FINAL

ACTION MEMORANDUM
Time-Critical Removal Action
Former Naval Station Puget Sound
Seattle, Washington

May 24, 2013

U.S. Department of the Navy
Naval Facilities Engineering Command Northwest
1101 Tautog Circle, Suite 203
Silverdale, Washington 98370

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1.0 Purpose

The purpose of this Action Memorandum is to document the decision by the U.S. Department of the Navy (Navy) to conduct a time-critical removal action (TCRA) described herein for the removal of radiological contamination at the former Naval Station Puget Sound (NAVSTA PS), located in Seattle, Washington. NAVSTA PS was originally established as Naval Air Station Seattle (NAS Seattle). When NAS Seattle closed in 1970, portions of the property were transferred to the National Oceanic and Atmospheric Agency (NOAA) and City of Seattle, and the rest of the site was renamed NAVSTA PS. A master lease between the Navy and the City of Seattle was executed in July 1996, authorizing the city to constructively use buildings south of NE NOAA Drive before full conveyance of property to the City. The other parcel that includes both Building 27 and NE NOAA Drive was provided to the National Oceanic and Atmospheric Administration (NOAA) for its use in 2000. In 2003 a new parcel was created for Building 27 and it was conveyed to the City of Seattle. A separate parcel containing NE NOAA Drive was also conveyed at this time to NOAA. The Navy is conducting the remedial action because the deeds transferring the former NAVSTA PS to the City of Seattle included provisions that all remedial actions at the site had been conducted and that any future remedial action deemed necessary would be conducted by the United States Navy.

The areas of focus for this TCRA are the central portion of Building 2; the “south shed” of Building 27; the catch basins south of Building 27, and soil adjacent to the areas of Buildings 2, 12, and 27 as outlined in Section 2.0 of this document. Both the Building 27 south shed and portions of Building 2 are vacant and portions of both buildings have deteriorated significantly (broken windows and leaking roofs) and incidents of trespassing have occurred in Building 2. Currently, the main hangar area of Building 27 is an indoor sports facility, which is open to the public. Building 2 is mainly vacant, with the exception of the hangar portion that is used for storage by the City of Seattle Parks and Recreation Department, and a north wing which houses offices and workshops for the job training program, Seattle Conservation Corps. Radium-226 (Ra-226), cesium-137 (Cs-137), and/or strontium-90 (Sr-90) contamination was found during the investigation of the south shed of Building 27, Building 2, associated Building 27 catch basins, and outside of Buildings 2, 12, and 27. The TCRA is intended to remediate the radiological releases in these areas to meet the standards for the intended future land use.

This TCRA is being conducted in accordance with the Department of Navy’s Environmental Restoration Program using the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. The Washington State Department of Ecology is the lead regulatory agency for the radiological cleanup at NAVSTA PS. This TCRA will follow the substantive requirements of CERCLA and the National Oil and Hazardous Pollution

Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] 300.5). To accomplish cleanup, Department of Navy's environmental restoration team partners with various stakeholders, including state and federal regulators, and local communities. The Navy will consider the State Model Toxics Control Act cleanup regulations (Washington Administrative Code [WAC] 173-340-515) in its review of applicable or relevant and appropriate requirements (ARAR). ARARs are an integral part of the CERCLA process and will substantively guide the cleanup action. The Navy and City of Seattle will collaborate with the appropriate agencies that the state determines to have oversight of radiological issues and dangerous/hazardous waste issues, if they arise, associated with the former NAVSTA PS. Additionally, radiological surveys will be performed by the Navy contractor following applicable guidance in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (U.S. Nuclear Regulatory Commission [NRC] et al., 2000) as outlined in the draft Radiological Removal Action Work Plan (Tetra Tech EC, Inc., 2013) and with appropriate state agency oversight.

2.0 Site Conditions and Background

The former NAVSTA PS is located in Township 25 North, Range 4 east, Section 2, in King County, Washington and has the geographical coordinate's 47°37'00" north latitude and 122°15'00" west longitude. The former NAVSTA PS is located approximately six miles northeast of downtown Seattle in the Sand Point neighborhood on the western shore of Lake Washington within Warren G. Magnuson Park (Magnuson Park), 7400 NE 74th Street, Seattle, Washington (Figure 1, "Site Location Map"). It is bounded by residential areas to the west and south, Lake Washington to the north and east, and NOAA – Western Regional Center facilities and Warren G. Magnuson Park to the east.

2.1 General Site History

Originally named NAS Seattle, portions of NAVSTA PS were built in 1925 on land donated by King County. Many of the major buildings were built in the late 1930s prior to World War II, including Building 27 (1937) and Building 2 (1929) (Figure 2, "Location of Building 27 and Building 2"). Further building construction and remodeling took place in later years, including an addition of the South Shed to Building 27 in 1944 and an expansion of the instrument shop in Building 2 in 1941 (1941 Instrument Shop).

During World War II, NAS Seattle supported air transport and ship outfitting of personnel for the Alaskan and Western Pacific theaters of operation. After the war, NAS Seattle was designated a Naval Reserve Air Station. Aircraft Overhaul & Repair (O & R) activities continued until 1959-60. From 1945 to 1970, the station maintained naval reserve squadrons for supplementing active duty forces, both in the continental United States and abroad. Aviation activities officially ceased on June 30, 1970, and NAS Seattle was decommissioned. After closure in 1970 the Navy rented buildings to approximately eight federal and institutional tenants. In Building 2 this included the United States Coast Guard Reserve. In portions of Building 27 this included unit of the Marine Corps Reserve. Between 1970 and 1977, the Navy divided the property into three parts, conveying considerable portions of the property that had supported air operations (runways and adjacent structures) to the NOAA) and the City of Seattle. The remainder of the property retained by the Navy was designated as Naval Support Activity, Seattle.

In April 1982, the property was once again re-designated NAS Seattle. In the early 1980s the number of tenant organizations expanded to more than 60 and ranged from NAVFAC, Army Reserve, to US Fish & Wildlife Service. Also during the 1980s and early 1990s NAVSTA PS hosted large community special events. One of the largest events noted using "the hangars" was the University of Washington Native American Student Association Pow Wow with more than 45,000 participants and attendees. In October 1986, NAS Seattle was designated NAVSTA PS as

a result of the station's decreasing support role in the Pacific fleet activities. In June 1991. The Base Realignment and Closure (BRAC) Commission announced the closure of former NAVSTA PS. In accordance with the recommendations of the 1991 BRAC Commission, the Navy closed NAVSTA PS in September 1995.

From November 1993 to October 1997, the Navy prepared and distributed an Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA) to analyze the environmental impacts of the proposed disposal and reuse of the facilities and land at the former NAVSTA PS. The Final EIS (FEIS) was distributed in October 1997 and identified the actions that would be necessary to mitigate impacts associated with reuse and redevelopment. The FEIS stated that the acquiring entity, under direction of Federal, State, and local agencies with regulatory authority over protected resources, would be responsible for implementing necessary measures. The FEIS also stated that the Navy would include appropriate restrictive covenants in the deeds for parcels where hazardous substances remained and for the historic properties in accordance with applicable Federal and State laws. The Navy issued a Record of Decision (ROD) in December 1997.

From 1988 to 1995, the Navy conducted several environmental investigations and cleanup actions on portions of former NAVSTA PS. A master lease between the Navy and the City of Seattle was executed in July 1996, which allowed the city to constructively use buildings south of NE NOAA Drive before full conveyance. Although this master lease did not encompass Buildings 2 or 27, the master lease contains an "Environmental Finding" section, in which the Navy included a "Finding of Suitability to Lease," which represents that "Historical records indicate Sand Point (NAS Seattle, NAVSTA Puget Sound) never handled radioactive or mixed waste."

This Finding applies to the entirety of "NAS Seattle, NAVSTA Puget Sound," and was relied upon by the Navy in all subsequent transfers of property associated with NAS Seattle, NAVSTA Puget Sound, insofar as no further radiological surveys were conducted by the Navy until after the notification that the City discovered radiological contamination in 2009. As such, an Environmental Baseline Survey (EBS) was performed to determine the suitability of transfer of portions of the former NAVSTA PS and a report was issued (URS Consultants, Inc., 1996). The EBS Report identified Buildings 2 and 27 as "Areas where only storage of hazardous substances or petroleum products has occurred (but no release, disposal, or migration from adjacent areas has occurred)." The transfer deed additionally included land use restrictions for Building 2 to address residual chemical contamination on the site. The EBS, however, did not describe the potential for radiological contamination, and apparently relied on the Finding that radiological waste was "never handled" at the base. The EBS Report was submitted to the Washington State Department of Ecology who issued a No Further Action letter dated May 16, 1996 for Parcel 2, which included Building 27. A Finding of Suitability of Transfer (FOST) was signed on April

15, 1998 (amended August 11, 1998 and March 9, 2000) which contained use restrictions for the subject property.

The Navy assigned approximately 103 acres of land, Buildings 11, 31, 18, 30, 41, 138, 406, 47, 345, 2, 12, 67, recreational fields, and related personal property (Parcel 1) at the former NAVSTA PS to the United States Department of Interior, who subsequently transferred the property to the City of Seattle for public park and recreational purposes on November 10, 1998 (Navy, 1998). The Navy assigned approximately 11 acres of land, Building 27, and related personal property (Parcel 2) at the former NAVSTA PS to the United States Department of Interior, who subsequently transferred the property to the City of Seattle for public park and recreational purposes on April 6, 2000 (Navy, 2000). The Navy's assignment required the United States Department of Interior to include in the following in the transfer deeds:

1. A covenant warranting that all remedial action necessary to protect human health and the environment with respect to any hazardous substance remaining on the property has been taken
2. A covenant warranting that any remedial action found to be necessary after the date of such transfer shall be conducted by the United States
3. A clause granting the United States access to the property in any case in which remedial action or corrective action is found to be necessary after the date of such transfer.

