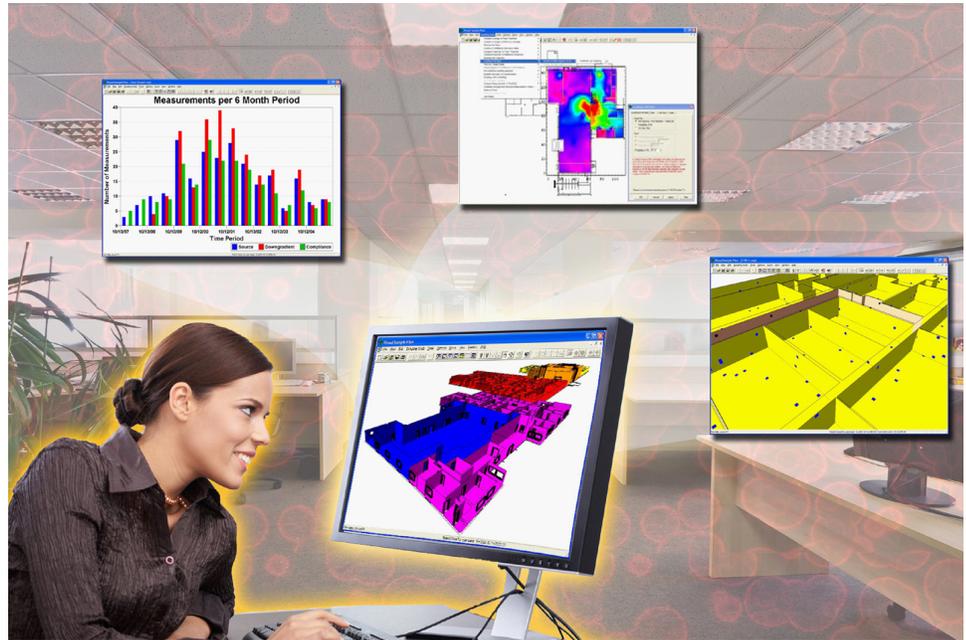
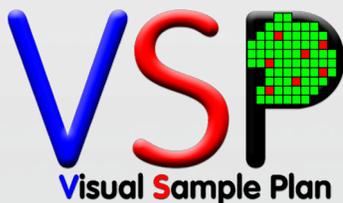


Visual Sample Plan (VSP)

Statistical Solutions with Confident Results



- ▶ How Many Samples Do I Need?
- ▶ Where Should I Take Samples?
- ▶ What Decisions Do My Data Support?
- ▶ How Confident Am I in Those Decisions?



WHAT IS VISUAL SAMPLE PLAN?

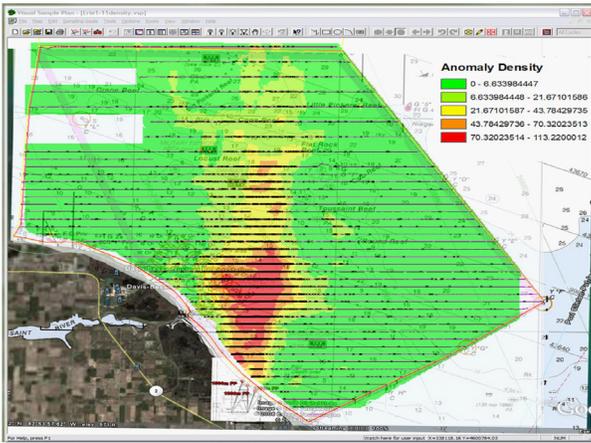
Visual Sample Plan (VSP) is a software tool that supports the development of a defensible sampling plan based on statistical sampling theory and the statistical analysis of sample results to support confident decision making. VSP couples site, building, and sample location visualization capabilities with optimal sampling design and statistical analysis strategies. VSP is currently focused on design and analysis for the following applications.

- ▶ Environmental Characterization and Remediation
- ▶ Environmental Monitoring and Stewardship
- ▶ Response and Recovery of Chemical/Biological/Radiation Terrorist Event
- ▶ Footprint Reduction and Remediation of Unexploded Ordnance (UXO) Sites
- ▶ Sampling of Soils, Buildings, Groundwater, Sediment, Surface Water, Subsurface Layers, Items.

The underlying methodology employs statistically defensible approaches which support the Data Quality Objectives (DQO) Process. The objective is to ensure that the right type, quality, and quantity of data are gathered to support confident decisions. VSP allows real-time evaluation of the tradeoffs between increased confidence in decisions and costs or number of samples required. VSP answers the questions of how many samples are required and where samples should be obtained.

DECISION RULES SUPPORTED

Designed for the non-statistician, VSP is organized to support multiple sampling objectives. Before developing a data-gathering plan, each user must determine what they will do with the data to support their decision-making process. VSP currently



It is estimated that over 20 million acres of land in the United States potentially contain unexploded ordnance (UXO). VSP helps create statistical based sample plans to aid in clean-up and disposal efforts.

support of in-field sampling and analysis activities. With each sampling plan, a 3-5+ page report is automatically generated that documents all the site sample area information, the sample locations, map, diagnostic graphics, statistical assumptions, any formulas used, costs, and sensitivity analyses. The sensitivity analysis table is interactive and can be customized for each user.

Finally, online help and technical documentation of the statistical methods are also freely available.

supports the following sampling goals or objectives:

- Estimate or compare averages
- Compare individual sample results against some limit
- Create transect or anomaly sampling/analysis for unexploded ordnance sites
- Evaluate trends over time
- Develop a geospatial contaminant concentration map
- Evaluate well placement redundancies or inadequacies
- Explore correlation between multiple analytes
- Estimate or compare proportions
- Assess whether the boundary around an area is contaminant free
- Develop a combined judgmental and probabilistic sampling scheme.

SPECIAL FEATURES

VSP has a number of unique, special features to facilitate use and support defensibility. Some of the diagnostic graphics are interactive, allowing immediate evaluation of tradeoffs between data quality objectives (DQO) requirements and costs. Sample locations are automatically displayed on maps and easily output to files that can be transferred to GPS units in

VSP USERS AND SPONSORS

VSP has been downloaded by more than 5000+ users worldwide and is being used by many government agencies and commercial entities. VSP is sponsored by the Dept. of Energy (DOE), Dept. of Defense (DoD), Environmental Protection Agency (EPA), Dept. of Homeland Security (DHS), Center for Disease Control (CDC), and United Kingdom Atomic Weapons Establishment.

ABOUT PNNL

Pacific Northwest National Laboratory is a Department of Energy Office of Science national laboratory where interdisciplinary teams advance science and technology and deliver solutions to America's most intractable problems in energy, national security, and the environment. PNNL employs 4,000 staff, has a \$855 million annual budget, and has been managed by Ohio-based Battelle since the Lab's inception in 1965.

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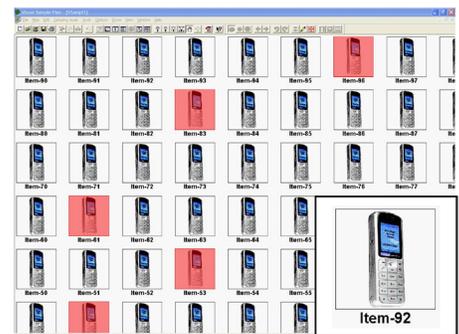
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VSP Training

VSP Training has been conducted at over 25 locations. To explore training opportunities or sponsorship of a course, visit our website at vsp.pnl.gov/current_training.stm or contact us by email.



Visual Sample Plan also aids in determining the appropriate number of items to sample (drums, property, containers, widgets...).