

1978 – 2011

33

YEARS OF
EXCELLENCE

WHITE SHIELD, INC

STATEMENT OF QUALIFICATIONS



White Shield, Inc.

Surveying • Mapping • Environmental

Offices at Pasco and Kent, Washington

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Pasco Office, Headquarters

320 N. 20th Avenue
Pasco, WA 99301
Phone: (509) 547-0100
Fax: (509) 547-8292
Email: wsik@whiteshield.com

Kent Office

23412 68th Avenue South
Kent, WA 98032
Phone: (253) 867-6070
Fax: (253) 867-6075
Email: wsib@whiteshield.com

Principals

Stuart W. Fricke, President

Small Business Enterprise

Native American-Owned
Small Disadvantaged Business
(FAR 52.219-9)

Indian-Owned Economic
Enterprise

State of Registration

WA: Eng/Land Survey #369
DUNS: 09-724-2234 (Pasco)
00-984-9899 (Kent)
WA UBI: 600 272 279

Federal Tax I.D.

91-1019180

Website:

www.whiteshield.com



White Shield, Inc. is a professional services consulting firm established in 1978, and is active in providing land surveying, construction surveying, mapping, environmental consulting, and industrial health and safety services to a diverse client base of government and commercial interests. The firm employs a staff of over sixty personnel located throughout the Pacific Northwest, operating from three office locations. The company is a Native American-owned Small Disadvantaged Business (complies with FAR 52.219-9 for subcontracting plans), MBE/DBE certified in qualifying NAICS codes, and is active in various organizations such as the Society of American Military Engineers (SAME), American Indian Council of Architects and Engineers (AICAE), and the Northwest Minority Supplier Development Council.

White Shield provides a wide range of professional services in support of the design and construction of various projects throughout the Pacific Northwest region. These services include a variety of survey and mapping capabilities, environmental studies, industrial health and safety, and industrial hygiene. We provide our expertise to major energy concerns, school districts, colleges and universities, Indian Tribes, Departments of Transportation, the Department of Energy, the banking and insurance industry, utility and communications industries, port districts, municipalities, the US Navy, the US Army Corps of Engineers, National Park Service, and the US Forest Service. Our services include the following:

SURVEYING SERVICES

ALTA Surveys	Geodetic Control Surveys	LiDAR & Aerial Control
Boundary Surveys	GIS Mapping	Right-of-Way
Cadastral Surveys	GPS Services	Topographic Mapping
Construction Surveys	Hydrographic Surveys	Transportation Design Surveys
Floodplain Profile Surveys	Land Parcel Delineation	Wetland Location Surveys
3D Laser Scanning	Building Information Modeling	Machine Control Modeling

ENVIRONMENTAL SERVICES

Asbestos Surveys	Health & Safety Plans	Phase I & II ESAs
Feasibility Studies	Industrial Hygiene	Regulatory Compliance
Groundwater Well Installation	Job Hazard Analysis	Remedial Investigations
Monitoring & Sampling	Lead-based Paint Surveys	SPCC Plans
Hazardous Material Surveys	Litigation & Permit Support	Subsurface Investigations

TRIBAL EMPLOYMENT RIGHTS OFFICES (TERO)

White Shield is TERO certified, or maintains Compliance Plans/Indian Preference Certificates with the following Indian Tribes:

- Crow Reservation
- Fort Belknap Indian Community
- Nez Perce Tribe
- Northern Cheyenne Tribe
- Puyallup Tribe of Indians
- Confederated Tribes of the Colville Reservation
- Salish and Kootenai Tribes
- Spokane Tribe of Indians
- Tulalip Tribes
- Confederated Tribes of the Umatilla Indian Reservation
- Yakama Indian Nation



White Shield provides a wide range of professional services in support of the design and construction of various projects in the natural and built environment throughout the Pacific Northwest region. Our experience includes an extensive variety of survey and mapping capabilities that have been provided to Departments of Transportation (Federal Highway Administration, Oregon DOT, Washington DOT, Sound Transit, multiple other local agencies), the US Department of Energy, US Navy, US Army Corps of Engineers, National Park Service, USDA Forest Service, Tribal organizations, the banking and insurance industry, utility and communications industries, schools, colleges and universities, port districts and municipalities. Below is a breakdown of the services we offer:

Surveying & Mapping Services

- ALTA Surveys
- As-Built Surveys & 3D Modeling
- Building Information Modeling (BIM)
- Boundary & Cadastral Surveys
- Construction Surveys
- Geodetic Control Surveys

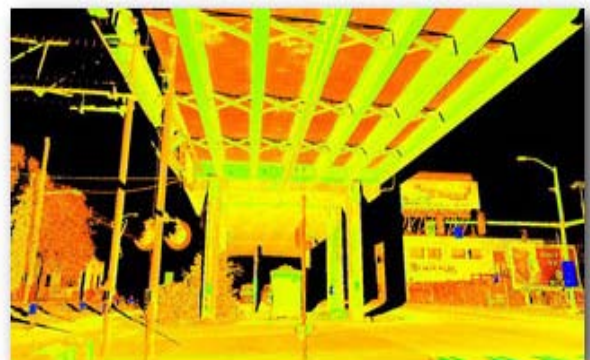
- Geophysical Surveys
- GIS Mapping
- GPS Surveys
- High Definition Laser Scanning
- Hydrographic Surveys
- Land Parcel Delineation

- LiDAR & Aerial Control
- Machine Control Modeling
- Right-of-Way
- Topographic Mapping
- Transportation Design Surveys
- Wetland & Floodplain Profile Surveys

White Shield has supported some of the largest and most complex projects in the Pacific Northwest, which include construction of the Nuclear Waste Treatment Plant at the Hanford Nuclear Reservation, the Link Light Rail System in the Seattle area, the Brightwater Wastewater Conveyance System for King County, Washington, a major highway redesign on I-90 east of Snoqualmie Pass for the Washington State Department of Transportation, and has just begun a challenging project involving 3D laser scanning of the Nuclear Waste Tank Farms at Hanford. Our Professional Land Surveyors are registered in the states of Washington, Oregon, Idaho, Montana, California, Nevada, Utah, Arizona, and Alaska. Our two offices in Pasco and Kent, WA are staffed with seventeen survey crews and four CADD operators, with most holding professional registrations. From these office locations, our five Project Managers can effectively mobilize resources to serve clients throughout the western United States.

High Definition Scanning

Our survey teams are able to capture project detail quickly, accurately and safely without multiple site visits. Sites can also be modeled for as-built validation and documentation. High Definition Scanning (HDS) analyzes a real-world object or environment to collect data on its shape, appearance (i.e. color), and three dimensional measurement. The collected data can then be used to construct digital, three-dimensional models useful for a wide variety of applications. HDS enhances output and enables designers to experience and work directly with real-world conditions.



- 3D data capture of all visible features
- Fast, accurate, complete, remote data collection
- Full panoramic, full color outputs
- Compatible with GPS and geo-referenced data

- x,y,z engineering measurements
- 3D CAD and 2D drawing extraction
- Data analysis (volume, clash, etc.)



HDS provides an easy way to accurately identify differences between actual construction and the design model of complex, exacting facilities. Using these tools, engineers can successfully avoid significant field-related construction conflicts that would otherwise have led to schedule extensions and additional project costs.

Topographic and Control Surveys

Our surveyors employ a cost efficient, field-to-finish system to provide the highest quality data in the least amount of time. We utilize the latest survey technology such as robotic total stations, Global Positioning System (GPS), digital levels, and scanners. Our professional survey staff is experienced in the application of this technology and survey theory for boundary, topographic, site development and design support, and construction services.

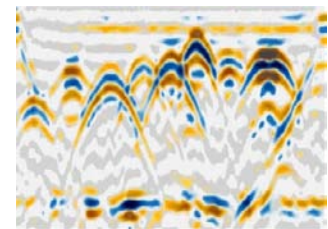
- Control Survey (GPS and Conventional)
- Topographic Mapping
- Construction Staking
- Aerial Survey Control
- Right-of-Way Surveys

- As-Built Surveys
- Cadastral and Boundary Surveys
- Tunnel Layout and Monitoring
- Settlement Monitoring
- Quantity Surveys

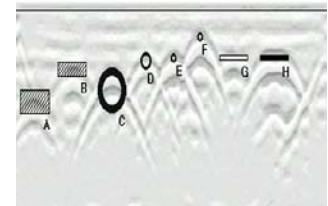
Our staff includes professional land surveyors, certified survey technicians, and construction surveyors. Our staff is among the best trained in the Pacific Northwest, employing the latest survey technology in highway, tunnel, industrial, environmental, public works, and construction projects.

Geophysical Investigations/Utility Mapping

Geophysics is a non-invasive, subsurface site characterization of geology, geologic structures, groundwater, contamination and manmade objects beneath the earth's surface. Our technicians are knowledgeable and experienced in working with ground penetrating radar (GPR), electromagnetics, and magnetics. They are able to provide the necessary geo-referenced information to locate utilities to avoid conflicts during excavation activities, and design or construction of new utility lines.



In environmental remediation, it is used to define landfills, contaminant plumes, buried drums, underground storage tanks (USTs), and pipelines and conduit that could transport wastes from the spill location. In engineering and construction applications, the expense of geophysical investigations is easily justified in the face of discovery of unknown utilities that create work stoppages and change orders.




- Subsurface Utility Engineering
- Utility Locating and Mapping
- Underground Storage Tank locating
- Dry Wells

- Borehole Clearance
- Rebar Mapping
- Concrete Assessment



STAFF QUALIFICATIONS

White Shield’s survey and mapping specialists provide an integrated package of services, employing a cost efficient, field-to-finish system that provides the highest quality data in the least amount of time. Our survey project managers exhibit an extremely diverse experience and are able to apply the appropriate leading-edge technology to meet the client’s survey and mapping needs. Our survey project managers have the project management experience to lead projects ranging from boundary and cadastral surveys to the specialized requirements of High Definition Scanning, LiDAR, and Aerial Control Mapping. Our staff is highly experienced in technically challenging projects and includes skilled field, research and CADD technicians utilizing modern GPS technology, robotic total stations and data collectors, digital scanners, and computer workstations with software capable of providing products in a variety of formats such as MicroStation (InRoads & GeoPak), AutoCAD (LDD3), and ArcInfo.