The United States Department of Interior, National Park Service provided the executed quitclaim deed to the City of Seattle for a public benefit conveyance of Parcel 1 and Parcel 2 on March 17, 1999 (National Park Service, 1999) and December 12, 2002 (National Park Service, 2002), respectively.

Because the removal actions include demolition and modification of buildings within the Sand Point Historical District, the Navy, in consultation with the Advisory Council of Historic Preservation, the Washington State Historic Preservation Officer, along with the City of Seattle and Federal Public Benefit Sponsors, complied with Section 106 and 110 of the National Historic Preservation Act by entering into a Programmatic Agreement on October 29, 1997. The Programmatic Agreement requires the incorporation of restrictive covenants in the conveyance documents to ensure protection of the historic properties.

In May 2010, a tenant of the City of Seattle Parks and Recreation Department renovated the northern hangar area of Building 27 into an indoor sports facility. That facility is currently open to the public. Currently Building 2 is mainly vacant, with the exception of the hangar portion that is used for storage by the City of Seattle Parks and Recreation Department, and the north wing containing offices and workshops used by the job training program Seattle Conservation Corps.

2.1.1 Radiological History

During planning of proposed renovations of Building 27, the City of Seattle reviewed historical drawings (Navy, 1937a, 1937b, and 1943) and identified a room, labeled "Radium Room", in the south shed of Building 27. Following this discovery Seattle Parks reviewed drawings for Building 2 and identified a space labeled "Instrument Shop." From the late 1930s through the 1960s, it was common practice at Naval Air Stations to perform maintenance on radioluminescent aircraft dials and gauges, and wrist watches. The aircraft components "glowed in the dark" due to the application radioluminescent paint which contained radium-226. Historical Navy records confirm that the former NAVSTA PS received routine shipments of Ra-226 which was used for the maintenance of the radioluminescent devices. These operations were commonly conducted in aircraft hangars; i.e., Buildings 2 and 27, implying that radioactive materials may have been used or stored in both Buildings 2 and 27.

Dose rate radiation surveys were conducted on April 14, 2009 in Building 27 and on May 12 and 19, 2009 in Building 2 and at three sewage pump houses (Pump House A, B, and 116) near Building 27 by a City of Seattle contractor (Argus, 2009a and 2009b).

The 2009 surveys identified two locations in the south shed of Building 27 with elevated radiation levels (Argus, 2009a and 2009b). The two locations were associated with a former sink drainpipe located on the second floor of Building 27 (former Radium Room) and where the pipe extended to the first floor.

Following completion of the 2009 surveys, a radiological remedial investigation at former NAVSTA PS was conducted in 2010, the results of which are presented in the *Radiological Remedial Investigation Report, Former Naval Station Puget Sound, Seattle, Washington* (Shaw, 2011). The radiological remedial investigation project release criteria for buildings, structures, material, and land areas at former NAVSTA PS developed for the remedial investigation are listed in Table 1, "Radiological Remedial Investigation Project Release Criteria." The radiological remedial investigation project release criteria for equipment and structures (surfaces) were taken from U.S. Atomic Energy Commission Regulatory Guide 1.86 (1974). The dose-based calculations were performed using the most current version of Residual Radioactivity (RESRAD) (U.S. Department of Energy, 2001) (for outdoor areas) software package. The dose-based calculations implement an all pathways resident farmer scenario using default parameter values except for the area and thickness of the contaminated zone, the depth of clean cover material, and the indoor/outdoor time fractions. The values for parameters that do not use default values are specified in the Radiological Remedial Investigation Report (Shaw, 2011). The Washington State Department of Health (WAC 246-246.20) and U.S. Nuclear Regulatory Commission (10 CFR 20.1402) regulations specify a dose limit of 25 millirems per year, and the residual radioactivity has been reduced to levels that are as low as reasonably achievable.

In promulgating CERCLA regulations, the U.S. Environmental Protection Agency has specified a dose limit of 15 millirems per year (USEPA letter, 1997). To take a more conservative approach, the dose limit of 15 millirems per year was used in the development of the soil and sludge radiological remedial investigation project release criteria, using the resident farmer exposure scenario (the most conservative scenario in RESRAD).

Radiological contamination above the project release criteria was found in and around the 1939 and 1941 Instrument Shops in Building 2, within the Building 27 South Shed (an addition onto the south face of the original Building 27 hangar structure), and within the southwest and southeast stair towers adjacent to Building 27. Radiological contamination above the remedial investigation project release criteria was also found in piping associated with former sinks within these buildings and in catch basins and soil adjacent to these buildings and in soil adjacent to nearby Building 12. The areas within Buildings 2 and 27 and the outside area south and west of Building 27 containing radiological contamination above release criteria were immediately secured with fencing and locks and signs were posted to prevent unauthorized access. Soil in other areas adjacent to Buildings 2, 12, and 27 with elevated activity is under asphalt or concrete pavement or at depth beneath grass cover and vegetation. The security measures taken at the site are described in greater detail in Section 3.0. The results of the remedial investigation are summarized in the following subsections.

2.1.1.1 Building 2

Radiological characterization surveys were performed applying the MARSSIM guide (NRC et al., 2000). The MARSSIM Class 1 surveys (performed when there is potential for radioactive contamination based on site operating history or known contamination based on previous radiation surveys above project cleanup criteria) of portions of the floors and Class 2 surveys (performed when there is potential for radioactive contamination or known contamination, but are not expected to exceed the project cleanup criteria) of the walls found radiological contamination above the project release criteria (Shaw, 2011) with contamination levels up to 7,161 disintegrations per minute per 100 square centimeters (dpm/100 cm^2) alpha and 16,580 dpm/100 cm^2 beta noted on both the floors and the walls. Radiological contamination above project release criteria within Building 2 was found in the 1939 Instrument Shop, the 1941 Instrument Shop, the area immediately adjacent to (south and east) the 1941 Instrument Shop, and the 1941 Instrument Shop ventilation system (Figure 3, “Radiological Surveys of Building 2 (Second Floor)” and Figure 4, “Building 2 Ventilation System (Second Floor)”).

Radiological contamination above project release criteria was found in three 1-meter squares and a small area of the south wall in the 1939 Instrument Shop. The area of radiological contamination found above project release criteria on the floor of the 1941 Instrument Shop was more substantial than the 1939 Instrument Shop and extended up to 6 meters laterally south and 5 meters to the east of the 1941 Instrument Shop footprint. Only one measurement on the

northern brick wall of the 1941 Instrument Shop exceeded project release criteria. It appears that this was the location of the former 1941 Instrument Shop Sink. A 15-foot length of capped drain pipe was found above the concrete floor. The drain pipe was found to contain sludge with radiological contamination exceeding project release criteria. The aboveground portion of the sink drain pipe was removed, while the balance of the drain pipe remains intact below the ground floor slab. The pipe opening in the concrete floor was filled with cement to prevent access.

With the exception of the 1941 Instrument Shop ventilation system, no radiological contamination above project release criteria was found on the ceiling or ceiling vents in areas surveyed. The ventilation system return ducts (accessed from the attic) are contaminated with levels exceeding project release criteria. Given that the 1941 Instrument Shop ventilation is a recirculating closed-loop system that does not exhaust outside the building, there is a potential that contamination exceeding project release criteria extends to other internal areas of the ventilation system.

According to the Radiological Remedial Investigation Report (Shaw, 2011), the source of radiological contamination likely originated from activities within the 1939 and 1941 Instrument Shops, and in the case of the 1941 Instrument Shop, may have spread to an area south during cleanup activities (mopping). Currently Building 2 is mainly vacant, with the exception of the hangar portion that is used for storage by the City of Seattle Parks and Recreation Department and a north wing which houses offices and workshops for the job training program, Seattle Conservation Corps.

2.1.1.2 Building 27

MARSSIM Class 1 characterization surveys of portions of the floors and Class 2 surveys of the walls were performed, and contamination was found above the project release criteria (Shaw, 2011); contamination levels up to 21,844 dpm/100 cm^2 alpha and 634,000 dpm/100 cm^2 beta were noted on both the floors and the walls, primarily on the second floor of the South Shed of Building 27 (Figure 5, “Summary of Radiological Survey Results – Building 27 (First & Second Floor)”). Radiological contamination above project release criteria within Building 27 was also found in the two adjoining stair towers (southwest and southeast stair towers).

Radiological contamination above project release criteria was found in the wood flooring that was exposed upon removal of the remodeled flooring in nearly all the rooms on the second floor of the South Shed. The migration of radiological contamination into the wood subfloor below the tongue and groove wood flooring appears to have been impeded by a layer of roofing-type tar paper found between the wood floor and subfloor. Exceptions would be areas with floor penetrations (i.e., former steam piping) or areas where former walls had been removed and the roofing paper did not originally exist. At penetrations and former wall locations (where the walls were removed), radiological contamination was found in the subfloor, in the three locations

where the subfloor was removed (Radium Room and two locations in the Safety Chief Room), and the floor joists. Radiological contamination above project release criteria on the first floor of the South Shed was found in the concrete floor of the Welding Shop where a drain pipe from a former Radium Room sink penetrated the concrete floor and one other site near a ceiling penetration. On April 26, 2010, the above ground portion of the sink drain pipe was removed, sectioned, placed in a 55-gallon drum, and disposed to a licensed low-level radiological waste (LLRW) facility. The remaining portion of the drain pipe remains intact below the ground floor slab. A second set of sink pipes were found immediately to the west of the Carbon Tissue Room. All associated piping was sampled, removed, sectioned, placed in a 55-gallon drum and disposed to a licensed LLRW facility. Radiological contamination above project release criteria was found on the second floor and the metal stairs of the southwest stair tower, and on the first floor and the metal stairs of the southeast stair tower.

