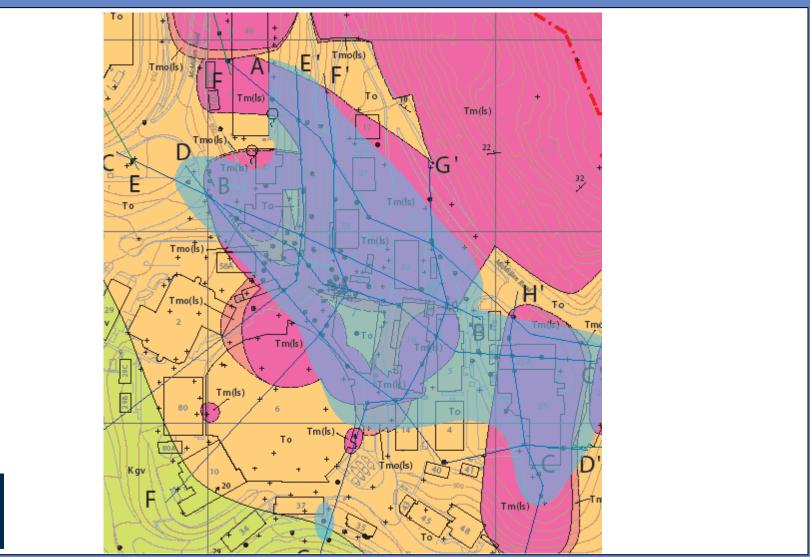




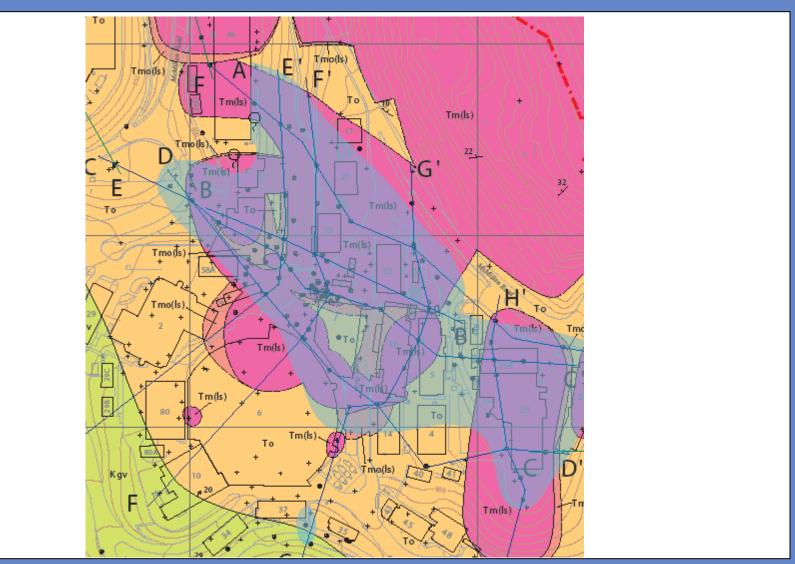




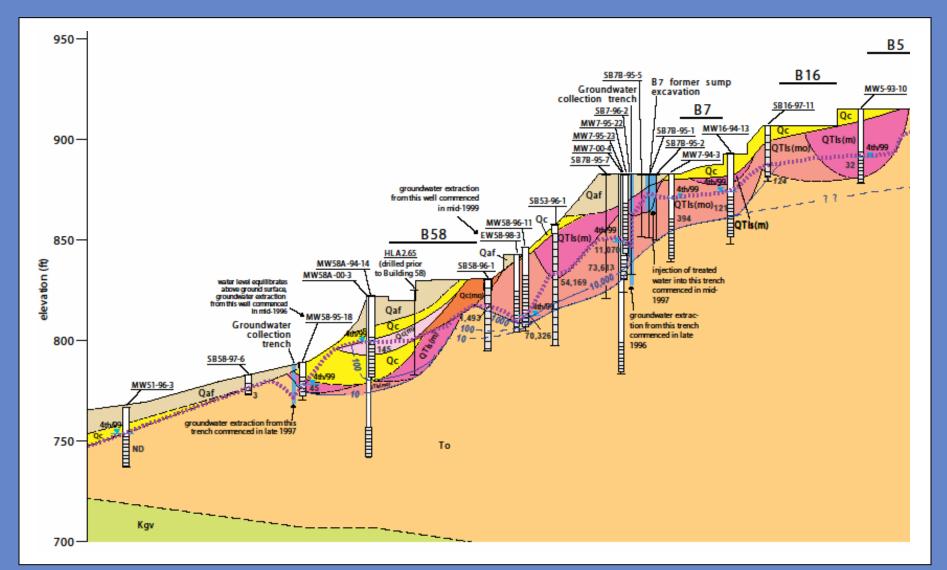




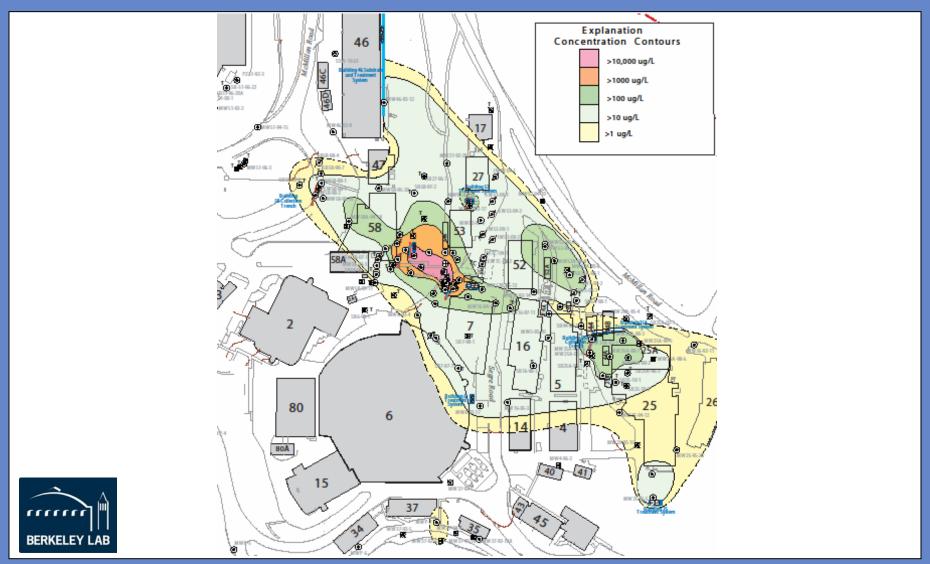




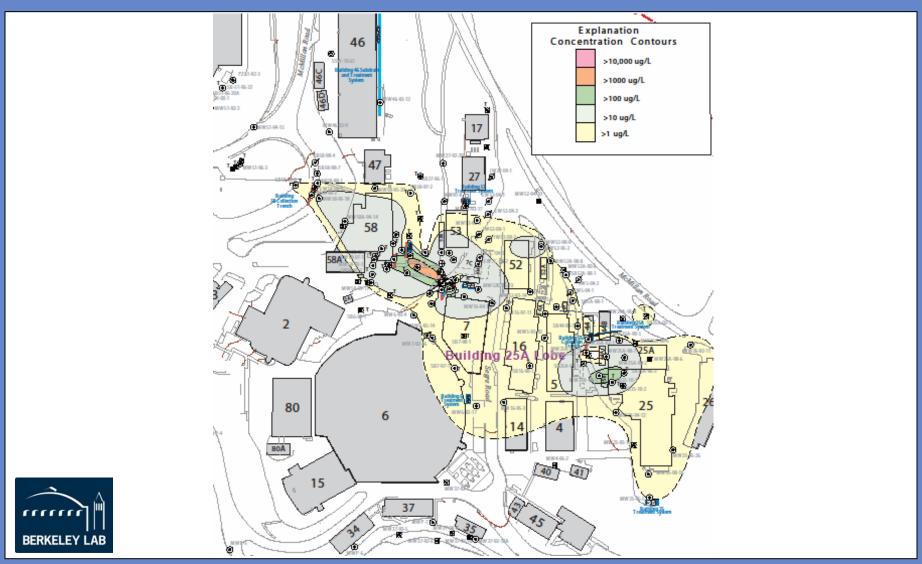




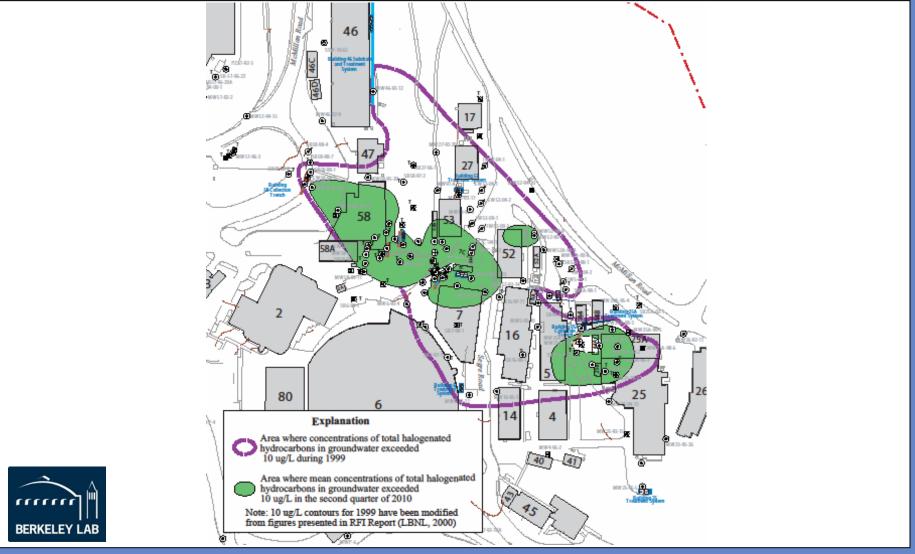