		Years of Experience	Boundary & Cadastral	ALTA Surveys	Topographic	Hydrographic/River Cross Sections	Right of Way Surveys	As-Builts & Utility Locations	Industrial Construction	Highway & Bridge Construction	Tunnel Construction	Railroad Surveys	Settlement Monitoring	Transmission Line Surveys	Geographic Information System	LIDAR/Aerial/Control Mapping	High Definition Laser Scanning
SUMMARY OF EXPERIENCE																	
KEY PERSONNEL	Mike Campise Survey Project Manager	31	•	•	•	•	•	•	•	•		•	•	•		•	•
	Charlie Porter, PLS Registrations: WA/VA/FL Kent Office Manager	40	•	•	•	•	•	•	•	•		•	•	•	•	•	•
	Darryl Witter, PLS Registrations: WA/ID/AZ Project Surveyor	26	•	•	•	•	•	•	•	•		•	•	•	•	•	•
	Mike Merritt, PLS Registrations: WA/OR/NV Project Surveyor	26	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Paul Kuhnle, PLS Registrations: WA Project Surveyor	24	•	•	•	•	•	•	•	•			•	•			•
	Ben Hodde, LSIT Geomatics Technical Lead Party Chief	6	•	•	•	•	•	•	•	•	•		•	•	•	•	•



EQUIPMENT

White Shield’s surveyors are equipped with the newest technologies available in high definition scanners, total stations, levels, and GPS equipment. Our standard equipment includes 3D laser scanners, full robotic total stations, data collectors with Carlson software, GPS receivers and laptop computers. We are equipped with precision digital levels for high order geodetic work, and high precision direct-read EDMs for industrial applications, or for use in dam, bridge, and settlement monitoring. In addition, we have a number of Trimble GPS units for establishing horizontal and vertical control networks, and our GPS receivers are subscribed to the Washington State VRS system. Bentley Microstation is consistently used for our project work for Departments of Transportation and US Army Corps of Engineers. The following is a list of equipment available to our survey crews:



SURVEY EQUIPMENT

- 1 Leica Scan Station II 3D Laser Scanner
- 1 Leica Scan Station C10 3D Laser Scanner
- 3 Leica 1203 Full Robotic Total Station, with data collection, 3 second
- 1 Trimble S6 Full Robotic Total Station, w/ data collection, 1 second
- 8 Trimble S6 Total Station, w/ data collection, 1 second
- 4 Leica 1100 Series, w/ data collection, 1, 3 and 5 second
- 1 Topcon GTS-302 Total Station, w/ data collection, 3 and 5 second

GPS EQUIPMENT

- 2 Trimble 5700/R7 Receivers (Dual Frequency, RTK, VRS Capable)
- 4 Trimble 4800 Receivers (Dual Frequency, RTK Capable) Geodetic Grade
- 1 Trimble Pathfinder Pro XRS, Resource Grade
- 2 Topcon GR3 (Dual Frequency, RTK, VRS Capable, Geodetic Grade)

VEHICLES

- 10 4X4 & 4X2 Trucks, 1991 – 2009 Models
- 10 Vans, 1990 – 2006 Models
- 1 Honda ATV, 2007 Model
- 2 Snowmobiles, 2005-2007 Models

LEVELS

- 3 Leica DNA-10 (Digital)
- 1 Leica NA 2002 (Digital)
- 1 Leica Sprinter (Digital)
- 4 Leica NA2
- 2 Leica 730
- 2 Zeiss Ni2
- 2 Topcon AT-G2A
- 1 Topcon AT-F4
- 1 Leitz BC2

PRINTERS

- 2 KIP 3100 Copier/Plotter/Color Scanner
- 1 HP T1120 Color Plotter
- 1 HP T750 Color Plotter

SOFTWARE

- Leica Cyclone/CloudWorx
- AutoDesk 2010 (AutoCAD/Civil 3D/Land Desktop Companion)
- Bentley MicroStation V8 and XM (GeoPak/InRoads)
- Star Net (Rigorous Least Squares) v6.0
- Traverse PC Survey v9.0
- Trimble Terra Model
- Trimble Geomatics Office v1.63
- Trimble Access
- Trimble Business Center
- Topcon 3D Office
- PowerCAD CE Pro
- Carlson SurvCE v2.0
- ESRI ArcInfo v9.31
- ESRI ArcPad





Sound Transit Central Link Light Rail, Seattle, WA; RCI Herzog for Sound Transit

White Shield provided surveying services to assist RCI Herzog and Sound Transit in building the Central Link section of its new light rail system. The anticipated end product will consist of an 82-mile commuter rail line with 12 stations running in North King, Snohomish, East King, South King, and Pierce Counties every few minutes during peak commuting hours. Opened in July 2009, the 14-mile Central Link portion of the system connects downtown Seattle and Southeast Seattle with a South 154th Street Station in Tukwila near the Seattle-Tacoma International Airport. White Shield supported the primary contractor RCI Herzog by providing all construction survey services in building a 4.5 mile section through Rainier Valley, and was responsible for using alignments and profiles to stake the back of walks, walls, curbs, storm layout, utility relocations, edge of pavement, the rail line, ballast wall, power and traffic pole locations, blue-tops, sidewalks, and other project details. As segments were completed, as-built drawings were developed for client use. Up to 5 crews at a time were utilized on this project.



Big Pasco Industrial Center Development Phase 4, Pasco, WA; Coast Rail, Inc. for the Port of Pasco

This 600-acre facility, located along the Columbia River, is home to manufacturing, warehousing, fruit and vegetable packing, assembly and distribution plants. The Big Pasco Industrial Center includes nearly 2 million square feet of improved buildings, and developable acreage for diverse industrial development, speculative development and build-to-suit arrangements. Each building is divided into four bays with each bay measuring 180 feet by 240 feet. Covered docks run full length on each side and handle both truck and rail shipments. The end docks are 12 feet wide and some buildings have end ramps for easy truck access to the end bays. Floors are rail car height and rail tracks serve each building. White Shield provided construction survey services for both track and road layout for this expansion phase of the project. The services included staking for rail alignments, base grade, sub-ballast, ballast, concrete ties, rails, frogs, points of switches, derailleurs, concrete panel rail crossings, and culverts and drain pipes. Additionally, White Shield provided a machine control model to the excavation contractor.



Commuter Rail, Tacoma to Lakewood Section, Tacoma, WA; Carter Burgess for Burlington Northern Santa Fe Railroad

White Shield provided GPS Control for aerial pre-mark positions along a 12-mile route from the City of Tacoma, WA to Camp Murray National Guard Base. The control was coordinated with existing WSDOT control monuments in establishing 76 aerial pre-marks. Additional services involved providing top of rail elevation and profile information, and the location of critical underground utility locations throughout the project corridor.

Puget Sound Light Rail, GPS Control for Aerial Mapping, Seattle, WA; Washington State Department of Transportation

Under contract to the Washington State Department of Transportation, White Shield determined coordinate values of over 400 aerial survey targets, using Real Time Kinematic (RTK) GPS technology, in support of WSDOT's aerial mapping of a proposed 30-mile, \$1.7 billion light rail corridor from Seattle-Tacoma International Airport to Northgate Shopping Center.



Sound Transit ALTA Surveys, Seattle, WA; Puget Sound Transit Consultants for Sound Transit

White Shield provided boundary and control surveys for the Right-of-Way retracement and future acquisition of additional Right-of-Way as part of the Light Rail project along Martin Luther King Jr. Way, near Seattle, WA. Reconstruction was based on field surveys and recorded documents for Right-of-Way along Martin Luther King Jr. Way bounded by South Bayview Street to the north, and South 140th to the south. The surveys included reconstruction on intersecting streets, and adjoining property. Final deliverables included right-of-way maps, parcel maps and legal descriptions of the proposed acquisition parcels.

RTA Commuter Rail, Tacoma to Everett, WA; HNTB for the Burlington Northern Santa Fe Railroad

White Shield provided field surveys and prepared detailed topographic base maps along 71 miles of BNSF tracks, from Tacoma to Everett, WA for the design of over \$600 million in improvements for the proposed commuter rail service. Services included aerial mapping, as-built mapping of bridges and underpasses, ground surveys and field editing of selected portions of the route, preparation of Intergraph MicroStation base maps, and the establishment of survey control using RTK, GPS, and digital level technology.

Central Link Light Rail Alignment Phase I and II Environmental Site Investigations, Seattle, WA; Garry Struthers & Associates for Sound Transit

White Shield provided support for Alignment Screening, Phase I Environmental Site Assessments (ESAs), and Phase II ESA Subsurface Investigations for properties along segments of the Central Link Light Rail Alignment for Sound Transit in Seattle, Washington. During Alignment Screening and Phase I ESAs, White Shield identified recognized environmental conditions for each property. At sites requiring Phase II ESAs, subsurface investigations were conducted per ASTM standards in order to define and characterize the extent of the contamination. Typical soil and groundwater contaminants in the Rainier Valley area of Seattle include petroleum products, priority pollutant metals, and solvents. As a member of the consulting team for this alignment, White Shield assisted Sound Transit real estate agents and assessors and coordinated with the owners of the properties in order to obtain rights-of-entry to sites. White Shield also provided an interpreter for the predominantly Asian community.



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Miller Creek LIDAR Mapping, Missoula, MT; Federal Highway Administration

White Shield provided mapping services using LIDAR for the Miller Creek Road Project. The services involved the acquisition of high resolution LIDAR and Orthophotography of the project area. High resolution LiDAR data was obtained in a 40 square mile project area.

Thompson River Road, Thompson Falls, MT; Federal Highway Administration

Survey and mapping services were provided for this project, located approximately 10 km east of the City of Thompson Falls. Services included providing GPS controlled aerial photography for mapping approximately 70 km of Thompson River Road, establishing the horizontal and vertical control needed to control the aerial photography for the project, establishing pairs of horizontal and vertical control points at approximately 5-km intervals along the project for future conventional traverses, and providing controlled color vertical aerial photography for mapping of the project corridor with approximately 26 flight lines of approximately 215 exposures.

Hopland Tribe Casino Survey, Hopland, CA; Hopland Tribe of Pomo Indians

White Shield performed an aerial survey and topographical mapping for the Hopland Indian Reservation and Hopland Casino Master Plan. The development included a new casino, golf course, and hotel development near Hopland, California. Project tasks included the use of GPS control methods to establish the survey control and over-fly at 1"=100', and 1-foot contour intervals for future planning purposes.

Bradfield Canal LiDAR and Aerial Survey, Wrangell, AK; Federal Highway Administration

White Shield managed this project for the Federal Highway Administration, Western Federal Lands Division, for the Bradfield Canal Road project area located in Southeast Alaska, southeast of the City of Wrangell. The services involved the acquisition of high resolution LIDAR (helicopter platform), color orthophotography, and GPS control for the analysis of a proposed 27-mile corridor along the North Fork Bradfield River and South Fork Craig River to the US/Canada Border.

Malmstrom Air Force Base Aerial Panels, Great Falls, MT; Merrick and Company for U.S. Army Corps of Engineers Omaha District

White Shield established 11 aerial panels at Malmstrom Air Force Base, Great Falls, Montana in support of Merrick and Company for the US Army Corp of Engineers Omaha District. Area covered encompassed approximately 15 square miles lying south of the Missouri River and north of State Highway 89. Ground control was established by Static GPS methods. The control was in support of 0.5' pixel orthophotography and 0.5' LIDAR mapping. Coordinate system was based on the AFB established network (WGS84, UTM Zone 12 North, Meters)



EPA Region 10 AES Contract (RAC II), Bunker Hill Task 014, Canyon Creek, Wallace and Shoshone County, ID;
CH2M Hill for the U.S. Environmental Protection Agency

White Shield is supporting CH2M-Hill with survey support to the EPA AES Contract. Canyon Creek is the third project site in the Bunker Hill Complex that has included survey. Within this Canyon Creek task order 0014, White Shield has completed 3-tasks in 2006 and 2007. Tasks have included monitoring wells surveys, aerial panel control, and river profile and cross-sections.



Goodnoe East and West Wind Turbine Farm, Goldendale, WA; Northwest Wind Partners, LLC

White Shield provided the initial boundary and ALTA surveys for an 8,000+ acre wind turbine generation farm covering 18 sections. Proposed facilities include 76 2-megawatt wind turbines to be located in the Goodnoe Ridge area southeast of Goldendale, WA. Proposed infrastructure includes additional access roads and electrical collection circuits that connect to the BPA Hanford-John Day 500KV line. Additional survey requests have included detail surveys for the connecting power line corridor, new power substation site plan, and determination of microwave beam paths and location relative to the turbines.

Miller Ranch Wind Turbine Farm Aerial Mapping, Bickleton, WA; Northwest Wind Partners, LLC

White Shield provided ground control for the aerial mapping of 19 sections for a proposed new wind farm development in the Wood Gulch/Big Horn Canyon area south of Bickleton, WA. Mapping was developed at 2-foot contour intervals (1"=100') to support the ALTA survey and engineering final designs. A Record of Survey was provided showing exterior boundary and PLSS corner ties.