A small penthouse structure is located on the roof of the Building 27 South Shed that contains heating and air conditioning equipment. This equipment was abandoned (not operational) but did appear to provide air flow into and out of the Radium Room. This structure was investigated and a radiological scoping survey was performed for removable contamination and gamma dose rate. On June 4, 2010, the interior of the air handling unit was accessed and surveyed. Radiological contamination above project release criteria was found on one ceiling vent.

Abandoned floor exhaust vents are located along the north and south perimeter walls of the Former Instrument Shop. These vents were surveyed by surveying the screen grates and surveying within the exhaust duct. Each of these floor vents was contaminated in excess of the project cleanup criteria. To investigate the extent of the exhaust duct contamination, the floor was cut at three locations, exposing the exhaust ducts. In all cases, it was determined that the ducts had been cut approximately 3 feet from the floor vent and the remainder of the exhaust ducting had been removed. The floor vent and attached exhaust duct were removed. Two of the three exposed joist space locations indicated contamination in excess of the project cleanup criteria.

A single run of the exhaust duct from this abandoned system was attached to the ceiling in the first floor Tech and Library Parts area. A survey was performed on the exhaust duct, including the accessible interior. Contamination in excess of the project cleanup criteria was detected.

No radiological contamination above project release criteria was found on the ceiling or roof of the South Shed. Archive drawings document that the roof was replaced at least two times since past radium activities had occurred in the building.

According to the Radiological Remedial Investigation Report (Shaw, 2011), the source of radiological contamination likely originated from activities within the instrument shop and

appears to have been spread throughout the South Shed, primarily on the second floor, during cleaning activities (mopping).

No radiological contamination above project release criteria is present in the public areas surveyed within the Building 27 hangar area. In May 2010, a tenant of the Seattle Parks and Recreation began renovation of the northern hangar area of Building 27 into an indoor sports facility. That facility is now open to the public.

2.1.1.3 Storm Drains

Sludge samples taken from the inside of a drain pipe from a former sink in the Building 2 1941 Former Instrument Shop was found to contain Ra-226 and Sr-90 at levels exceeding project release criteria (Figure 6, "Pump Houses and Sewer/Storm Drain Line" and Figure 7, "Manhole, Catch Basin, Pipe, and Pump House Sampling Locations"). The drain discharged to the storm line that parallels the west side of Building 2 at manhole MH-134. The aboveground portion of the drain pipe was removed and cement was placed in the pipe opening to prevent access. None of the sludge samples collected within accessible locations in Building 2, in manholes west of Building 2 (manholes MH-162, MH-134, and MH-135), or in manholes located under and north of Building 27 (manholes MH-136, MH-1005, and MH-160) were found to exceed project release criteria. Three samples of sludge from a sediment pit located near manhole MH-134 did not exceed project release criteria for Ra-226. However, the three samples contained Cs-137 (ranging from 3.0 pCi/g to 6.03 pCi/g) and will require further investigation and remediation. There was not a project release criteria for Cs-137 during the radiological remedial investigation. Further investigation of the Cs-137 contamination will be conducted.

The former Radium Room sink piping that penetrated the concrete floor of the Welding Shop on the first floor of the Building 27 South Shed is connected to the storm drain line that runs south from the building and west to catch basin CB-3. The aboveground portion of the drain pipe within Building 27 was removed at the slab and capped. The line from catch basin CB-3 connects to manhole MH-141 and continues through manholes MH-137 and MH-160 to discharge into Lake Washington. Of the sludge samples collected within this storm drain line, only samples collected from catch basin CB-3 were found to contain radiological contamination (Ra-226) exceeding the project release criteria of 3.85 picocuries per gram (Shaw, 2011). Drain pipes from former sinks located near the center of the South Shed are connected to the storm drain line that traverses south to catch basin CB-1. Catch basin CB-1 connects to an adjacent 24-inch storm line that runs north to manhole MH-136 located within Building 27 and through manholes MH-1005 and then MH-160 before it discharges to Lake Washington. Of the sludge samples collected within this storm line, only samples collected from catch basin CB-1 were found to exceed project release criteria for Ra-226.

Based on the sediment results for the sewers and catch basins, it was determined that catch basins CB-1, CB-3, and CB-5 had elevated levels of Ra-226 in the sediment. As a precaution to prevent contaminated sediment migration to larger downgradient storm drain pipes, the three catch basins were remediated during the radiological remedial investigation conducted in 2010. The catch basin inlet and outlet pipes were plugged and the water pumped off the top of the sediment and containerized for disposition. The remaining sediment was scraped out and containerized in 55-gallon drums for disposition. After removing all the sediment, a quick-drying concrete was added to each catch basin and troweled over the bottom and sides of the catch basin to cover any residual sediment and seal it in place. After the concrete dried, the plugs were removed and the catch basin resumed its normal function. These catch basins will require removal and replacement.

2.1.1.4 Soil

Results of gamma walkover surveys and soil sampling indicate that soil containing Ra-226 concentrations exceeding project release criteria is present in limited areas northeast and northwest of Building 12, the former Boiler Plant, (south of NE NOAA Drive) (Figure 8, "Building 12, Potential Soil Contamination Area") and south and southeast of Building 2 (Figure 9, "Building 2, Potential Soil Contamination Area"). The vertical extent of this soil appears to be limited to a thin layer of soil typically less than 2 feet below ground surface. A single discrete item (radioactive button) was found and removed from the soil along the east side of Building 2.

Results of gamma walk-over surveys and soil sampling indicate that soil containing Ra-226 concentrations exceeding project release criteria is present in historically unpaved (nontarmac) areas south and west of Building 27 (Figure 10, "Building 27, Potential Soil Contamination Area"). The vertical extent of this soil appears to be limited to a layer of soil typically 1 to 2 feet thick within 3 to 5 feet of soil above groundwater depending on elevation and whether the area received fill from past construction of the National Oceanic and Atmospheric Administration overpass. Based on the findings of the radiological remedial investigation, an Engineering Evaluation/Cost Analysis was initiated to develop and evaluate removal action alternatives, with the intent that the selected alternative would be implemented as a non-TCRA. However, due to continued deterioration of the buildings and the discovery of trespassers breaking into Building 2, the lead agency (Naval Facilities Engineering Command Northwest) decided to forego further development of the Engineering Evaluation/Cost Analysis and perform a TCRA in order to expedite the removal actions.

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3.0 Threats to Public Health or Welfare or the Environment, and Statutory and Regulatory Authorities

The results of the radiological remedial investigation conducted in 2010 (Shaw, 2011) identified radiological contamination above the project release criteria in and around the 1939 and 1941 Instrument Shops in Building 2 and within the Building 27 South Shed (an addition onto the south face of the original Building 27 hangar structure) and two adjoining Building 27 stair towers. Radiological contamination above the project release criteria was also found in storm lines associated with these buildings and in soil adjacent to these buildings and nearby Building 12. These conditions may present a risk to public health or welfare or the environment if this TCRA is not implemented. The TCRA is being performed to address only the radiological contamination. If other contamination is encountered it will be addressed by temporarily containerizing, characterizing, and ultimately disposing of the contamination at an appropriate landfill according to local, state, and federal requirements. The TCRA will be performed to expedite the cleanup process.

A temporary fence surrounds the contaminated soils on the west and south sides of Building 27. The fence gate is locked along with all the exterior doors of the South Shed. Padlocked doors and plywood barriers have been installed to prevent access to all areas of the South Shed. The only exception is a small room in the Southeast Tower that is open to Building 27 tenants for access to the hangar water main shutoff valve. This area has been thoroughly surveyed and poses no radiological concerns for the public.

Building 2 access doors and stairwells are secured by either plywood barriers or padlocks. Building 27 fencing and all access points to Buildings 2 and 27 are posted with “Controlled Area.” Radiological postings are in place inside both buildings, where necessary.

Buildings 2 and 27 are inspected on a weekly basis to ensure that all points of access are secured and to look for evidence of trespassing. Fencing, locks, plywood barriers, postings, and shielding are all inspected for integrity. To document the inspection, a security checklist is completed, signed, and forwarded to Navy project management staff and City of Seattle Parks and Recreation personnel. On a monthly basis, a radiological dose rate survey is performed along the Building 27 perimeter fence, along the south and west exterior face of the South Shed, and at select South Shed interior locations. Radiological dose rates are also measured at the Building 2, second floor Radiologically Controlled Area entrances. Once each month, a smear survey is also conducted at the boundaries of Radiologically Controlled Areas and other locations to ensure that contamination has not migrated beyond the posted radiological areas or that radiological conditions have not changed at the boundaries of the controlled areas.

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4.0 Endangerment Determination

Actual or threatened releases of radiological contaminants from the former NAVSTA PS, if not addressed by implementing the response actions presented in this Action Memorandum, may present a risk to public health, or welfare, or the environment due to the potential release of contamination should deterioration of the buildings and break-ins (trespassers) to the buildings continue or in the event the buildings are renovated or demolished in the future. The Navy has determined that this threat can be abated and eliminated by undertaking this TCRA.

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5.0 Proposed Actions and Estimated Costs

This section describes the proposed TCRA to mitigate the conditions cited in Section 4.0. This section also discusses ARARs and presents the estimated costs for the TCRA.