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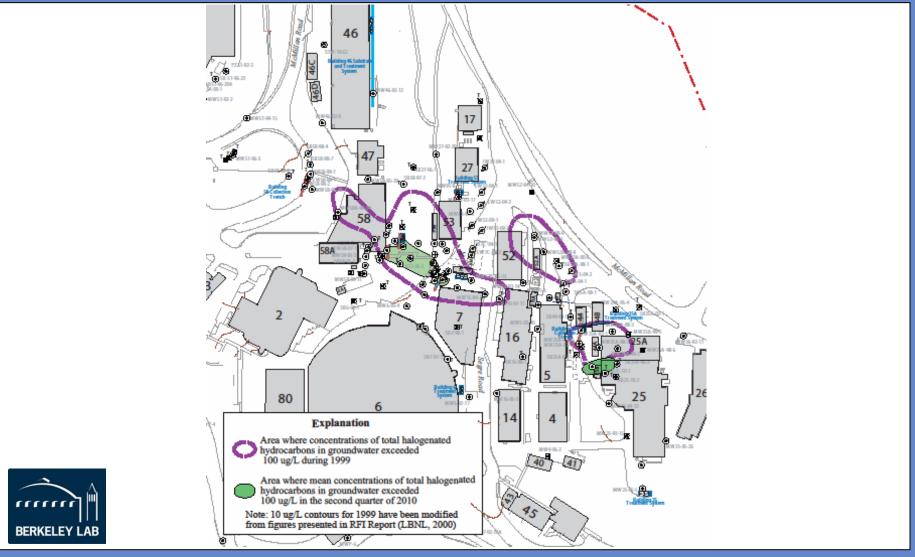
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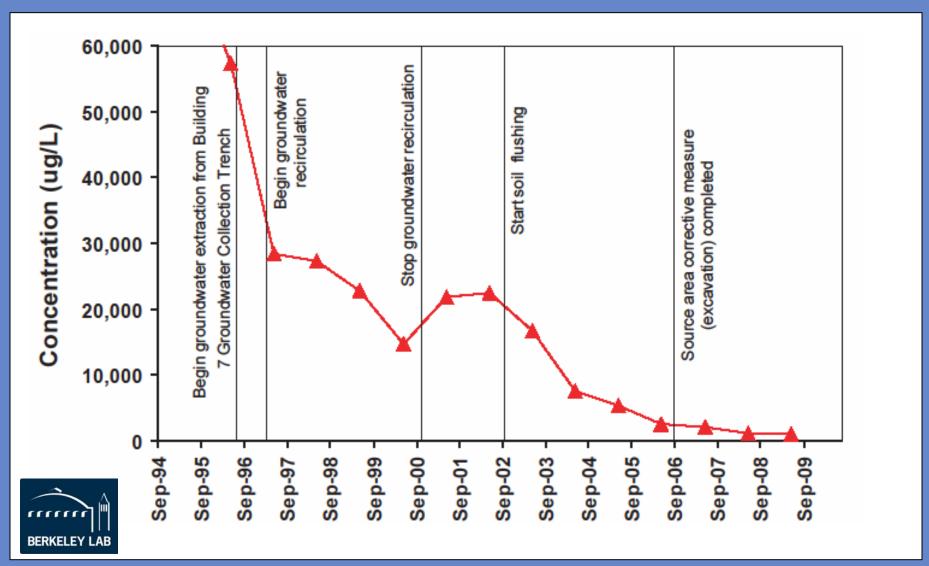
2010 versus 1999 Old Town Plume - 10 ppb



2010 versus 1999 Old Town Plume – 100 ppb



B7 Lobe Total VOC Concentration Trend



In Conclusion

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- ERP reports and data available at http://www.lbl.gov/ehs/erp/html/documents.shtml