Alaska Natural Gas Pipeline Surveys, Prudhoe Bay to Beaver Creek, AK; URS for North American Natural Gas Producers Group (NANGPG)

White Shield provided DGPS survey support to the North American Natural Gas Producing Group (NANGPG) Pipeline Team fieldwork effort. The proposed pipeline alignment runs between Prudhoe Bay and Beaver Creek, Alaska. Our work requirements included assisting URS environmental study and permitting teams with DGPS training, developing data dictionaries, DGPS equipment configuration and maintenance, performing geodetic grade GPS surveys of base stations, post processing of Trimble Pathfinder daily data files, Quality Control of DGPS field data, and transmitting data using a web-based project portal. White Shield supported approximately 20 field teams working, at times, over the entire alignment. The base of operations was at Fairbanks with temporary field offices in Coldfoot and Tok.

Lake Hills Connector, Bellevue, WA; Puget Sound Energy

White Shield performed a detailed route survey for the Bellevue Lake Hills Connector High Pressure (HP) gas line project for Puget Sound Energy (PSE). This project is supporting the design of approximately 10,000 linear feet of 16" HP main and 8,500 linear feet of 12" HP main in the Kelsey Creek area of Bellevue. The route began near the intersection of SE 8th and 118 Ave SE, and continued to NE 10th St and 110th Ave NE. This project required a complete route and topographic survey presented with 1-foot contours. White Shield provided PSE monuments and benchmarks, property boundaries with tax ID numbers, easement boundaries, and the edge and centerline of ROW. Also mapped were above ground and below ground utilities, driveways, gutters, fences and gates, the 100-year flood plain and the ordinary high water level of Kelsey Creek. Services also included mapping ditch lines, manholes, catch basins, roadway striping and other pavement markings, traffic signals, curbing, and sidewalks. White Shield performed a detailed wetland survey of the route and identified the specific aquatic and riparian vegetation types within those areas.



High Voltage Transmission Line Route Survey; Puget Sound Energy

White Shield provided Puget Sound Energy (PSE) with a survey of the high voltage transmission line route located in the Sammamish-Clyde Hill, Berrydale-Lea Hill, and Sammamish-Novelty Hill areas of King County, Washington. The route's length was approximately 82,507 linear feet, or about 15.7 miles. To maximize efficiency White Shield utilized GPS surveying techniques whenever possible and also used RTK GPS for mapping. In areas where GPS was not the best tool, robotic and reflectorless total stations were used to increase the efficiency of data collection. White Shield surveyed the aerial tops of all poles, insulators, distribution cross-arms, and anchors within or crossing the road template, located the trees encumbering the lines within the public ROW, and verified edge of pavement, sidewalks, driveways and ingress/egress to any businesses located along the route. Ground elevations were provided at all existing power line structures along the right of way as



well. White Shield located the hi/low point of the lines throughout the route to determine the sag, and recorded the date, time, and temperature to monitor line tension and facilitate design.

16"HP gas main, Phase I, Phase II, Phase III; Kent, WA, Puget Sound Energy

White Shield assisted Puget Sound Energy (PSE) with their proposed 16" high-pressure (HP) gas main pipeline near Kent, WA along South 272nd Street and the West Valley Highway. White Shield provided a complete route and site topography survey for the project, which began near the intersection of South 272nd street and Star Lake Road and ended at the intersection of South 259th Street and 80th Avenue South. The complete survey length was approximately 27,500 feet not including the substation. Robotic and reflectorless total stations were used during this project to ensure safety of the field crew and to increase efficiency of data collection. By utilizing these instruments White Shield eliminated the dangers associated with locating jersey barriers, lane lines or edge of pavement on highly traveled roads. A project vicinity map and plan view of the pipeline route was included. White Shield also provided PSE with an elevation profile along the centerline of the ROW and of SR-167 where it crossed the anticipated pipeline route, and property boundaries with tax ID numbers, easement boundaries, and street names including railroad crossings. The edge of pavements, sidewalks, driveways, curbs and gutters, roadway striping and other pavement markings were identified, and building or structures within 100 feet of the ROW were noted as well. White Shield provided ditch flow lines and top of slope, and above and below ground utilities including sanitary sewer, storm water, potable water, power, traffic signals, cable and gas. A hydrographic survey was also performed on the Green River, which consisted of utilizing sounding devices to measure depth, and surveying the surface of the water elevation.

Bonney Lake 8" High Pressure Reinforcement Project, Bonney Lake, WA; Puget Sound Energy

White Shield assisted Puget Sound Energy (PSE) with survey services in Bonney Lake, WA supporting the design of an 8" natural gas supply main. The 14,000 ft route proceeded along 9th Street East, 182nd Avenue, and 4th Street East, to supply gas to the Bonney Lake area. The route crossed busy county roads, residential streets and private property. White Shield mapped the right-of-way, including boundary & right-of-way lines, edge and centerline of pavement, driveways, curbs and gutters, visible evidence of utilities, utility poles, light poles, drainage features & ditches, catch basins & inverts, manholes & inverts, rockeries, walls, sidewalks, trees (8" diameter and larger measured four feet from the base), survey monuments & benchmarks, traffic signals including loops, topographic features, and wetland flags. In addition to the listed routes White Shield surveyed 100' in each direction along the right-of-way at all intersections and the end points of the routes. All mapping was on the Washington State Plane Coordinate System (NAD83/91).

Central Seattle 12" High Pressure Gas Main, Seattle, WA; Puget Sound Energy

White Shield assisted Puget Sound Energy (PSE) in the preliminary phase of a project located in the Central District in Seattle. The project consisted of installing approximately 7,200 linear feet of 12" steel wrapped high-pressure gas main. The route traversed through residential neighborhoods beginning at 18th Avenue and South Weller Street and ended at 26th Avenue South and Marion Street. White Shield noted all monuments and benchmarks, edges of pavement and type of pavement surfacing, driveways, sidewalks, curbs and gutters, drainage structures, culverts and ditches. Above and below ground utilities were located throughout the route including light poles, utility poles, traffic signals and loops, visible indications of property lines, and traffic circles. All mapping was performed on the Washington State Plane Coordinate System (NAD83/91).



Chiller Plant, Washington State University, Pullman, WA; KPFF Consulting Engineers for Washington State University

White Shield supported KPFF and the University with preparation of a site plan of a 400' x 400' area for expansion of WSU Chiller Plant facility between South Fairway Road and Round Top Road. Services included a topographic and utility survey with 1' contours; spot elevations along curbs, sidewalks, road centerline; and building corners, doors, and loading docks. All tree trunks 3' in diameter and larger were located and labeled with size and drip line included on the plan. White Shield used utility location services, WSU base maps, and existing as-built plans to compile the complete utility survey. Utility covers and lids were pulled to obtain or verify depths, sizes, direction, number, and type of material, and elevations were provided at the top and bottom inside tunnels and vaults. Deliverables were provided in AutoCAD 2004 format drawing files with LDD 2005 DTM files.

USDA-ARS Plant Biosciences Building, Washington State University; HDR Engineering for Washington State University

White Shield prepared a site plan of a 3.5-acre site on the WSU Campus for development of the USDA Agricultural Research Station Biosciences Building 2. This project was a four-story 90,000 GSF Plant Biosciences Research Facility which will house offices, meeting rooms, research laboratories, and core laboratory facilities for WSU Principal Investigators and USDA-ARS-funded Scientific Years on the WSU Pullman campus. White Shield provided elevation contours at 1' intervals; identified pavement types and limits; plotted the location of structures above and below ground; man-made and natural features; all floor elevations; and elevations at each entrance of buildings located within the site boundary. Utilities were mapped noting the size, depth, material, and pressure of water and gas mains, central steam and other utilities including irrigation meters, valves and vaults, buried tanks, and septic fields either serving, or on the property. Sanitary sewers, combination sewers, storm drains, catch basins, and manholes were similarly mapped. All other above ground features were mapped, including fire hydrants, power and communication systems, trees, and shrub plantings by perimeter outline. The location, size, and depth of all service tunnels was provided, including all grade breaks and changes in tunnel size, interior floor and ceiling elevations, changes in direction, and at 50' minimum intervals. Ductbank height and width was identified, with number and size of conduits. Final deliverables were made in AutoCAD 2004 with supporting LDD2005 DTM files.

Library Road Phase III, Washington State University, Pullman, WA; Washington State University

Library Road Phase III is a continuation of improvement work begun in 2000. The improvements to the campus infrastructure in the area of Library Road will provide greater service capacity and a more pleasant environment, enhancing pedestrian movement, reducing regular vehicular traffic, and maintaining service access and ADA parking areas. Traffic circulation and pedestrian safety at the transit hub located at the intersection of Campus and Thatuna Streets will also be improved.

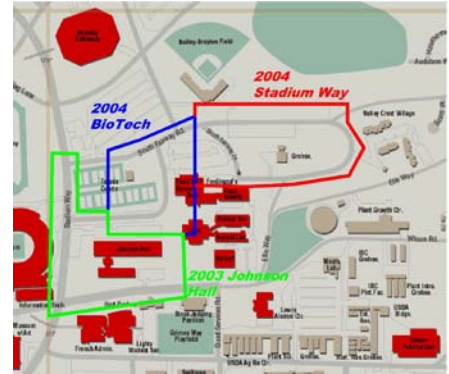
White Shield supported KPFF Consulting Engineers and the University with a high-density topographic survey of an approximate 8-acre area to facilitate streetscape re-development. The survey included mapping of all above ground structures including building corners and doorways, trees, utilities, signs and curbs. Horizontal and vertical control was established by static GPS observations. Other survey tasks included subsurface utility verification (potholing) to develop an underground utility map.





Biotech/Life Sciences Building, Washington State University, Pullman, WA; KPFF for Washington State University – 2007

White Shield supported Washington State University and KPFF with preparation of a design package for construction of the new Biotech/Life Sciences building located on the Washington State University Pullman campus. The project site is located between the Johnson Hall expansion and Stadium Way Improvement projects that White Shield completed in 2003 and 2004. Survey tasks included development of an existing site plan of approximately a 425'x525' area. An additional underground detail survey was made of the existing steam tunnel located on the site. Site topography of the developed area consisted of campus buildings, tennis courts, WSU IT infrastructure, high/low/chilled pressure waterlines, and standard underground utility infrastructures.



University of Washington Utility Tunnel, Seattle, WA; KPFF for the University of Washington

White Shield conducted detailed topographic mapping, including interior mapping of existing utility tunnels at the University. AutoCAD base maps, utilized for the design of a half-mile \$7.6 million extension of utility tunnels throughout the southwest campus area of the University of Washington, were also developed for this project.

Within the past 5 years White Shield has provided surveying services to support new construction and renovation on over 20 school projects in the Puget Sound area with a total capital cost of over \$500 Million. These have included 6 elementary schools, 1 junior high and 13 high schools. These school projects represent 10 of the 23 School Districts in the Puget Sound Area, including Bellevue, Edmonds, Renton, Highline, Shoreline, Issaquah, Lake Washington, Puyallup, and Seattle. Several of these projects are detailed in the following descriptions.

Denny Middle School/Chief Sealth High School, Seattle, WA; Absher Construction for the Seattle School District

White Shield provided survey services in support of the innovative design and construction of this co-located school campus. Project improvements included the construction of sewer, water storm and gas site utilities, rain garden, curb gutter and sidewalks, tennis courts and building layout. In addition to the layout of site features, High Definition Laser Scan was utilized to provide



verification of the concrete sub-floor in the new gymnasium. Elevations were measured to a tolerance of 0.005' and reported on 10 foot grid spacing. The completed campus will provide new, separate outdoor student plazas for Chief Sealth High School and Denny International Middle School students. Modernization Chief Sealth High School's is focused on abating life-safety issues, improving energy efficiency and comfort, revitalizing the school's appearance inside and out, and creating a superior educational environment. The new Denny



International Middle School encourages team learning, a clear and flexible pathway to high school, and provides the many benefits of a 21st century facility.