5.1 Proposed Action

The proposed TCRA at the former NAVSTA PS will focus on the tasks listed here and detailed in the draft Radiological Removal Action Work Plan (Tetra Tech EC, Inc., 2013). Figure 11, "Planned Removal Action Areas," provides the locations of the following planned removal activities:

- Removal of radiologically contaminated Building 27 components, including associated radiological surveys and waste management, and subsequent demolition of the Building 27 South Shed and restoration of the south face of the original Building 27 hangar structure
- Removal of radiologically contaminated Building 2 components, including associated radiological surveys, restoration, and waste management. The ventilation system will be removed if contamination is found above TCRA project release criteria. Sections that are not above project release criteria may be left in place
- Removal of radiologically contaminated soil surrounding Buildings 2, 12, and 27, including additional characterization, associated radiological surveys, restoration, and waste management
- Removal and replacement of radiologically contaminated storm drain system components (e.g., catch basins, pipe, and appurtenances) associated with Buildings 2 and 27; including additional assessments, associated radiological surveys, removal, restoration, and waste management
- Disposal of non-LLRW in a permitted landfill and LLRW in a licensed LLRW waste disposal facility

The TCRA project release criteria for equipment and structures (surfaces) were taken from U.S. Atomic Energy Commission Regulatory Guide 1.86 (1974). The dose-based calculations were performed using the most current version of Residual Radioactivity (RESRAD) Version 6.5 for soils and RESRAD BUILD for buildings. Additional details on how the release criteria were determined and the dose associated with each release criteria are provided in Appendix A, "Navy Assessment of Derived Concentration Guideline Limits for Radium-226, Strontium-90, and Cesium-137 Contamination at Former Naval Station Puget Sound at Sand Point."

The Washington State Department of Health (WAC 246-246.20) and U.S. Nuclear Regulatory Commission (10 CFR 20.1402) regulations specify a dose limit of 25 millirems per year, and the

residual radioactivity has been reduced to levels that are as low as reasonably achievable. Both the U.S. Environmental Protection Agency and Washington State Department of Ecology use risk based standards. In promulgating CERCLA regulations, the U.S. Environmental Protection Agency has specified a dose limit of 15 millirems per year (USEPA letter, 1997).

To take a more conservative approach, the dose limit of 15 millirems per year was used in the development of the soil/sediment Derived Concentration Guideline Limits using the RESRAD Industrial Worker scenario with the radon pathway turned on and an occupancy factor of 0.115 indoor and 0.115 outdoor, or the Recreationist scenario with an outdoor occupancy factor of 0.59, which ever value is more restrictive. The TCRA project release criteria for buildings, structures, material, and land areas at former NAVSTA PS are listed in Table 2, "Time-Critical Removal Action Project Release Criteria".

5.2 Contribution to Remedial Performance

The removal action objectives for the former NAVSTA PS site are to:

- Provide protection of human health and the environment through the removal of soil contamination with concentrations of Ra-226, Cs-137, and/or Sr-90 exceeding the project release criteria
- Provide protection of human health and the environment through the removal/replacement of storm drain lines or catch basins containing sludge contamination with concentrations of Ra-226, Cs-137, and/or Sr-90 exceeding the project release criteria
- Provide protection of human health through the removal of impacted building materials and equipment with known radiological contamination exceeding project release criteria
- Disposal of non-LLRW in a permitted landfill and LLRW in a licensed LLRW waste disposal facility

When the removal action objectives are achieved, a no further action determination will be requested from Washington State Department of Ecology for the release of the buildings and remediated soil. Completion of the TCRA will reduce the potential human health and ecological risks of exposure to radiological contaminants at the former NAVSTA PS to acceptable levels.

5.3 Applicable or Relevant and Appropriate Requirements

The ARARs addressing contaminated environmental media are applied to the scope of this TCRA as outlined in this section. The NCP (40 CFR 300.5) defines "applicable" requirements as: "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility citing laws that specifically address a hazardous substance, pollutant, contaminant, remedial action,

location, or other circumstance found at a CERCLA site." Only those promulgated state standards that are identified by a state in a timely manner and that are equally or more stringent than federal requirements may be applicable.

The NCP (40 CFR 300.5) further defines "relevant and appropriate" requirements as: "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility citing laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site." Like "applicable" requirements, the NCP also provides that only those promulgated state requirements that are identified in a timely manner and are more stringent than corresponding federal requirements may be relevant and appropriate.

To Be Considered (TBC) guidance are guidelines or advisories that are issued by the federal or state government, but which are neither legally binding nor promulgated (U.S. Environmental Protection Agency, 1988). However, these guidelines may be used when necessary to ensure protection of public health and the environment and when they have not been superseded. If no ARARs address a particular circumstance at a CERCLA site, then TBCs can be used to establish remedial guidelines or targets.

The radionuclide-specific ARARs have been identified for the on-site radiological contaminants of concern, Ra-226, Sr-90, and Cs-137. Asbestos (from ceiling and floor tiles) and lead (from lead-based paint) will need to be considered for handling and disposal if removed, but are not included in the radionuclide-specific ARARs provided in Table 3, "Radionuclide-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered."

Key location-specific ARARs consider that the site is located adjacent to Lake Washington and that historic structures are located at the facility. These ARARs are provided in Table 4, "Location-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered," and include state and federal flood plain and coastal zone acts/regulations as well as national and state historic preservation acts. Because of the historic significance of Buildings 2 and 27, the Navy submitted a consultation letter to the Washington State Department of Archeology & Historic Preservation (DAHP) to review the scope of the proposed demolition activities on behalf of the State Historic Preservation Officer under provisions of Section 106 of the National Historic Preservation Act of 1996 (as amended) and 36 CFR 800. The State Historic Preservation Officer determined that demolition of the Building 27 south shed will have no adverse effect on Building 27, a contributing property to the National Register listed NAS Seattle historic district provided that if the south end wall is treated appropriately to meet Secretary of Interior's Standards (Washington State Department of Archeology & Historic

Preservation, 2013). Additionally, it has been determined that the proposed soil remediation and removal and replacement in-kind of flooring, wall board, drain pipe, and ventilation system components at Building 2 will also have no adverse effect on the NAS Seattle historic district.

In March 2011 the City of Seattle Landmarks Preservation Board approved the designation of the Sand Point Naval Air Station Landmarks Preservation District. This designation is separate from the Washington DAHP historic district and typically requires a separate review for alterations to historic resources, especially demolition of significant structures.

Action-specific ARARs are provided in Table 5, "Action-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered." ARARs focus on regulations related to demolition and disposal of materials on site including radiologically contaminated building materials and soils, lead-based paint, and asbestos containing ceiling and floor tiles. ARARs are an integral part of the CERCLA process and will substantively guide the cleanup action. The ARARs include activities related to demolition and excavation including stormwater management, erosion control, grading, discharge and potential treatment of waste water (i.e., decontamination water), and control of air emissions during execution of the remedial action and waste management.

The duration of the TCRA is expected to be less than 12 months. It is anticipated the field work will begin in June 2013 and will be completed by December 2013 with the subsequent demolition of Building 27 South Shed and restoration of the hangar south wall. The overall estimated cost (in 2012 dollars) to implement the TCRA is expected to be approximately $9,000,000 including disposal charges.

6.0 Expected Change in the Situation Should Action be Delayed or Not Taken

If the TCRA is not conducted, the radiological contamination present in Building 2 and Building 27, in the catch basins associated with Building 27, and in soil adjacent to Buildings 2, 12, and 27 would remain in place, potentially migrate in surrounding soils and surface water, and the public could be inadvertently exposed to them over time.

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7.0 Outstanding Policy Issues

None identified at this time.

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8.0 Recommendation

This decision document represents the selected removal action for the former NAVSTA PS located in Township 25 North, Range 4 east, Section 2, in King County, Washington, developed in accordance with the substantive requirements of CERCLA as amended, and is consistent with the NCP. This Action Memorandum supports the following planned removal activities:

- Removal of radiologically contaminated Building 27 components, including associated radiological surveys and waste management, and subsequent demolition of the Building 27 South Shed and restoration (in accordance with the Secretary of Interior's Standards [Washington State Department of Archeology & Historic Preservation, 2013]) of the south face of the original Building 27 hangar structure
- Removal of radiologically contaminated Building 2 components, including associated radiological surveys, restoration, and waste management. The ventilation system will be removed or cleaned if found above project release criteria. Sections that are not above project release criteria may be left in place
- Removal of radiologically contaminated soil surrounding Buildings 2, 12, and 27, including additional characterization, associated radiological surveys, restoration, and waste management
- Removal and replacement of radiologically contaminated storm drain system components (e.g., catch basins, pipe, and appurtenances) associated with Buildings 2 and 27; including additional assessments, associated radiological surveys, removal, restoration, and waste management
- Disposal of non-LLRW in a permitted landfill and LLRW in a licensed LLRW waste disposal facility

A TCRA is necessary to address risk to public health, or welfare, or the environment due to the potential release of contamination should deterioration of the buildings and break-ins (trespassers) to the buildings continue or in the event the buildings are renovated or demolished in the future. Contamination remaining in place may potentially migrate in surrounding soils and surface water, and the public could be inadvertently exposed to them over time. The Navy has determined that this threat can be abated and eliminated by undertaking this TCRA.

This decision is based on, and will be included into the administrative record for this site, which is available at the Seattle Public Library, Northeast Branch, 6801 35th Avenue NE, Seattle, Washington.

Approved by: Cindy L O'Hare Date: 5/24/13

Cindy L. O'Hare, PE
Environmental Ops Supervisor

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Figures

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SOURCE: 2009 GOOGLE-MAP DATA @ 2009 TELE ATLAS

SCALE: 1"=2 MILES

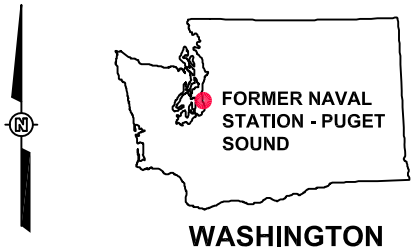

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FIGURE 1
SITE LOCATION MAP

FORMER NAVAL STATION – PUGET SOUND
7500 SANDPOINT WAY NE
SEATTLE, WASHINGTON

XREF Files: IMAGE Files: sanpoint site.jpg
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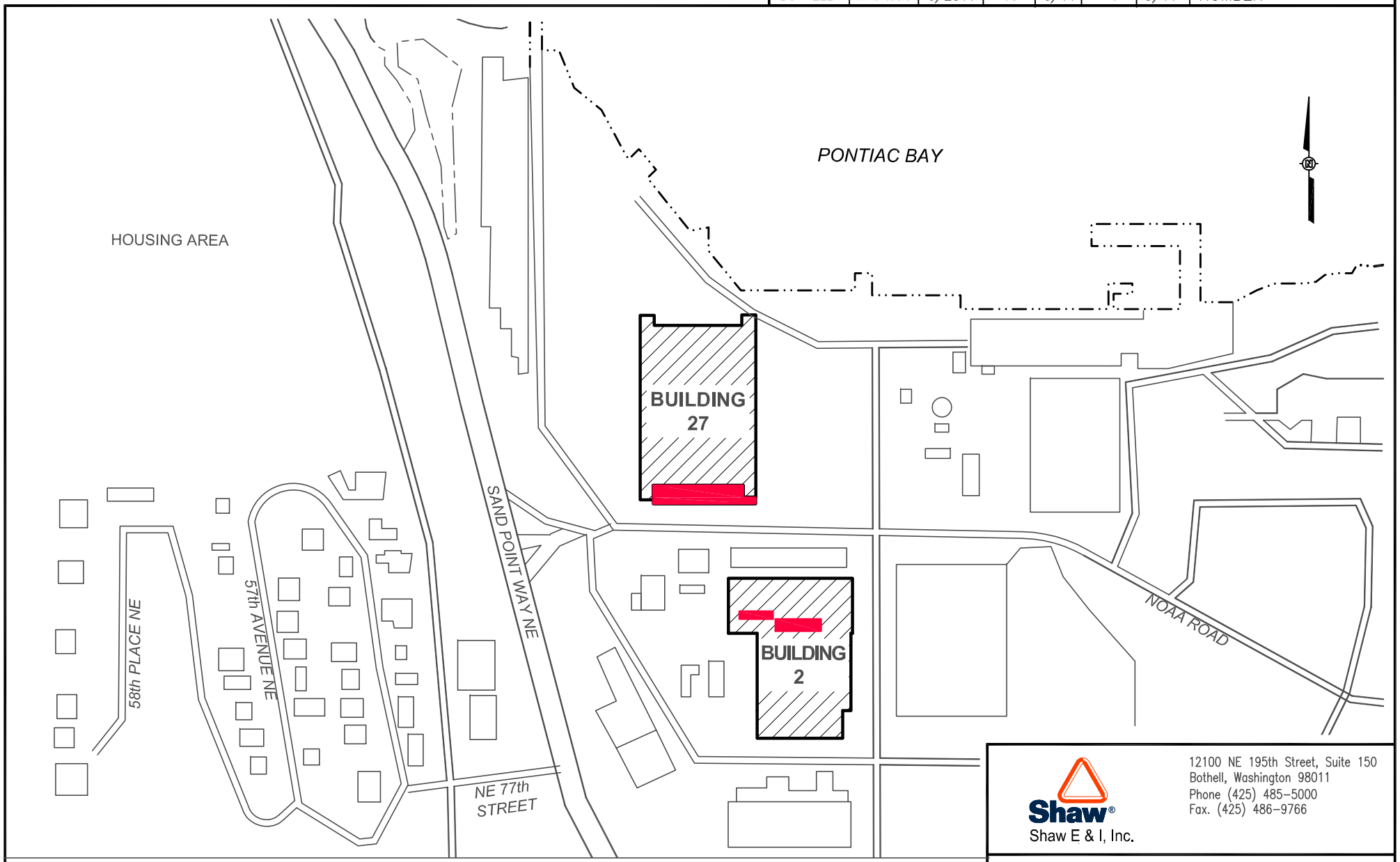

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SCALE
0 600 1200 FEET

SOURCE: 2009 GOOGLE-MAP DATA @ 2009 TELE ATLAS

LEGEND:

APPROXIMATE LOCATIONS OF INVESTIGATIONS

FIGURE 2

LOCATION OF BUILDING 27 AND BUILDING 2

FORMER NAVAL STATION – PUGET SOUND
7500 SANDPOINT WAY NE
SEATTLE, WASHINGTON

LEGEND:

- OUTLINE OF BUILDING (1941)
- OUTLINE OF BUILDING (1986)
- ABOVE PROJECT CLEAN-UP CRITERIA
- BELOW PROJECT CLEAN-UP CRITERIA
- NOT SURVEYED

DATA SOURCE: RSS-326, 330, 333, 339, 345, 353, 354, 359, 360, 363, 364,366,414,441,443,450,453,457,462

PROJECT CLEANUP CRITERIA

	Removable	Average
Ra-226	20 dpm α/100cm²	100 dpm α/100cm²
Beta-gamma	1,000 dpm β-γ/100cm²	5,000 dpm β-γ/100cm²

SCALE

0 20 40 FEET

SOURCE: US NAVAL STATION, SEATTLE WASHINGTON
BUILDING 2 PLAN - 1986 (DRAWING #50263)
1941 (DRAWING #50106)
1939 (DRAWING #50030)

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FIGURE 3

RADIOLOGICAL SURVEYS OF BUILDING 2 (SECOND FLOOR)

FORMER NAVAL STATION – PUGET SOUND
7500 SANDPOINT WAY NE
SEATTLE, WASHINGTON

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
BOTHELL	MPortacio 6/2011	JM 6/11	TS 9/11	BT-EECA-137165-F16

XREF Files: IMAGE Files: TABLE.jpg
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OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
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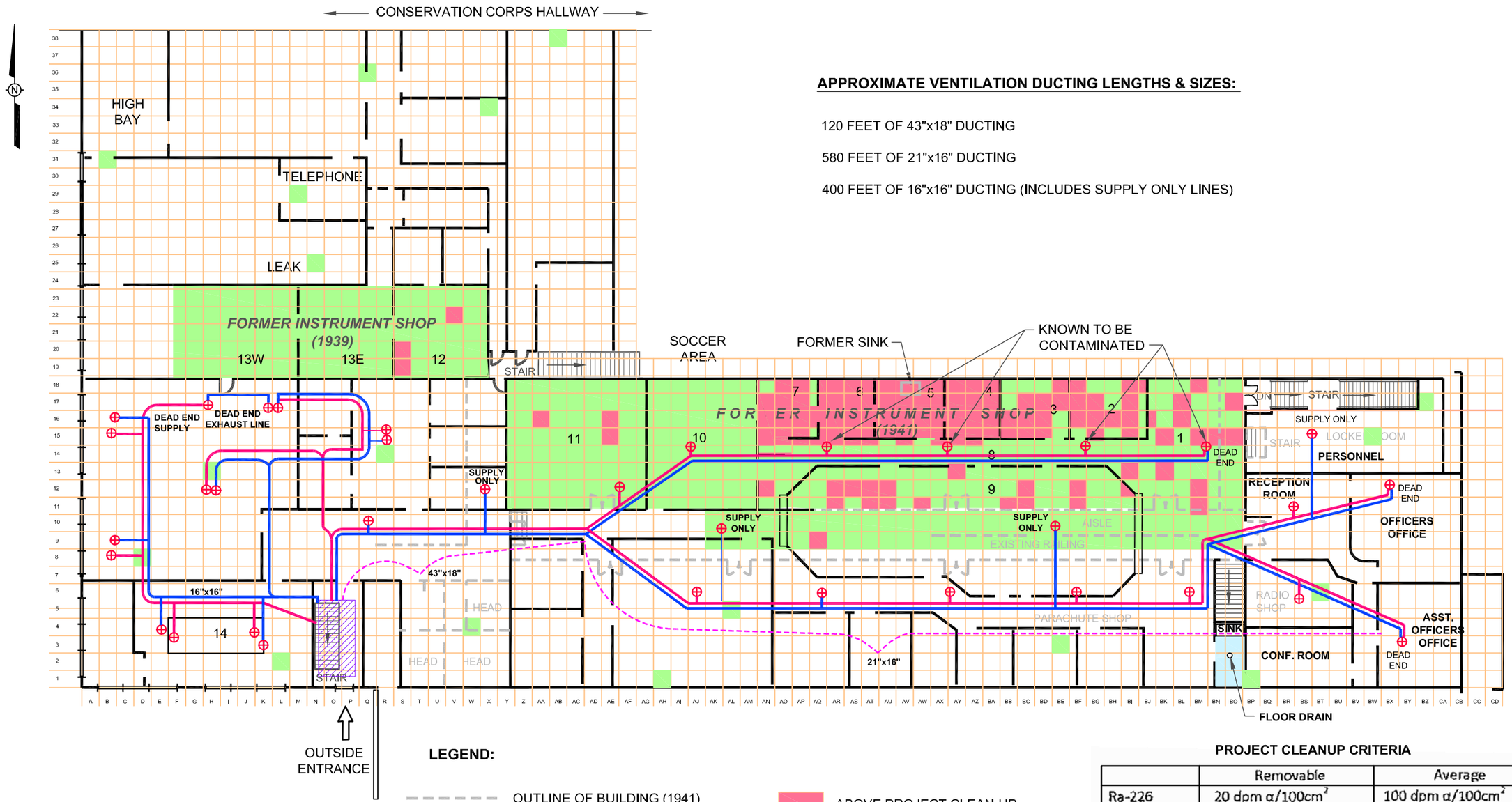

APPROXIMATE VENTILATION DUCTING LENGTHS & SIZES:

120 FEET OF 43"x18" DUCTING

580 FEET OF 21"x16" DUCTING

400 FEET OF 16"x16" DUCTING (INCLUDES SUPPLY ONLY LINES)

LEGEND:

OUTLINE OF BUILDING (1941)

OUTLINE OF BUILDING (1986)

DATA SOURCE: RSS-326, 330, 333, 339, 345, 353, 354, 359, 360, 363, 364,366,414,441,443,450,453,457,462

AIR MOVER ~9'x6'x6'