Renton Park Elementary School; *John Korsmo Construction for Renton School District*

White Shield provided construction staking services to John Korsmo Construction for a new school in the Renton School District in Renton, WA. This 2 year project involved demolition of the old school, construction of a new 64,371 square foot building, and associated sports fields on a sprawling 5 acre property. The construction survey staking, required verification of the existing control provided by the client. White Shield field located and verified the rough grade, retaining walls, storm system, water system, sanitary sewer system, curbs, exterior lighting, and building location. WSI staked sidewalks, curbs, and the location and elevation of parking areas.



South Lake High School; *Commercial Structures for Seattle School District*

White Shield provided Commercial Structures with construction-staking and survey services for an alternative public school in the Seattle School District that is home to 136 students from grades 9 through 12. WSI verified the existence of property corners and compared field locations to the existing Plat of Survey, and established a network of survey control points and 3 benchmarks near the construction site. The firm also set Temporary Erosion and Sediment Control (TESC) facilities by staking clearing limits at intervals of approximately 75-feet, and staking detention ponds and the centerline of swales. Additionally, staking was provided for mass grading which encompassed the location and elevation of the building pad and the parking areas, resulting in a sub-graded site. WSI also staked the curb and sidewalk alignment every 50 feet on straights with grade, and every 25 feet on curves. All storm and sanitary structures were staked, including cleanouts for sewer. With regard to waterlines, WSI stated all horizontal changes in direction, tees, water valves, manholes and hydrant locations, and staked columns and grid lines on an offset. WSI was also responsible for staking the center of light poles and electrical vaults. Finally, WSI staked the perimeter of the Plaza, which was established around the entire building, with all radius points, and provided cut-fill to finished grade elevation.

Glacier Peak High School, Snohomish, WA; *Lydig Construction for the Snohomish School District*

White Shield supported Lydig Construction with the building of a new 245,000 square foot high school for the Snohomish School District. This new high school featured a new performing arts center and an artificial turf football field with a project cost of \$60 million. WSI verified the property corners, and established a network of control points in order to execute the survey tasks efficiently. WSI provided staking for the location and elevation of the building pad and parking areas for mass grading. Storm, sanitary structures, water lines, light poles, electrical vaults, valves, manholes, and hydrants were also staked. Retaining walls were staked at 50 foot intervals, and 200 points were set for the installation of the sidewalks. WSI established the perimeter curb, fencing, and home plate of the baseball fields, and also provided soccer field and track layouts.





Kennydale Elementary School; *Wick Construction for Renton School District*

White Shield provided construction staking and survey services for Wick Construction for a new school in the Renton School District. Kennydale Elementary School is located on 6.7 acres, which includes sports fields and a play area. WSI verified the existing property corners or control points, established a network of control points and three benchmarks to facilitate efficient performance of all future survey tasks, and staked the location and elevation of the building pad and parking areas for the mass grading. WSI staked all storm and sanitary structures, water lines, manholes, hydrant locations, and utility crossings which included setting approximately 120 points to complete these tasks. A utility as-built survey was supplied to the client upon completion.



New Lynwood High School; *Cornerstone General Contractors for the Edmonds School District*

White Shield provided Cornerstone General Contractors with construction staking and survey services at the New Lynwood High School located in the Edmonds School District. The High School is located on a 40-acre site off of North Road in Lynwood, WA. The new two-story, fully accessible school is a 214,000 square foot facility, and will accommodate 1600 students and 100 staff members. The construction included a 450-stall parking lot and a separate bus entry/exit area. The school also included a 350-seat Performance Theater, artificial turf soccer and softball field, football field with a running track, baseball fields, tennis courts, and a field house with concessions. WSI verified the property corners and compared field locations to the existing plat of survey, and provided Cornerstone with three benchmarks to facilitate vertical checks. The firm also set temporary erosion and sediment control (TESC) facilities by staking clearing limits at 50-foot intervals, and also includes staking the detention ponds, silt fences, and bioswales. WSI provided staking for mass grading for features such as parking lots, building envelopes, and site slopes to get the sub-grade. Storm, sewer, water utilities were staked, as well as curbs and sidewalks throughout the project, at 50' intervals to finish grade. Additionally, WSI was responsible for staking the center of light poles and corner of vaults. Following the development of the foundation, WSI established basic grid control for the project.

Puyallup Elementary School #23; *Commercial Structures Inc. for Puyallup School District #3*

White Shield provided Commercial Structures with construction staking and survey services for a new elementary school located in the Puyallup School District. This \$22 million dollar facility, located on a 15 acre site, is approximately 74,000 square feet in size, and is home to approximately 750 students. WSI verified the existence of property corners and compared their field locations to the existing plat of survey, and established a network of survey control points. WSI set temporary erosion and sediment control, which included staking clearing limits at 75 foot intervals. Also, detention ponds, silt fences and bioswales were posted. Additionally, staking was provided for mass grading, which encompassed major site features such as building envelopes, road centerlines, streets, parking lots, earthwork and all site slopes, resulting in a sub-graded site. The firm also staked curb and gutter line alignments as well as radius points at 50-foot stations with cut/fill to top back of finish grade. Above and below-ground utilities such as storm, water, sewer were also established.





Cedarhurst Elementary School; Babbit Newman Construction for Highline School District

White Shield provided construction staking and survey services to Babbit Newman Construction for the demolition and new construction of Cedarhurst Elementary School, located in Burien, WA. The project included construction of the new 65,000 square foot school, and site development work to accommodate play fields, playgrounds, and a covered play court. WSI verified the existence of property corners and compared field locations to the existing plat of survey. A network of control points and 2 benchmarks near the site were established, and staking was provided for mass grading which encompassed the major site features such as location and elevation of the building pad, building envelopes, road centerlines, streets, sidewalks, parking lots, earthwork, and site slopes resulting in a sub-graded site. The firm also staked the curb and gutter line alignments as well as radius points at 25-foot stations. WSI also located all utilities including storm, water, sanitary structures, hydrants, and utility crossings.



Puyallup Junior High School #7; Commercial Structures Inc. for Puyallup School District #3

White Shield supported Commercial Structures with construction staking and survey services for the new Glacier View Junior High in the Puyallup School District. The 98,306 square foot school is located on a sprawling 20 acre site which included a soccer field and a track. WSI verified the existence of property corners and compared their field locations to the existing plat of survey, and established a network of survey control points. WSI provided Commercial Structures with six benchmarks near the construction site to facilitate vertical checks, and staked the location and elevation of the building pad and parking areas for mass grading. WSI was also responsible for staking all storm and sanitary structures, light poles, electrical vaults, curbs, retaining walls at 50-foot intervals, and sidewalks.

Woodridge Elementary School; Cornerstone Construction Co. for Bellevue School District

White Shield provided construction staking and survey services for the demolition and reconstruction of a new 62,000 square foot elementary school for the Bellevue school district. This \$20 million school was completed in summer of 2007, and opened for the 2007-2008 school year. The new school featured a gymnasium and multi-purpose room, stage areas, music rooms, and art/science project rooms incorporating state of the art technology. WSI provided construction staking services on the 10 acre site which included staking for clearing limits at 50 foot intervals, staking for mass grading at 100 foot intervals, and stake curbs and edge of pavement at 50 foot intervals. WSI also staked the center of structures with double offsets and other elements of work including bio-swale, hydrants, all grid line intersection and corners, intersecting gridlines once building slabs were in for each zone and two elevation benchmarks.

Sherwood Forest Elementary School; Cornerstone Construction Co. for Bellevue School District

White Shield assisted Cornerstone Construction Co. with demolition and construction of a new \$25 Million, 2-story, 6,200 square foot elementary school for the Bellevue School District. WSI verified the existence of property corners, and established a network of control points, and located and verified rough grade, retaining walls, storm system, water system, sanitary sewer system, curbs, exterior lighting, and building location. WSI also staked sidewalks, curbs, and the location and elevation of parking areas.





Paine Field ARFF Facility, Everett, WA; KPFF Consulting Engineers for Snohomish County, WA

White Shield provided KPFF Consulting Engineers with survey services to support construction of a new Aircraft Rescue and Fire Fighting (ARFF) facility at Paine Field. White Shield performed a topographic survey to map the entire site, which includes the elevation of adjacent building floor elevations, a storm swale/grass ditch, all utility rim elevations, and pavement and concrete edges. All other structures, utility vaults, light poles, water and gas locations, striping of taxiways/roadways adjacent to the ARFF area were noted as well. White Shield identified the power and communication duct bank locations, and located all utility structure and vaults associated with power and communication. Horizontal and vertical control was obtained from the Paine Field Survey Control Network, supplied by the Paine Field Superintendent of Operations.



Washington State Penitentiary Close Compound Expansion, Walla Walla, WA; Ambia Architecture for Washington State Department of Corrections

White Shield supported Ambia with topographic surveys and verification of utility location, to include compilation of existing aerial mapping, previous consultants electronic utility maps, and new site plan information acquired by RTK GPS and conventional methods. Areas were encountered that contained undocumented underground utilities. Ground penetrating radar was employed to identify these areas, facilitate design, and prevent major construction change orders. This project involved development of 165± acres for the pre-design and construction of various facilities in the Close Custody Compound Expansion.



Redmond Town Center, Redmond, WA; The Macerich Company

White Shield provided surveying and mapping services for the design and construction of a \$170 million, 120- acre retail/commercial center in downtown Redmond, Washington. A variety of surveys were performed during the design and construction phases of this project. Services included overall project ALTA survey, topographic surveys, construction surveys for both the infrastructure development and the building and site work, flood plain study surveys, offsite road construction surveys, and establishment of new benchmarks for the City of Redmond. Documents provided included easements, binding site plans, and project as-builts.





25 Unit Staff Quarters Project, Fort Belknap Agency and Hays, MT; *Weller Architects for DHHS, Indian Health Service - Seattle*

White Shield is providing design and boundary survey support to *Weller Architects* for an IHS project consisting of a 25-unit design for new staff quarters located at several sites on the Fort Belknap Reservation. The Fort Belknap Agency area is composed of 3 sites. Two existing leases were retraced. A new lease was developed to encompass the intended area. Existing leases were creating overlaps and did not include the new area needed for development. A site plan was prepared of all properties intended for the new lease. The Hays / White Cow area site is a 4.55 acre site that has a prior 2005 boundary survey, and was verified for this project. A new site plan will be completed for this site.

Tulalip Tribes Housing Department Mission Highland 52-Lot Subdivision, Marysville, WA; *Tulalip Tribes*

This was a three-phase survey for the Tulalip Tribes Housing Department on the 43-acre Mission Highland site on the Tulalip Reservation. The first phase was an ALTA/ACSM survey of the entire site, which included title research, a boundary survey, and mapping of the topographic features. The second phase was the plating of 52 lots on the site. Phase 3 was an As-Built survey of the sub-division after the completion of the sub-division's infrastructure.



SR9 – 176th to Marsh Road, Snohomish County, WA; Scarsella Brothers, Inc. for Washington State Department of Transportation

White Shield is supporting Scarsella Brothers and WSDOT with construction survey services for this \$53.4 million safety and congestion improvement along 4.6 miles of SR9 between 176th Street SE and Marsh Road in east Snohomish County. This project will convert SR9 to a wider four-lane highway, add guardrails, provide new intersections at Marsh Road and SR9, at the Marsh/Airport Way/Springhetti intersection, and add new turn lanes at four other major intersections. Project scope will include grading, drainage structures, subsurface drainage, asphalt pavement finish grade, signing, striping, guardrails, and other safety-related features.