AIR PLENUM

ABOVE PROJECT CLEAN-UP CRITERIA

BELOW PROJECT CLEAN-UP CRITERIA

NOT SURVEYED

EXHAUST LINE

SUPPLY LINE

PROJECT CLEANUP CRITERIA

	Removable	Average
Ra-226	20 dpm α/100cm²	100 dpm α/100cm²
Beta-gamma	1,000 dpm β-γ/100cm²	5,000 dpm β-γ/100cm²

SCALE

0 20 40 FEET

SOURCE: US NAVAL STATION, SEATTLE WASHINGTON
BUILDING 2 PLAN - 1986 (DRAWING #50263)
1941 (DRAWING #50106)
1939 (DRAWING #50030)

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FIGURE 4
BUILDING 2 VENTILATION SYSTEM (SECOND FLOOR)
FORMER NAVAL STATION – PUGET SOUND
7500 SANDPOINT WAY NE
SEATTLE, WASHINGTON

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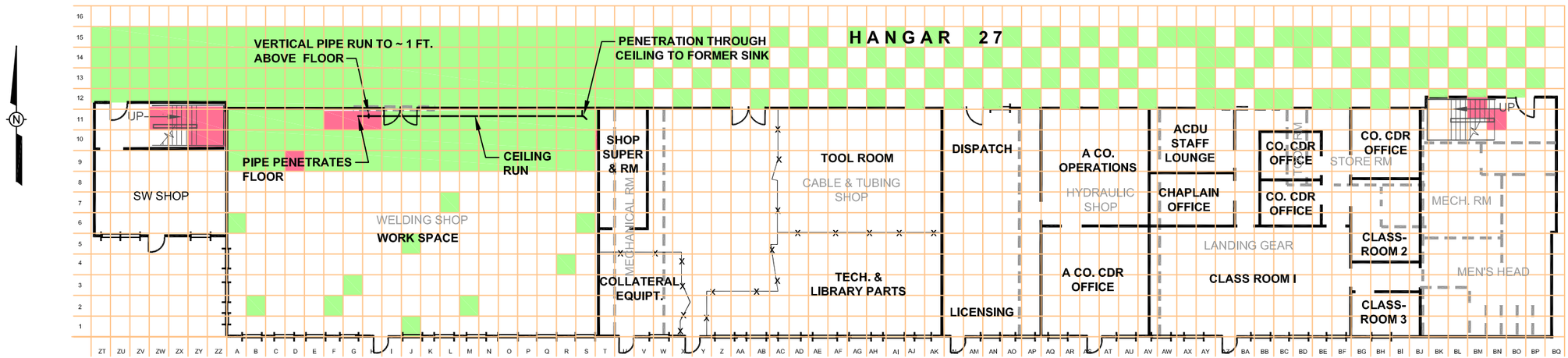
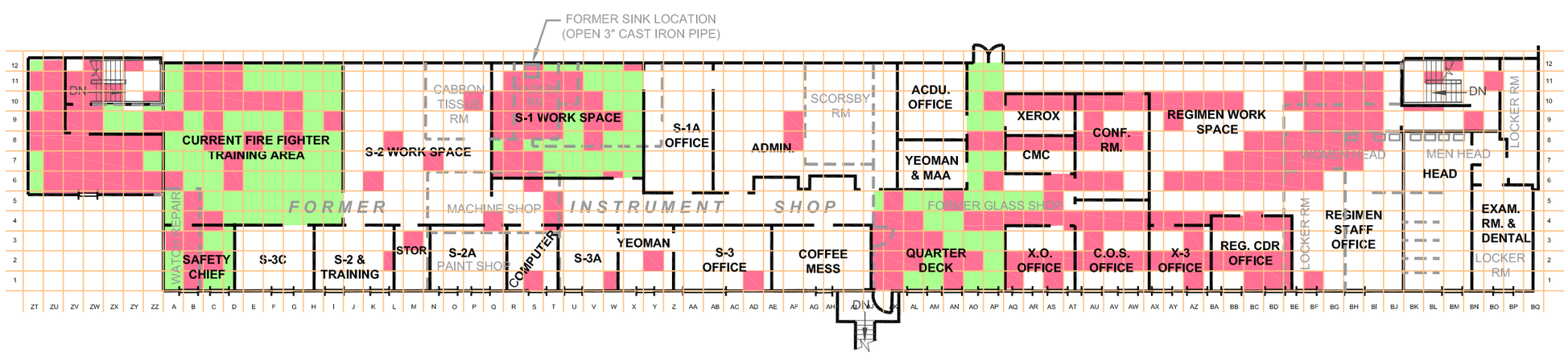


FIRST FLOOR PLAN

DATA SOURCE: RSS-084, RSS-120, RSS-132, RSS-328



SECOND FLOOR PLAN

LEGEND:

- OUTLINE OF BUILDING (1943)
- OUTLINE OF BUILDING (1985)
- ABOVE PROJECT CLEAN-UP CRITERIA
- BELOW PROJECT CLEAN-UP CRITERIA
- NOT SURVEYED

SCALE

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SOURCE: US NAVAL STATION, SEATTLE WASHINGTON
BUILDING 27 PLAN - 1985 (DRAWING #54151)
1943 (DRAWING #54080)

DATA SOURCE: RSS-040, RSS-041, RSS-046, RSS-059, RSS-062, RSS-066, RSS-116, RSS-134, RSS-148

PROJECT CLEANUP CRITERIA

	Removable	Average
Ra-226	20 dpm α/100cm²	100 dpm α/100cm²
Beta-gamma	1,000 dpm β-γ/100cm²	5,000 dpm β-γ/100cm²

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FIGURE 5
SUMMARY OF RADIOLOGICAL SURVEY RESULTS - BUILDING 27 (FIRST & SECOND FLOOR)
FORMER NAVAL STATION – PUGET SOUND
7500 SANDPOINT WAY NE
SEATTLE, WASHINGTON

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
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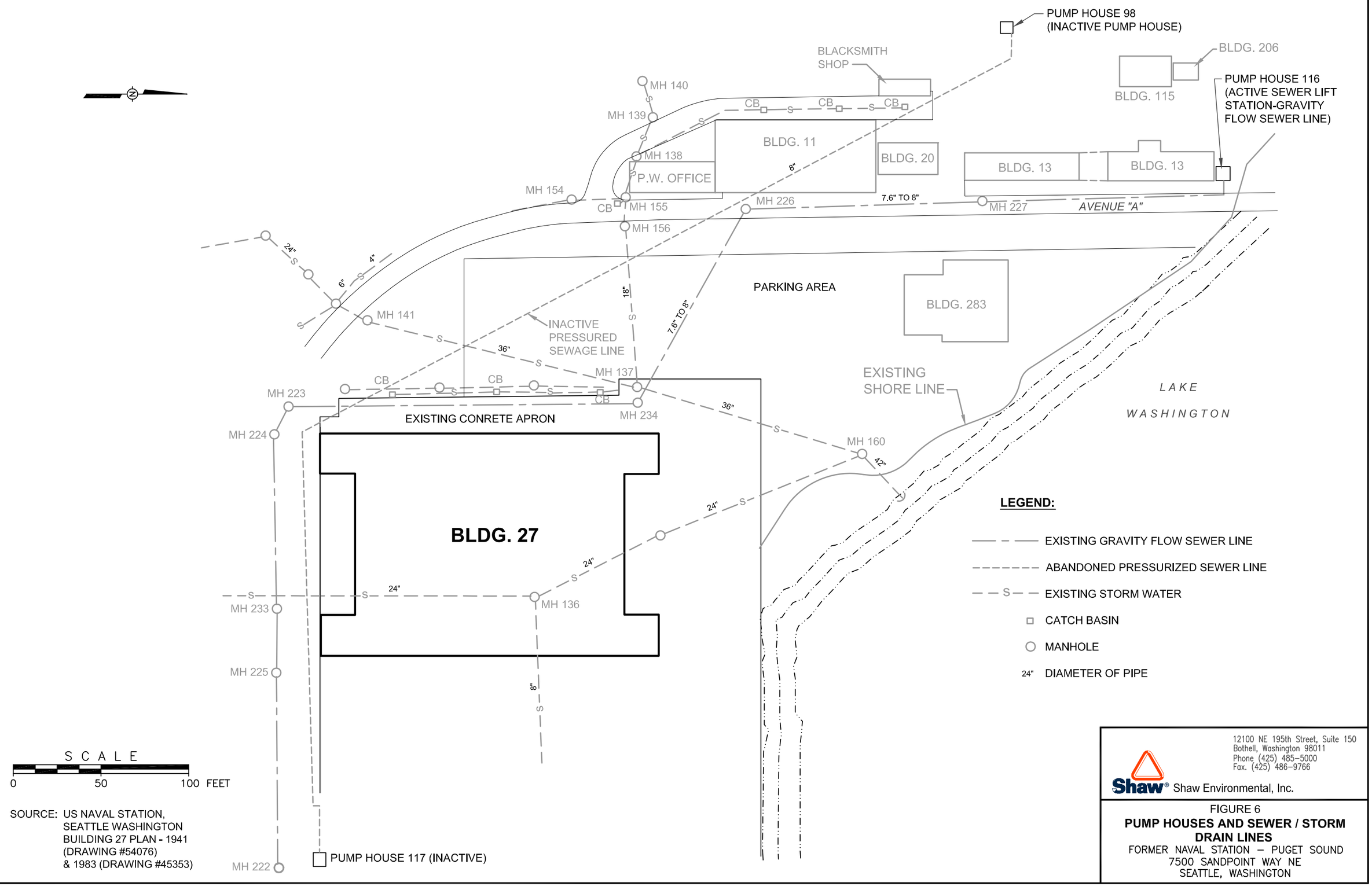

SOURCE: US NAVAL STATION, SEATTLE WASHINGTON BUILDING 27 PLAN - 1941 (DRAWING #54076) & 1983 (DRAWING #45353)