SR522 – UW Bothell/Cascadia Community College Campus Access; Mowat Construction Co. for Washington State Department of Transportation

White Shield is providing construction survey services to support Mowat Construction and WSDOT in the construction of a new \$50.7 million entrance to the south side of the University of Washington and Cascadia College Bothell campus. In addition to the new entrance, the project includes a new signal and exclusive exit lane to the campus at the southbound I-405 to westbound SR 522 off-ramp, and a new bridge for the I-405 off-ramps constructed over the campus access street. White Shield's services included survey for slope staking, pavement finish grade, drainage structures, subsurface drainage, and retaining walls.



Sound Transit Central Link Light Rail, Seattle, WA; RCI Herzog for Sound Transit

White Shield assisted Sound Transit in building the Central Link section of its new light rail system. The anticipated end product will consist of an 82-mile commuter rail line with 12 stations running in North King, Snohomish, East King, South King, and Pierce Counties every few minutes during peak commuting hours. Construction is near completion on the 14-mile Central Link portion that connects downtown Seattle and Southeast Seattle with a South 154th Street Station in Tukwila near the Seattle-Tacoma International Airport. White Shield supported the primary contractor RCI Herzog, who was later acquired by Parsons, by providing all construction survey services in building a 4.5 mile section through Rainier Valley, and was responsible for using alignments and profiles to stake the back of walks, walls, curbs, storm layout, utility relocations, edge of pavement, the rail line, ballast wall, power and traffic pole locations, blue-tops, sidewalks, and other project details. As segments were completed, the "as-built" drawings are developed for client use. Up to 5 crews at a time were utilized on this project.





Federal Highway Administration IDIQ Contract, Surveying & Mapping Services, Washington, Oregon, Idaho, Alaska, Montana and Wyoming; Federal Highway Administration, Western Federal Lands Highway Division

This 5-year FHWA IDIQ contract started in April 2005, and is White Shield's third consecutive IDIQ contract since 1995. Surveys of highway route segments are required to support engineering, design, and development of future construction improvements projects on federal lands of the National Forest and National Parks located in the states of WA, OR, ID, AK, MT, and WY. The work generally includes control traverses, topographic, planimetric, hydrological, cadastral, design stakeout, GPS control, and aerial control for photography, LiDAR and other mapping technologies. White Shield has completed 40 task orders under this contract.



I-90 Snoqualmie Pass East, Mile Post 55 to 71 (Hyak to Keechelus Dam), Kittitas County, WA; URS for Washington State Department of Transportation

White Shield is providing on-going survey and mapping support to URS for the design of expanding I-90 to 6-lanes between Hyak and Keechelus Dam. In 2003, White Shield completed a 15 mile Right of Way Retracement Survey that included this segment. Tasks completed in 2006 under the current contract include the horizontal and vertical location of 48 boreholes for inclinometers and extensometers, establishment of 170 Sirovision camera reference points, establishment and monthly monitoring of 15 points for deformation surveys, staking 5,600 feet of design slope catch line for geotech review, locating 200' of headscarps, locating additional wetland and talent ditch sites, 3 bridge deck detail surveys, and 5 culvert/bridge surveys. In 2007, 6 miles of topographic mapping was provided in the areas of Crystal Springs, Keechelus Lake, Gold Creek, Mardee Lake and Townsend Creek, an additional 13,000 feet of catch line was staked and a 3-mile utility survey was performed. 83 additional boreholes were located to facilitate geotech review for an alignment feasibility study.



Washington Road CA-PFH 123, Washington, CA; PBS&J for Federal Highway Administration

White Shield supported improvements to California Forest Highway (FH) 123, Washington Road. This project was a rehabilitation, restoration, and resurfacing (3R) of approximately 5.4 miles from the intersection with California State Route (SR) 20 proceeding northerly to the Town of Washington, ending at the Town and USFS boundary. Project scope included grading, drainage structures, subsurface drainage, asphalt pavement rehabilitation, signing, striping, guardrails, and other safety-related features.





I-90 Snoqualmie Pass East, Hyak to Easton, Washington; Washington State Department of Transportation

White Shield provided surveying services for this 17 miles Right-of-Way Retracement project that begins at Hyak (MP55) near Snoqualmie Pass and proceeds to Easton (MP72). The project included records research for PLSS corners and retracement of I-90 right-of-way, locating 32 monuments, 5 PLSS corners and referencing to the WSDOT control network, recovery of approximately 18 paved over centerline monuments, Title Report review, office calculations and preparation of Record of Survey. The project was tied to the Washington Coordinate System.



RTA Commuter Rail, Tacoma to Everett, WA; HNTB for the Burlington Northern Santa Fe Railroad

White Shield provided field surveys and prepared detailed topographic base maps along 71 miles of BNSF tracks, from Tacoma to Everett, WA for the design of over \$600 million in improvements for the proposed commuter rail service. Services included aerial mapping, as-built mapping of bridges and underpasses, ground surveys and field editing of selected portions of the route, preparation of Intergraph MicroStation base maps, and the establishment of survey control using RTK, GPS, and digital level technology.

Going-to-the-Sun Road, Glacier National Park, Montana; Federal Highway Administration, Western Federal Lands Division

Nine task orders to date have ranged from 1,500 feet to 16.6 miles in length. Over 44 miles of roadway have been mapped for asphalt overlay, slope reduction, reconstruction of historic masonry rock wall details (individual crenels), and campground and drainage improvements. White Shield also densified the National Parks 1993 GPS Network with Static GPS at approximate 1-2 mile intervals. Conventional total station traverse meeting FHWA Second Order Class II accuracy was made between the GPS control points. Digital Differential levels have been run the full length. Specialty detail surveys have been completed at the Quarter Circle Bridge near West Glacier, the West Tunnel Side Viewing Portals, and East Portal masonry wall slide concerns. GPS Airborne controlled aerial photography was collected on 10 miles of roadway, and was later ground mapped to gather culvert, signage and other improvements obscure to the aerial work.



OTIA III, Bundle 413/414, Bridges 04728 (Camas), 04729 (Dale), 02466 (Dixie Cr.); Anderson Perry & Associates for Oregon Bridge Delivery Partners/Oregon Department of Transportation

As an OBDP Specialty Consultant (Survey), White Shield supported Anderson Perry and Associates with supplemental survey and mapping in Bundle 413/414. Three separate bridges were assigned to White Shield. Survey efforts included R/W retracement, base mapping (typical 100' eachside of centerline/ 500' from each end of bridge), utility survey, river cross-sections, cadastral property ties, and roadside inventories. These advance design surveys were completed to further refine the scope for the Design/Build contract award.





I-82 Valley Mall Blvd. Interchange, Yakima, WA; Washington State Department of Transportation

White Shield, under a current WSDOT Statewide Survey On-call IDIQ contract, provided survey services to retrace approximately 4 miles of the existing Right-of-Way (ROW) of I-82 between the I-82/SR24 Nob Hill Blvd. Interchange and the I-82/US 97 South Union Gap interchange (based on the ROW plans). The survey established the ROW centerline, located all ROW breaks, located found PLSS section and quarter corners, and property corners adjoining the ROW as shown on existing surveys of record. The information was shown as a WSDOT Monumentation Map, and recorded as a Record of Survey. Horizontal and vertical control was provided by WSDOT. White Shield provided MicroStation DGN (WSDOT level assignments), InRoads ALG for centerline, and ASCII files of surveyed points. White Shield also performed additional records research for recorded surveys provided by WSDOT, researched short plats and subdivisions adjoining the ROW, provided a Record of Survey map, and prepared Land Corner Recordation forms for PLSS corners that were field perpetuated.

Bellevue I-405 Direct Access, Bellevue, WA; HDR Engineering for Washington State Department of Transportation

The Bellevue Direct Access project, located on the NE 8th Street Bridge over I-405, included intersections, ramps and street approaches. White Shield provided right of way delineation, topographic mapping, subsurface utility locations, structure detailing, highway location, bridge clearances, digital base mapping, and construction staking support for the design and re-construction of new freeway off-ramps from I-405 to downtown Bellevue.



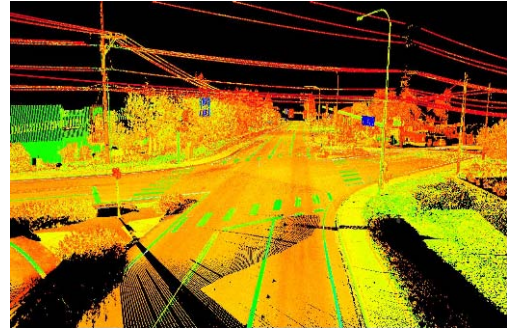
Eastgate Multi-Story Park and Ride, Bellevue, WA; KPFF for King County Metro Transit

Topographic mapping was provided for the design of a multi-story parking structure and interim parking area. The work involved locations of planimetric features, above and below ground utilities, existing ground mapping, preparations of a Record of Survey of a boundary retracement, and preparation of legal descriptions for street vacations. The ground mapping information was collected sufficient for one-foot contour interval mapping.



NAS Whidbey Water Distribution System, Oak Harbor, WA;
Kennedy Jenks Consultants for NAVFAC NW

White Shield was selected to provide utility mapping and topographic survey as part of a \$10.8 million American Recovery and Reinvestment Act (ARRA) design-build contract to replace the water distribution system at Naval Air Station Whidbey Island, located in Oak Harbor, Wash. When complete the project will replace the water distribution lines on Ault Field and the Seaplane Base with 16.14 miles of new ductile iron water lines up to 18 inches in diameter. The system has been designed to minimize water outages while construction occurs near the existing lines and several fragile old cast iron lines.



The complicated utility systems on the project, particularly on the Air Base required extensive record research, and information gathering from Navy Records, the City of Oak Harbor and Island County sources and interviews with land owners abutting the project. Field delineation of the utilities was accomplished using a combination of electronic locating and Ground Penetrating Radar. The utilities were incorporated into the project base map and transmitted to the client on time within an extremely tight schedule.

Brightwater Conveyance System, Central Contract, King County, WA; VCGP/Parsons RCI/Frontier-Kemper (VPFK) Joint Venture for King County, WA

White Shield supported the Joint Venture (JV) of VCGP/Parsons RCI/Frontier-Kemper (VPFK), the general contractor assigned to the Conveyance System's central portion located in Kenmore. The project includes two tunnels approximately 11,600-feet and 20,100-feet long, a 3,400-foot long influent sewer micro-tunnel and portal structures at North Kenmore and Ballinger Way. White Shield provided all construction related surveying for the project, including establishment of a site control network, sediment and erosion control, a temporary construction road, a 50-foot grid for mass grading of the site, a 3,400-foot micro-tunnel, 35-foot high noise reduction walls and the reconstruction of 192nd street. To facilitate shaft development at the Kenmore Portal, White Shield provided control for the shaft, set the centerline and laid out the frames for the new wall segments. This process was repeated every 20-feet of depth to attain a total depth of over 120-feet. After the portal had reached about 80-feet in depth and line of sight issues arose, control was established on the portal walls by using an array of reflector prisms. This process was repeated to develop the micro-tunneling portal and will be repeated again at the 200-foot Ballinger Portal. Once horizontal tunneling begins, high accuracy control traverses were used to guide the Tunnel Boring Machine (TBM) through the tunnel. A Global Positioning System (GPS) was used to develop a highly accurate control network along the surface of the route, and to monitor movement as the TBM proceeds.

Mercer Island Sewer, Lake Line Phase II, Mercer Island, WA; Tetra Tech/KCM for City of Mercer Island

White Shield provided photographic mapping involving ten post-mark control points and identifying three existing I-90 control points. White Shield also performed a bathymetric survey from Pump Station No. 5 to Roanoke Way and from Pump Station No. 1 to the King County Inlet Facility. A pump station topographic survey was also conducted at the proposed sites for Pump Station No. 4 and Pump Station No.5. Mapping included site utilities and above grade site features such as trees, structures, pavement limits, bulkheads, utility poles and docks. Additionally, an as-built survey was conducted to locate the below grade structure and measure pipeline invert elevations, wet well floor elevation, and overflow weir elevations.