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FIGURE 6

PUMP HOUSES AND SEWER / STORM DRAIN LINES

FORMER NAVAL STATION – PUGET SOUND
7500 SANDPOINT WAY NE
SEATTLE, WASHINGTON

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
BOTHELL	MPortacio 6/2011	CG 6/11	TS 9/11	BT-EECA-137165-F19

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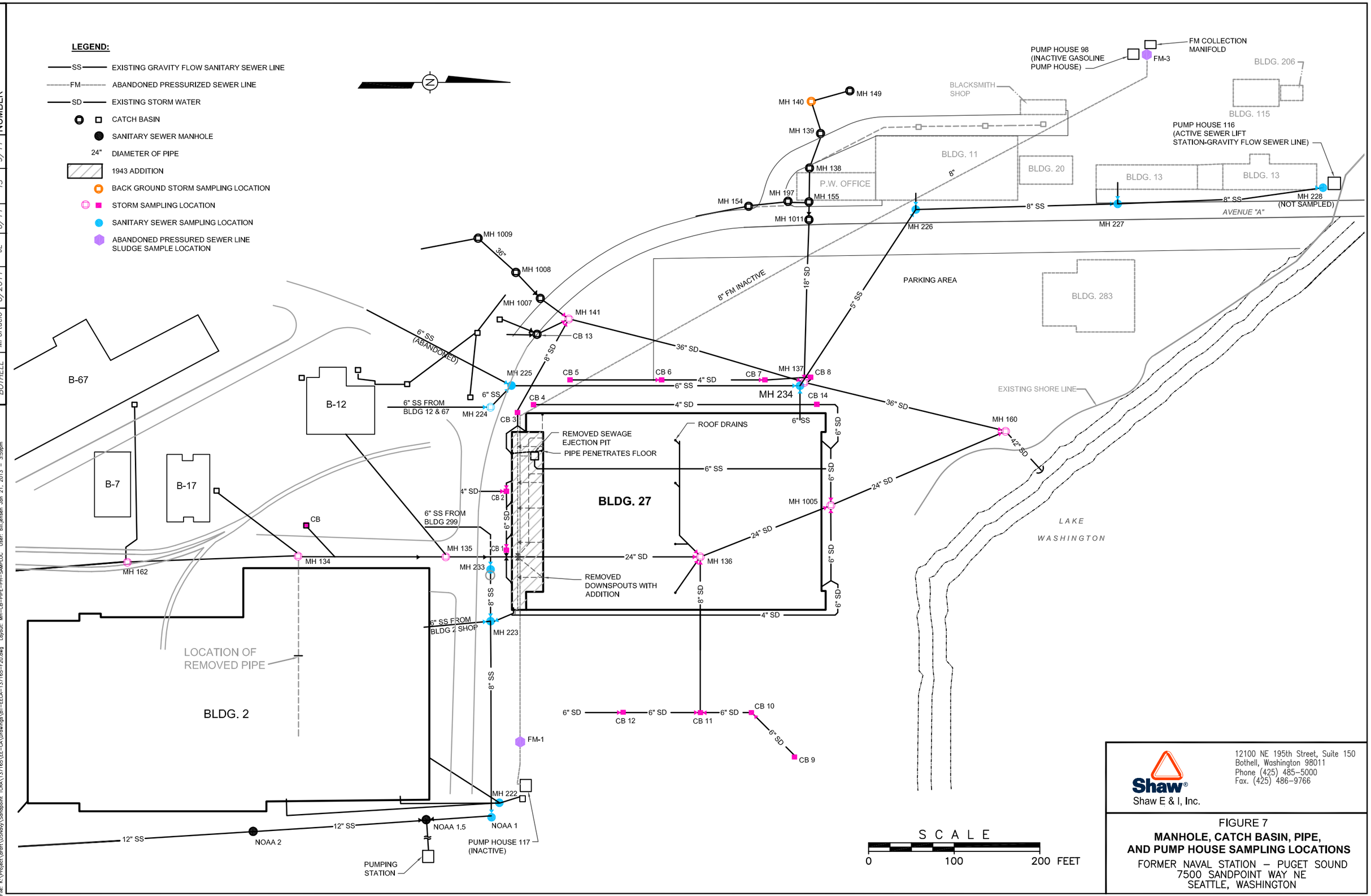

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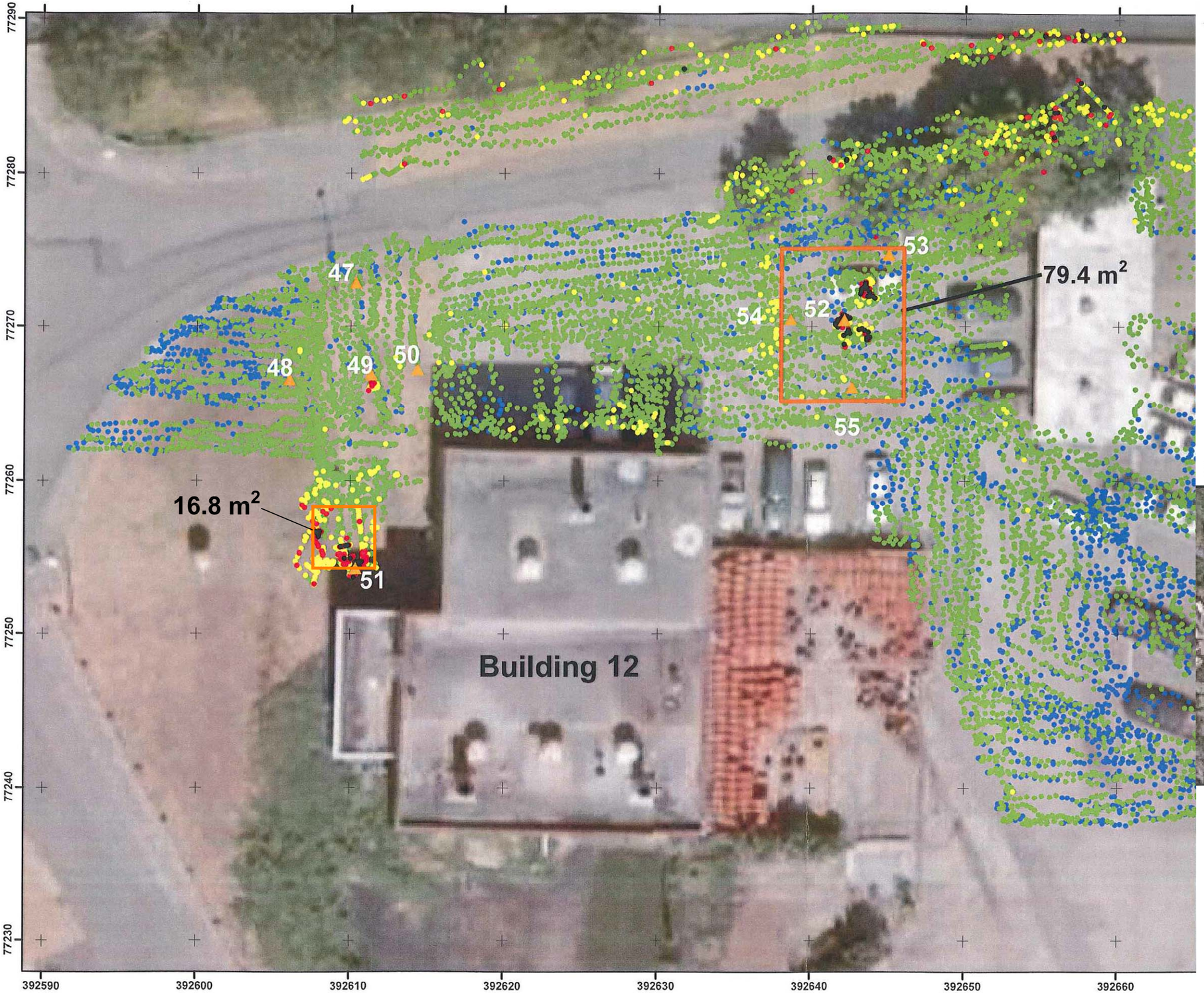
FIGURE 7

MANHOLE, CATCH BASIN, PIPE, AND PUMP HOUSE SAMPLING LOCATIONS

FORMER NAVAL STATION – PUGET SOUND
7500 SANDPOINT WAY NE
SEATTLE, WASHINGTON



Legend

- Boring Locations

CPM

- 3428 - 5250
- 5251 - 7250
- 7251 - 9250
- 9251 - 11250
- 11251 - 36533
- Potential Soil Contamination Area

NAD 1983 WA State Plane
North FIPS 4601

N W E S

Meters
0 2 4 8 12 16

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FIGURE 8
BUILDING 12
POTENTIAL SOIL CONTAMINATION AREA
FORMER NAVAL STATION – PUGET SOUND
7500 SANDPOINT WAY NE
SEATTLE, WASHINGTON

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
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Legend

- Boring Locations

CPM

- 3721 - 4500
- 4501 - 6500
- 6501 - 8500
- 8501 - 10500
- 10501 - 14409
- Potential Soil Contamination Area

NAD 1983 WA State Plane
North FIPS 4601

N W E S

Meters
0 2.5 5 10 15 20

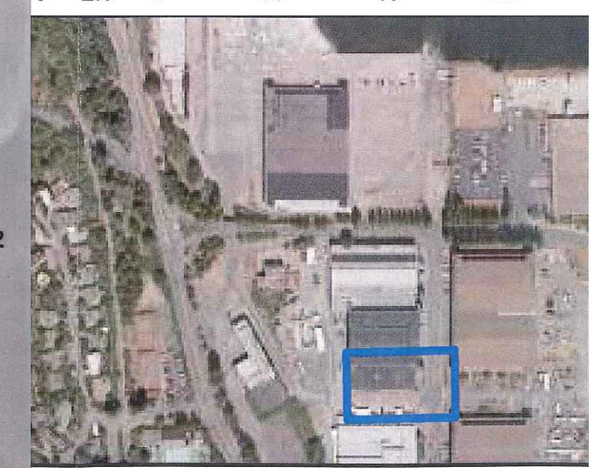

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FIGURE 9
BUILDING 2
POTENTIAL SOIL CONTAMINATION AREA
FORMER NAVAL STATION – PUGET SOUND
7500 SANDPOINT WAY NE
SEATTLE, WASHINGTON