Juanita Pump Station; Brown & Caldwell for King County, WA

White Shield provided topographic mapping and utility locating work. These survey services were necessary in order to develop base-maps for the pre-design and final design of the Juanita Bay Pump Station and pipeline facilities along a 2.2-mile corridor.

Henderson/Martin Luther King Way CSO, Seattle, WA; HDR Engineering for King County, WA

A variety of surveying services, which included right-of-way surveying, topographic mapping, subsurface utility locations, structure detailing, and digital base mapping was provided by White Shield for the design of 5000 foot, 14'-8" diameter CSO overflow tunnel, pumping stations, force main, and gravity sewers. The project included a large quantity of subsurface location by various techniques to accurately locate and identify underground structures and utilities.

Denny Way/Lake Union CSO, Seattle, WA; Black and Veatch for King County, WA

White Shield provided GPS survey control, aerial and ground mapping, and prepared digital base maps utilized for the design of a \$133 million, 2.5-mile sewer project which included a 1.2-mile, 18-foot diameter tunnel and outfall.

Cedar River Treatment Facilities Planning and EIS, King County, WA; CH2M Hill/RW Beck for City of Seattle Water Department

White Shield provided a variety of surveying and mapping services for the EIS, and planning and design of treatment facilities for the Cedar River water supply at Lake Youngs. Services included the establishment of GPS survey control, aerial topographic mapping, and determination of the boundary for the six square miles of the Lake Youngs Reservation. The location of piezometers, stream gages, extensive flagged wetland areas, and lake drainage was also conducted. Topographic mapping of service roads, a proposed compressor site, and of a 150-acre proposed treatment plant site was also included in White Shield's services.

Kirkland Pump Station, Kirkland, WA; Tetra Tech/KCM for King County, WA

This project was for the design and rebuilding of a sanitary sewer pump station and the replacement of approximately 1-mile sanitary force main, near downtown Kirkland. The work included a route survey, a topographic survey, a boundary survey, utility mapping, and the writing of legal descriptions for new easements. Mapping limits extended to the Right-of-Way. White Shield also compiled as-built drawing information and validated field information.

West Linn Sewer, Clackamas County, Oregon; URS for Clackamas County Water Environment Services

During the construction phase, surveys were conducted for the layout of approximately 15,000 feet of sanitary sewer. White Shield performed a variety of survey services for the design of this project, including topographic mapping, resolution of land boundary network, easement calculations, and preparation of legal descriptions.

Interbay Pump Station, Phase II, Seattle, WA; Parametrix, Inc. for King County, WA

White Shield is supporting Parametrix and King County in their pre-design work for the Interbay Pump Station and Discharge Structure sites. White Shield collected existing survey information and researched existing property lines, easements and rights-of-way for property acquisition purposes related to properties adjacent to the Pump Station and Discharge Structure sites. Survey work was also identified that will be required for the final design.



Whidbey Island NAS Wetland Delineation Survey, Whidbey Island Naval Air Station, WA; Ecology and Environment, Inc. for the Department of the Navy

White Shield supported Ecology and Environment under this contract for surveying services at Whidbey Island Naval Air Station. Initial scope of services involved a survey of jurisdictional boundaries of several wetland areas that were flagged by a wetland professional. Areas included an estimated 50-acre parcel (impact area), and two mitigation areas – Crescent Harbor Marsh (estimated at 150 acres) and a coastal dune system at Ault Field (estimated at 100 acres). Aerial mapping was used for DTM creation in the entire study area and RTK GPS of ± 300 wetland flag locations.

Nursery Bridge Fish Facility, Milton-Freewater, OR; TetraTech EC for U.S. Army Corps of Engineers, Walla Walla District

White Shield collected 25 river cross-sections spanning a $\pm 21,000$ feet reach of the Walla Walla River near Milton-Freewater, Oregon. The cross-sections were used for hydraulic modeling by TetraTech EC for study of the Nursery School Bridge (Eastside Highway) fish structure sediment problem. White Shield supplied field data in a HEC format to support the modeling efforts. Project highlights included layout and monumentation of 17 existing cross-sections by coordinates and 8 new cross-sections from aerial photography, using RTK GPS and manual ground data collection methods. Cross-section ranges were typically 300 feet long between flood control levees.

Stehekin River Topographic Survey, Chelan County, WA; National Park Service

White Shield provided survey services to National Park Service. The survey included a longitudinal profile in conjunction with additional information along the Stehekin River channel between mileposts 6 and 8 above Lake Chelan. White Shield tied to the existing NPS grid and benchmarks. This survey was completed to support the development of a one-dimensional hydraulic model of the river and facilitate analysis of riverbed elevation changes. Data was supplied to the client in a HEC format to support the hydraulic model.



White Shield has been providing its clients' quality environmental services since 1978 throughout the various regions and major metropolitan areas of the Pacific Northwest. With offices strategically located in western and eastern Washington, we are able to serve the region effectively with our full range of environmental services. We have worked in the high desert plateaus, the Cascade Mountains, the Puget Sound area, the Olympic Peninsula, and the river valleys of eastern Washington and Oregon. Additionally, we have worked in major industrial sites at Hanford, the Puget Sound area, Superfund sites, and military bases throughout Washington State. Our services have also carried into the Idaho Rockies, eastern Montana, and northern California.



Our environmental program is staffed by environmental, geological, industrial hygiene, and industrial health and safety experts who have many years experience helping our clients comply with the myriad of local, state, and federal regulations, as well as assisting with their environmental and natural resource issues. We believe that these issues can be managed in a cost-effective and timely manner to the complete satisfaction of all stakeholders. We provide a wide range of environmental services to both the public and private sector. Our typical clients include site developers, tribal governments, federal state, and local agencies and municipalities, as well as banking, insurance, petroleum, and food products industries. Some of our environmental services include:

**Environmental Investigations,
Remediation, and Management**

- Phase I and II Environmental Site Assessments
- Brownfield Investigations
- Groundwater Well Installation
- Groundwater Monitoring and Sampling
- Remedial Investigations & Feasibility Studies
- Remediation Conceptual Design
- Remediation Management and Oversight
- EIS – NEPA/SEPA Compliance

Environmental Compliance

- MTCA Compliance
- Permit Support
- SPCC Plans
- Erosion and Sediment Control Plans
- Environmental Monitoring
- CERCLA / RCRA Compliance
- Litigation Support

Hazardous Materials & Waste

- Hazardous Materials Inventory
- Asbestos Surveys
- Lead Based Paint Surveys
- Underground Storage Tank Investigations
- Emergency Spill Response
- Waste Shipment and Manifesting

Environmental Health and Safety

- Health and Safety Plans
- Regulatory Compliance (OSHA)
- Job Hazard Analysis
- Industrial Hygiene Monitoring
- Hazard Mitigation
- Hazardous Materials Management






Environmental Project Managers

Our environmental project managers are highly technically qualified and are able to manage a wide variety of environmental, health and safety projects to meet the client’s needs. They are seasoned professionals with the credentials and professional registrations that reflect their expertise in their field, and are assigned projects that reflect their individual experience. White Shield has the resources to provide all types of environmental project services, from Phase I Environmental Site Assessments to complex remedial investigation/feasibility studies. Project managers are responsible for quality assurance on their individual projects, and for following White Shield’s Quality Assurance Plan throughout all phases of the project. Review of all work is performed by experienced professionals or under their direct supervision.

White Shield’s key environmental personnel have the knowledge and experience to handle the technical challenges associated with environmental engineering, and environmental health and safety services. Our key environmental staff is composed of a variety of disciplines, including environmental engineers, hydrologists, geologists, hazardous waste specialists, and industrial hygienists. Their individual areas of expertise are outlined in the following table.

		Years of Experience	Phase I & II Assessments	Groundwater Monitoring & Sampling	Remedial Investigations	Remediation Conceptual Design & Management	UST Investigations	Brownfield Investigations	CERCLA/RCRA Compliance	SPCC Plans	Environmental Monitoring	Asbestos & Lead-Based Paint Surveys	Waste Categorization, Shipment & Manifesting	Job Hazard Analysis, Mitigation & Management	Industrial Hygiene, Health and Safety Plans
SUMMARY OF EXPERIENCE															
KEY PERSONNEL	Stuart Fricke President, Principal in Charge	18	•	•	•	•	•		•	•	•	•	•	•	•
	Dave Polivka, LG, LHG Environmental Project Manager	22	•	•	•	•	•	•	•	•	•	•	•		
	Bill Rodgers, LG, LHG Environmental Project Manager	30	•	•	•	•	•	•	•		•	•	•	•	•
	Alejandro Gonzalez, PhD, PE Remediation Engineer	24	•	•	•	•	•	•	•	•	•				
	Don Hemovich, PE Remediation Engineer	35	•	•	•	•	•		•	•	•	•		•	•
	Jan Marie Bailey Asbestos Planner	22	•	•	•	•			•		•	•	•	•	•
	Roxanne Bradshaw Asbestos/Lead/Mold Assessor	16				•					•	•	•		
	Milton Stamp, CHST Safety Officer, Industrial Hygiene	14												•	•
	Eric Berg, CHMM Environmental Scientist	19	•	•	•					•	•	•	•		



Certifications

White Shield maintains environmental, hazardous waste, and health and safety certifications for its environmental staff through education and testing. We invest in each of our employees to keep abreast with new technologies and changing regulations as it pertains to our work associated with hazardous waste, asbestos, lead-based paint, and underground storage tanks. The following is a list of certifications we maintain for our environmental staff:



- Washington State Professional Engineer
- Washington State Professional Geologist/Hydrogeologist
- Washington State Underground Storage Tank Site Assessor
- Washington State Underground Storage Tank Site Supervisor
- Certified Hazardous Materials Manager
- Certified Industrial Hygienist
- AHERA Certified Asbestos Inspector
- Asbestos Microscopy Certification - Washington State University
- Hazardous Materials Categorization (HazCat)
- Hazardous Waste Operations & Emergency Response Supervisor (80 hr)
- 40 hour HAZWOPER Health & Safety Training
- 8-hour HAZWOPER Health & Safety Refresher
- Construction Health & Safety Technician
- Certified Safety Professional
- Certified Lead-based Paint Risk Assessor
- Certified Lead-based Paint Inspector





Air Quality Monitoring, Richland Federal Building, Richland, WA; General Services Administration

White Shield supported the General Services Administration with air monitoring services at the Richland, WA Federal Building during contractor removal of asbestos containing materials. The work was performed after normal business hours when the building is un-occupied. Pre-abatement air sampling and an initial inspection of the containment installed by the abatement contractor were conducted to ensure compliance with Federal and State regulations. During the abatement, White Shield provided twice-weekly air monitoring at three locations outside of the containment, and a visual inspection inside the containment weekly. Air sample analysis was conducted by the Phase Contrast Microscopy (PCM) method. When the abatement concluded, White Shield provided a final visual inspection, aggressive air sampling, and Transmission Electron Microscopy (TEM) air sample analysis before removal of the containment by the abatement contractor.

Mercury Tube Sampling 100 BC Area, Hanford Nuclear Reservation, near Richland, WA; Washington Closure Hanford Inc., for the Department of Energy, River Corridor Contract

White Shield assisted with the design and development of procedures for the implementation of a Mercury sampling, separation and amalgamation process. Work on this effort included performing soil sampling for site closeout operations, sampling and packaging unknown radiological and hazardous wastes, developing and maintaining chains of custody, locating sampling points using GPS techniques, transporting samples to the shipping facility and performing analysis on anomalous waste.

Bremerton Gas Works TBA Planning, Bremerton, WA; Ecology and Environment, Inc. for the U.S. Environmental Protection Agency

White Shield created and developed a Project Plan, and Health and Safety Plan for a Targeted Brownfield Assessment (TBA) at this former coal gasification site. This site was previously used to provide electricity and natural gas to the city of Bremerton, WA. In addition to the project, and health and safety plans, White Shield provided field operations for sample documentation and formal reporting. Field operations also consisted of collecting subsurface core samples using the "Geo-probe" push-probe method. Results from the fieldwork were detailed in a formal report.

Sub-Contractor Health & Safety Oversight, Washington Closure Hanford, Inc. for the Department of Energy, River Corridor Contract

White Shield is providing Health and Safety Officer oversight of sub-contractors for the 100-D/DR Remediation Site on the Hanford Nuclear Reservation. The Health and Safety Officer insures compliance with Washington Closure Hanford contractual Health and Safety requirements and the DOE 10 CFR 851 Compliance Matrix. Assistance is provided for planning of the day meetings, daily and weekly site safety inspections, development and implementation of Job Hazard Analysis, Integrated Work Control Packages, Operational Monitoring Plans for ACGIH sampling, and implementing of the DOE-driven Integrated Environmental Safety Management Systems.

Waste Characterization Sampling Services, Hanford Nuclear Reservation near Richland, WA; Washington Closure Hanford, Inc. for the Department of Energy, River Corridor Contract

White Shield is providing facility and waste characterization sampling in support of the River Corridor Contract (RCC) projects on sites scattered throughout Hanford Nuclear Reservation. Personnel are collecting and preparing samples for the Field Remediation (F4) Project; Deactivation, Decommissioning, Decontamination, and Demolition (D4) Project; and the Interim Safe Storage (ISS) Project activities in the 100, 300, 400, and 600 Areas of the Hanford Site. Samples are being collected from a variety of media including hazardous waste, radiological waste, construction debris, asbestos containing materials, miscellaneous aqueous liquids, bulk solids, soils and sediments, unexpected media and waste forms, and biological materials. To facilitate sample shipping, White Shield is maintaining a secure facility as required to provide defensible methods of maintaining sample integrity and delayed custody transfer. We perform weekly, monthly and quarterly facility inspections (safety equipment, chemical inventory, temperature logs etc.) of the facility. In addition to supporting sampling



activities throughout the RCC, White Shield developed spreadsheets for waste processing and tracking data, operated X-Ray Fluorescence equipment and GPS units, interpreted sampling plans and staked sampling point locations and input data into the sample tracking database.

Health and Safety Field Remediation Support, Hanford Nuclear Reservation, near Richland, WA; *Washington Closure Hanford, Inc. for the Department of Energy, River Corridor Contract*

White Shield is providing on-site Health and Safety support to the River Corridor Contract (RCC) Field Remediation (FR) organization at various locations on the Hanford site. A Certified Industrial Hygienist and Safety Professional is responsible for writing health and safety plans and procedures for all areas of the Field Remediation effort, performing field monitoring, keeping FR management informed of all on-going operations, and generating other documents as directed by the FR project and RCC Health and Safety Management Team.



Phase I Environmental Site Assessment, Severson/Selinco Properties; Sequim, WA; Washington State Department of Fish and Wildlife

Washington State Department of Fish and Wildlife, on behalf of the Trust for the Public Lands, retained White Shield to conduct a Phase I Environmental Site Assessment (ESA) of the Severson/Selinco Properties, LLC/TPL located in Sequim, Washington. These properties consisted of approximately 100 acres of agricultural and undeveloped land along the Dungeness River. The assessment was performed in accordance with the American Society for Testing and Materials (ASTM) E 1527-00. The purpose of the ESA was to evaluate the likelihood for the presence of recognized environmental conditions (RECs) at the site. White Shield reviewed available information from various sources with respect to the historical uses of the property, including assessor's records, permits, historical maps, and aerial photographs. Based on our studies and observations, it was concluded that two 200-gallon above ground fuel storage tanks and five drums of unknown petroleum products located in and adjacent to a barn on the northern portion of the subject site were RECs.

Dungeness River Match, Sequim WA; Washington State Department of Fish and Wildlife

White Shield recently assisted Fish & Wildlife by conducting a Phase I Environmental Site Assessment on Olympic Game Farm. An on-site reconnaissance of the property was performed to assess the potential presence of obvious hazardous materials/waste. A visual survey of adjacent properties was conducted in order to evaluate the potential for past or present hazardous materials that could affect the site. White Shield reviewed all appropriate databases to determine the location of hazardous waste generators within one mile of the property, and also reviewed historical aerial photographs, appropriate maps, geotechnical data & geologic reports for the property and adjacent properties to obtain information regarding potential contamination. The chain of title was reviewed to evaluate the potential for prior owners to have generated or disposed of hazardous materials on site.

U.S. Navy Other Environmental Liability (OEL), Various Naval Bases, WA; URS for the Department of the Navy

White Shield, working as subcontractor for URS Corporation, assisted in conducting "Other Environmental Liability" (OEL) inventories at several Puget Sound Naval bases. The purpose of the project was to assist the Navy in the accounting of Non-DERP environmental liabilities that were never accounted for as required by Federal Accounting Standards. The project created an inventory of all equipment and facilities that would require cleaning before being moved, or prior to base closure. Creating the inventory required an audit of Spill Prevention Control and Countermeasure Plans, Pollution Prevention Surveys, and other Environmental Compliance Documentation. The project also required performing compliance assessments to document environmental liabilities within the Naval industrial complex including warehouses, maintenance shops, office buildings, firing ranges, machining equipment, tanks, hazardous wastes and hazardous material storage areas, storm water impoundments and transformers. The naval bases included Bangor, Keyport, Whidbey Island, and the Bremerton Naval Shipyard.

ASARCO Remedial Action Oversight, Tacoma, WA; CH2M Hill for the U.S. Environmental Protection Agency, Region 10

White Shield assisted CH2M-Hill and EPA with oversight of the remedial action taken by ASARCO under CERCLA at the main ASARCO facility and smelter site north of Tacoma, Washington. The action included the replacement of arsenic contaminated surface soils in adjacent areas. The work was monitored for compliance with the Record of Decision, the approved remedial design, and other documents relating to the project. The activities included excavation of contaminated materials, placement of contaminated materials in the on-site containment facility (OCF), demolition of on-site structures, site grading, drainage and capping, and review of related PRP documents. Air monitoring was also provided during remedial action activities in 2007. White Shield prepared monthly technical status reports.



Hazardous Materials Inventory & Categorization, Great Plains Region; Bureau of Indian Affairs

White Shield provided inspection and project management support for the identification of unknown hazardous materials located at 28 Bureau of Indian Affairs road shop buildings located on various Indian Reservations in North Dakota, South Dakota, and Nebraska. The project included using a HAZCAT sampling kit to identify unknown chemical characteristics, compiling a complete list of hazardous materials, their location, description, condition, estimates of cost for removal and disposal, and identifying qualified transportation and disposal contractors to remove the materials. Segregation requirements and situations were identified and addressed that were immediately dangerous to health and the environment. This project covered a large geographic region and required a significant amount of planning and coordination with each Indian Reservation and Tribal Employment Rights Offices. White Shield staff also coordinated and managed the removal and disposal of 51 “lab pack” containers of laboratory wastes found in a warehouse on one of the reservations.

Central Link Light Rail Alignment Phase I and II Environmental Site Investigations, Seattle, WA; Garry Struthers & Associates for Sound Transit

White Shield provided support for Alignment Screening, Phase I Environmental Site Assessments (ESAs), and Phase II ESA Subsurface Investigations for properties along segments of the Central Link Light Rail Alignment for Sound Transit in Seattle, Washington. During Alignment Screening and Phase I ESAs, White Shield identified recognized environmental conditions for each property. At sites requiring Phase II ESAs, subsurface investigations were conducted per ASTM standards in order to define and characterize the extent of the contamination. Typical soil and groundwater contaminants in the Rainier Valley area of Seattle include petroleum products, priority pollutant metals, and solvents. As a member of the consulting team for this alignment, White Shield assisted Sound Transit real estate agents and assessors and coordinated with the owners of the properties in order to obtain rights-of-entry to sites. White Shield also provided an interpreter for the predominantly Asian community.

Hazardous Materials Assessment (Asbestos, Lead-based Paint & Hazardous Materials), Washington State Penitentiary, Walla Walla, WA; DLR Group Architects for Washington State Department of Corrections

White Shield performed a hazardous materials assessment for nine buildings at the Washington State Penitentiary that will be demolished as part of the expansion of the Close Custody Facility. The assessment included determining the presence of lead-based paint using an X-ray fluorescence (XRF) analyzer, a survey for asbestos containing building materials, and compiling an inventory of all hazardous chemicals and potentially hazardous materials located in the buildings.

Phase I Environmental Site Assessment, Lincoln City, OR; Confederate Tribes of Siletz Tribe of Oregon

A Phase I Environmental Site Assessment was completed in compliance with ASTM Standards E1527 and E1528 on a 38-acre undeveloped parcel. Tasks included site reconnaissance, identifying known and potential toxic hazards, researching historical and current site uses, reviewing state and federal toxic contamination and cleanup databases, and technical report writing.

Lead-based Paint Inspection and Risk Assessments, Various Naval Bases, WA; URS for the Department of Navy

White Shield provided lead-based paint inspection and risk assessment services at naval housing facilities located on various naval facilities throughout the Puget Sound Region. The project involved the use of an X-ray fluorescence (XRF) analyzer and physical sampling of suspected lead-based paint containing material, as well as providing electronic documentation and daily reports. Facilities included the Bangor Naval Submarine Base, the Bremerton Naval Shipyard, and the Whidbey Island Naval Air Station with over 110 housing units assessed.



Remedial Investigation for Pesticide Contamination, Prosser, WA; Port of Benton

White Shield conducted a Remedial Investigation to identify and remediate soil and groundwater contaminated with pesticides at a former aerial spraying operation located at the Prosser Airport in Prosser, Washington. The site was operated as a base for aerial spraying of pesticides and herbicides, beginning prior to 1966. The contaminants of concern are petroleum from a former aviation fuel tank, chlorinated herbicides and pesticides including DDT and Dinoseb. White Shield project managers oversaw the excavation of approximately 1,300 tons of DDT contaminated soils for disposal. To determine when DDT levels in the soils were below MTCA cleanup levels, soil samples were analyzed for DDT in the field using immunoassay analytical techniques. White Shield also provided oversight for the installation and sampling of four monitoring wells at the site to characterize the groundwater flow direction and gradient, and to determine the levels of pesticides, herbicides, and petroleum constituent in the water. Coordination between the Department of Ecology and the Port of Benton was provided to identify remedial options for the soils and groundwater.

Remedial Investigation and Feasibility Studies, Alexander Farms, Prosser, WA; Dan Alexander, Alexander Farms

White Shield provided environmental services required for the design and implementation of a Remedial Action Plan for Dinoseb contamination (an herbicide) at the Yakima Chief Ranches. Services included emergency interim action, soil characterization and removal, emergency and long-term groundwater characterization and modeling, and Remedial Investigation/Feasibility Study (RI/FS). The RI/FS work plan and related documentation featured potential site remedial technologies that included soil and groundwater cleanup options to meet MTCA cleanup standards. A transient solute groundwater model was developed to accurately describe the site's aquifers and an irrigation canal that transects the site creating a complex hydrologic condition at the site. White Shield also coordinated with the property owner, Washington Department of Ecology, EPA Region X, and local residences in order to investigate and monitor the site's soil and groundwater. Presently, the site is undergoing long-term groundwater monitoring and sampling while a Corrective Action Plan and final consent decree is being negotiated. Groundwater monitoring and sampling activities are scheduled on a quarterly basis as outlined in the Site Sampling and Analysis Plan.

Phase I Environmental Site Assessments, Tulalip Indian Reservation, Marysville, WA; Tulalip Tribal Housing Authority

White Shield provided technical oversight for two Phase I Environmental Site Assessments (ESAs) on the Tulalip Indian Reservation. The ESAs were conducted on two residential developments that were to be renovated. Support included site reconnaissance, environmental records review, and historical records review consisting of prior ownership, historical maps, local street directories and tax assessor documents. Tests conducted for these assessments included testing for lead in drinking water, Radon, and an asbestos/lead-based paint survey.

Mesa Tanker Spill Remediation, Mesa, WA; R.H. Smith Distributing

White Shield Inc. provided emergency spill response remediation at a 2000-gallon gasoline tanker truck spill on Washington State Highway 17 in Mesa, Washington. White Shield responded on short notice to the spill site and coordinated the excavation and removal of over 500 tons of petroleum contaminated soils. Following excavation, White Shield sampled the remaining soils to determine if petroleum contaminated soils remained. Difficulties at the site included not being able to excavate immediately adjacent to the highway close to pavement in order to prevent undermining of the heavily traveled highway and maintaining traffic flow along the highway. White Shield coordinated with the Washington State Department of Ecology, Washington State Department of Transportation, R.H. Smith Distributing, and the Federated Insurance Company.



Phase II Environmental Site Assessment Oversight, Investco/Looney Site, Tacoma, WA; Environmental Management Services, LLC

White Shield provided oversight and report review for a Phase II Environmental Site Assessment at a former steam plant located along the Thea Foss Waterway in Tacoma, Washington. The plant site dated to the late 1800s, and used wood for fuel before being converted to bunker fuel. White Shield staff oversaw the installation of eight push-probe borings and the excavation of two test pits. Soils and groundwater were sampled for petroleum hydrocarbons, PCBs, and metals.

Asbestos and Lead-based Paint Survey, Celilo Indian Village, The Dalles, OR; Cooper-Zietz Engineers for U.S. Army Corps of Engineers

Project management was provided for asbestos and lead-based paint surveys on 16 houses at the Celilo Indian Village in The Dalles, Oregon that were to be demolished by the U.S. Army Corps of Engineers. Project responsibilities involved testing to determine the presence of lead-based paint using an X-ray fluorescence (XRF) analyzer, and a survey for asbestos-containing building materials.

Upper Columbia River Field Investigation and Sampling; CH2M Hill for the Environmental Protection Agency, Region 10

White Shield provided CH2M-Hill with a Sample Processing Coordinator for the Upper Columbia River Sampling Project in order to coordinate sediment sample processing and packaging, development of Chain of Custody and Forms II Lite documentation, arrangement of shipment and transport, and assistance with the sample collection activities. A subsequent task order directed the collection of fish tissue samples from within six different sampling areas. The fish were collected by a variety of methods including electro-fishing, gill netting, and traps. The collected fish were transported to a central processing area at the Kettle Falls Marina where they were weighed, measured, catalogued, filleted, and packed for shipment. The Coordinator position required an understanding of CLP procedures and the CLP Guidance document ("CLP Guidance for Field Samplers", OSWER 9240.0-35, Aug 2004) and familiarity with laboratory analytical procedures and QA/QC considerations.

Dye Testing, Washington Potato Plant, Warden, WA; El Oro Beef Feeders

White Shield is providing project management support and annual dye testing at the Washington Potato processing plant to determine the potential for sanitary sewage contamination of the process wastewater stream. The solids in the process water are filtered out and sent off for cattle feed, and no sanitary contamination can exist in the process water. Fluorescent dye is placed into potential sources of contamination, and the outfall for the process water is monitored for traces of the dye. A control test is conducted by placing dye in the process water to be certain that the dye is visible should cross-contamination be present. Potential sources of contamination consist of approximately 40 known sanitary waste plumbing fixtures.

Phase II Environmental Subsurface Investigations, Consolidated Freightways, Kennewick, WA; Blymyers Engineers

White Shield provided various environmental services at the Consolidated Freightways facility including UST decommissioning and assessment, environmental subsurface investigations to determine and evaluate the extent of diesel soil and groundwater contamination at the site, and groundwater monitoring and sampling on a quarterly basis to characterize the diesel groundwater plume. Groundwater contamination at the site was due to leakage of diesel fuels from underground storage tanks. In addition, White Shield provided potential remediation options at the site.



Midnite Mine Sampling Event, Spokane Indian Reservation, WA; URS Corporation for the U.S. Environmental Protection Agency, Region 10

White Shield provided sampling staff support at the Midnite Mine on the Spokane Indian Reservation in compliance with the EPA Region 10 RAC program. The abandoned mine was operated until 1981. Currently, radioactivity and heavy metals found in acid mine drainage are posing a threat to human health and the environment. The EPA is doing a Feasibility Study in anticipation of cleanup efforts.

Groundwater Monitoring and Sampling, Boomsnub Site, Vancouver, WA; URS Corporation for the U.S. Environmental Protection Agency, Region 10

White Shield performed technical assistance services for URS Corporation on the Remedial Action Contract (RAC) for EPA Region 10 at the Boomsnub Superfund Site in Vancouver, Washington. Tasks included groundwater monitoring and sampling.

Toppenish Pik-a-Pop, Remediation Feasibility Study, Toppenish, WA; R.H. Smith Distributing

White Shield assisted R.H. Smith Distributing by providing a Project Manager and Hydro-Geologist for this feasibility study at a service station in Toppenish, Washington, where there is gasoline contaminated groundwater. He has overseen the sampling of the monitoring wells at the site and is currently working with the client to develop efficient and cost effective methods for remediating the groundwater. These methods may involve the use of oxygen releasing compounds to enhance the natural degradation of the gasoline. Mr. Polivka is coordinating with EPA who has jurisdiction over the site to develop a plan that will satisfy the needs of all stakeholders.



Hanford 300-Area UST Removal, Hanford Nuclear Reservation, Richland, WA; Washington Closure Hanford, LLC for the US Department of Energy

White Shield supported Washington Closure Hanford with the removal of an abandoned 5000 gallon UST in the 300-area of the Hanford Nuclear Reservation. The tank, located at Facility 3621D that is slated for demolition, was formerly used to supply diesel fuel for large generators, and was emptied and placed into temporary closure in 2007. This decommissioning process was required to be completed prior to the facility demolition.

Phase II Environmental Assessment and Tank Removal, Vashon, WA; K2 Corporation

White Shield (WSI) provided K2 Corporation with a Phase II Environmental Site Assessment at their facility located on Vashon Island. WSI installed eleven borings at selected locations around the facility to investigate the potential for soil and/or groundwater contamination. All borings were advanced using a "Geoprobe" drill rig. The drill rig pushed a 2 inch "probe" to depths of approximately eight to twelve feet below ground surface. At each four foot interval, samples were collected for possible chemical analysis. The soil was visually examined for evidence of contamination and screened using an Organic Vapor Analyzer (OVA). Upon reaching groundwater a temporary 1-inch diameter well was placed in the boring and the water sampled for the location specific contaminants of concern. WSI also performed a GPR/magnetic survey to determine the exact location of a 300-gallon heating oil tank and to determine if a second tank was present. WSI's Certified Site Assessor and a Certified Tank Decommissioner (Central Environmental Construction) cleaned, decommissioned, removed and disposed of the tank. WSI visually checked the soils beneath the tank and piping for signs of leakage, and collected five clearance samples from the sidewall and base of the tank excavation for diesel/heavy oil analysis. Approximately one hundred cubic yards of petroleum contaminated soil was excavated for disposal. Contaminated soil had migrated under the building at the site, and WSI is working with K2 and the Washington State Department of Ecology on a plan to address the future soil remediation.

Genesee Union Hardware Store Fueling Station, Genesee, ID; Central Environmental Construction for Pacific Northwest Farmer Cooperative

White Shield (WSI) provided site assessment and remediation oversight services at the Genesee Warehouse (now Pacific Northwest Farmer Cooperative) Facility in Genesee, Idaho. Upon lifting one of the gasoline aboveground storage tanks, it was discovered that a hole approximately 2 inches in diameter was present in the bottom of the tank. Following tank removal, WSI began excavating petroleum-contaminated soils from the site. As excavation progressed, it was discovered that the contaminated soils extended to the depth of at least 10 to 14 feet below the former base of the tank and also below the depth that groundwater was encountered, approximately 11 bgs. To facilitate the remediation WSI submitted a plan to the Idaho Department of Environmental Quality requesting approval to dewater the excavation and remove contaminated soils to a depth of 14 bgs. WSI removed approximately 7,000 gallons of water from the excavation and placed it in a former diesel tank for on-site air stripping treatment. Upon completion of the excavation, WSI collected 10 samples from the base of the excavation and 17 samples from the sidewalls to determine if the contaminated soils had been removed. Sample analyses results were used to run the Idaho Risk Evaluation Model (REM) for Risk Based cleanups. The results returned indicated that the site posed a risk greater than is allowed by the State of Idaho Cleanup Regulations. Additional excavation was performed and a total of approximately 7800 cubic yards of soil were removed. Additional samples were then collected from the base and the sidewall of the excavation and were also used in the REM. The results of the REM showed the soil was no longer an exposure pathway of concern. As a result the excavation was backfilled and a plan to install groundwater monitoring wells was submitted to the Idaho Department of Environmental Quality.



Paradise Inn UST De-commissioning, Mt. Rainier National Park, Paradise, WA; Watts Construction for the National Park Service

During a planned re-design and construction of the Paradise Inn, the main lodge in Mt. Rainier National Park at Paradise, Washington, it was found that two underground storage tanks (USTs) and some related lines that supply heating oil to the facility were leaking. White Shield assisted Watts Construction and the National Park Service in overseeing the removal of the tanks and remediation of the project site. The regulatory agency responsible for this project was the Tacoma-Pierce County Health Department (TPCHD). Evidence of impacted soil was found around the UST fill ports, and in the already excavated area underneath the Paradise Inn dining room. Odors of impacted soils were also reported by personnel on-site east of the north-south oriented portion of the inn, and demolition of a sump in the boiler room needed to be halted when it was found to be partially filled with free-liquid heating oil. Further removal of piping underneath the building was determined to increase the likelihood of unintended spillage, due to the many yards of intertwined supply pipes. TPCHD concluded that careful abandonment with the pipes being drained and capped was the most reasonable solution, and was left to

National Park Service and Project Manager discretion. The tanks will be pumped and stabilized for transportation to the Kautz Creek storage area to be cut and cleaned before transportation out of the park.

Remedial Investigation for Gasoline Leak, Smitty's Conoco, Kennewick, WA; R.H. Smith Distributing

White Shield provided a Hydrogeologist and Project Manager for the investigation and remediation of a 6500-gallon gasoline leak at a service station in Kennewick, Washington. The site is within the Wellhead Protection Area for one of the City's municipal drinking water wells. To date the investigation has included sampling of soils in trenches used for fuel distribution lines, the installation and sampling of four groundwater-monitoring wells to determine if groundwater was impacted by the release, and the design and installation of a product recovery system to recover floating product found on the groundwater. Two of the wells were constructed as 4 inch wells to facilitate floating product removal. White Shield's Project Manager designed a state-of-the-art product recovery system, using a floating skimmer and pump that will remove floating product but will not capture water should the water level rise above the intake of the skimmer. The system is automated to maintain 24-hour operation. Additional support included the installation and sampling of three additional groundwater-monitoring wells at the site to further delineate the extent of the groundwater plume. All work is being coordinated with the City of Kennewick, the Washington State Department of Ecology, and the insurance carrier for R.H. Smith Distributing.