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
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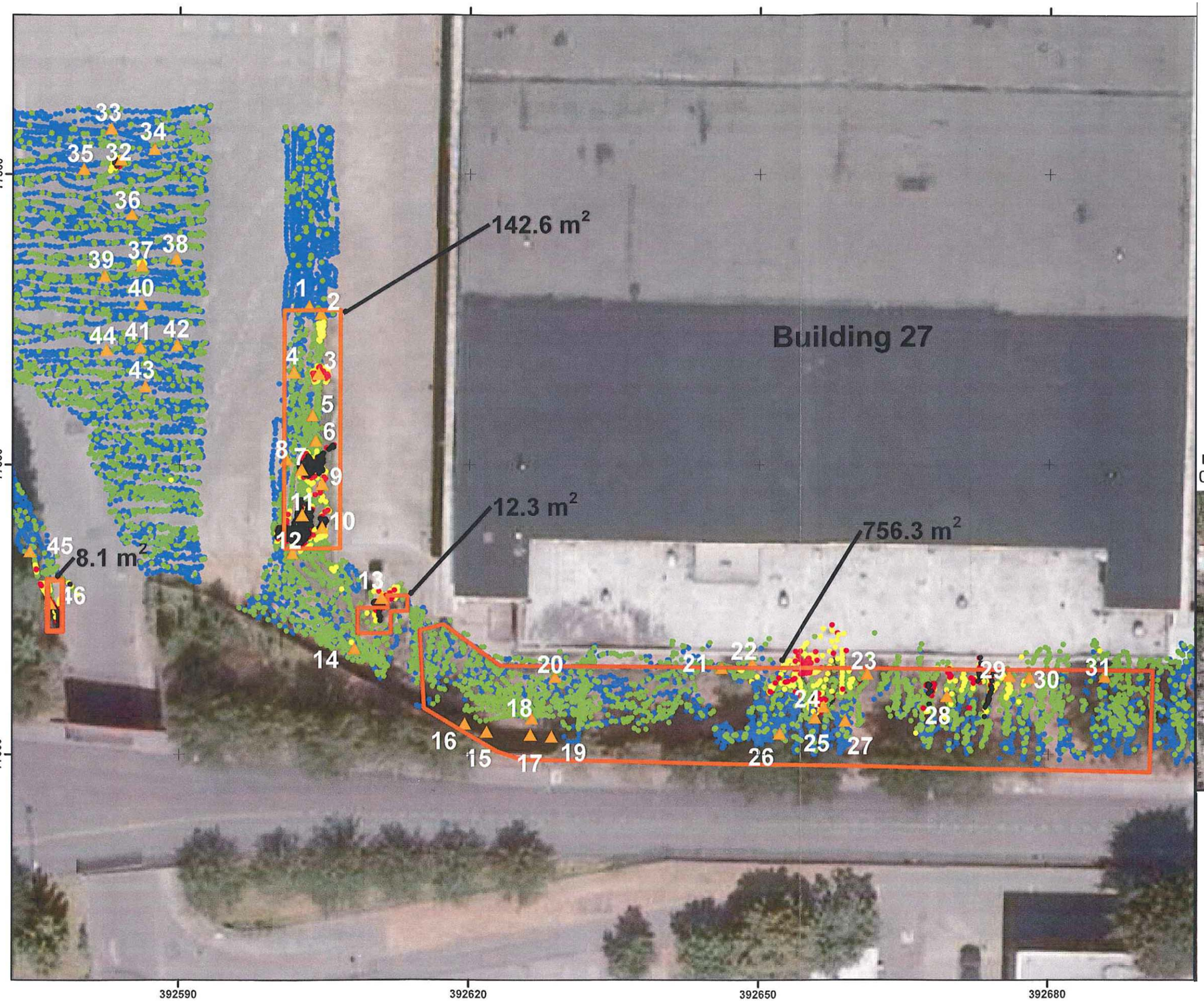
OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
BOTHELL	MPortacio 6/2011	JL 6/11	TS 9/11	BT-EECA-137165-F21



Legend

- Boring Locations

CPM

- 3586 - 5600
- 5601 - 7600
- 7601 - 9600
- 9601 - 11600
- 11601 - 187277
- Potential Soil Contamination Area

NAD 1983 WA State Plane
North FIPS 4601

Meters
0 4 8 16 24 32

Shaw E & I, Inc.
12100 NE 195th Street, Suite 150
Bothell, Washington 98011
Phone (425) 485-5000
Fax. (425) 486-9766

FIGURE 10
BUILDING 27
POTENTIAL SOIL CONTAMINATION AREA
FORMER NAVAL STATION – PUGET SOUND
7500 SANDPOINT WAY NE
SEATTLE, WASHINGTON

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LEGEND

- PLANNED SOIL REMOVAL ACTION AREAS
- PLANNED BUILDING REMOVAL ACTION AREAS
- PLANNED STORM DRAIN AND SINK DRAIN REMOVAL ACTION AREAS
- MANHOLE
- CATCH BASIN
- CONTRACTOR CONTROLLED AREA
- TRAFFIC ROUTING

90 0 90 Feet

N

SOURCE: TETRA TECH EC, INC. RADIOLOGICAL REMOVAL ACTION WORK PLAN. RADIOLOGICAL MATERIALS TIME CRITICAL REMOVAL ACTION. FIGURE 3-1

Shaw Environmental, Inc.
(A CB&I Company)

FIGURE 11

PLANNED REMOVAL ACTION AREAS

FORMER NAVAL STATION - PUGET SOUND
7500 SANDPOINT WAY NE
SEATTLE, WASHINGTON

137165-B2 conc/5/22/13

Tables

Table 1
Radiological Remedial Investigation Project Release Criteria

Radionuclide	Surfaces		Soil		Sludge	
	Equipment, Waste (dpm/100 cm^2)[a]	Structures (dpm/100 cm^2)[a]	Residential (pCi/g)[c,d]	Residual Dose (mrem/y)[b]	Residential (pCi/g)[c,d]	Residual Dose (mrem/y)[b]
Cesium-137	5,000	5,000	Not calculated	Not applicable	Not calculated	Not applicable
Radium-226	100	100	1.40	15	3.85	15
Strontium-90	1,000	1,000	3.76	15	Not calculated	Not applicable

SOURCE:

U.S. Atomic Energy Commission, 1974, Directorate of Regulatory Standards, Regulatory Guide 1.86, Termination of Operating Licenses for Nuclear Reactors, June.

Note(s):

[a] *These limits are based on U.S. Atomic Energy Commission Regulatory Guide 1.86 (1974). Limits for removable surface activity are 20 percent of these values.*

[b] *The resulting dose is based on 15 mrem/year using RESRAD-Build Version 3.3 or RESRAD Version 6.3.*

[c] *The off-site laboratory will ensure that the MDA meets the listed project release criteria by increasing the number of samples or counting time as necessary. The MDA is defined as the lowest net response level, in counts, that can be seen with a fixed level of certainty, customarily 95 percent. The MDA is calculated per sample by considering background counts, amount of sample used, and counting time.*

[d] *Release criteria for soil and sludge is the summation of the dose-based concentration guideline (15 mrem/year) and the mean background concentration. Mean background concentrations: Radium-226 soil (0.467 pCi/g), Radium-226 sludge (0.453 pCi/g), and Strontium-90 soil (0.055 pCi/g). Background was not established for Cesium-137 (soil or sludge) or Strontium-90 (sludge).*

dpm/100 cm^2 denotes disintegrations per minute per 100 square centimeters.

MDA denotes minimum detectable activity.

mrem/y denotes millirems per year.

pCi/g denotes picocuries per gram.

Table 2
Time-Critical Removal Action Project Release Criteria

Radionuclide of Concern[a]	Surfaces		Soil/Sediment		
	Building Surfaces (dpm/100 cm^2)[b]	Dose (mrem/y)	Radiological Remedial Investigation Mean Background (pCi/g)	Dose-Based Guideline (pCi/g)[c]	Release Criteria (pCi/g)[d,e]
Cesium-137	5,000	1.64	Not determined	25.63	25.63
Radium-226	100	1.71	0.467	1.07	1.54
Strontium-90	1,000	0.685	0.055	9.45	9.51

SOURCE:

U.S. Atomic Energy Commission, 1974, Directorate of Regulatory Standards, Regulatory Guide 1.86, Termination of Operating Licenses for Nuclear Reactors, June.

Note(s):

[a] *Criteria for other radionuclides will be listed in Task-specific Plans, if needed.*

[b] *These limits are based on U.S. Atomic Energy Commission Regulatory Guide 1.86 (1974). Limits for removable surface activity are 20 percent of these values.*

[c] *The resulting dose is based on 15 mrem/year using RESRAD-Build Version 3.3 or RESRAD Version 6.5.*

[d] *The off-site laboratory will ensure that the MDA meets the listed project release criteria by increasing the number of samples or counting time as necessary. The MDA is defined as the lowest net response level, in counts, that can be seen with a fixed level of certainty, customarily 95 percent. The MDA is calculated per sample by considering background counts, amount of sample used, and counting time.*

[e] *Release criteria for soil/sediment is the summation of the dose-based concentration guideline (15 mrem/year) and the Radiological Remedial Investigation mean background concentration (0.467 pCi/g for Radium-226 and 0.055 pCi/g for Strontium-90). Mean background has not been established for Cesium-137. A background investigation and establishment of site background levels will be conducted prior to implementation of the time-critical removal action.*

dpm/100 cm^2 denotes disintegrations per minute per 100 square centimeters.

MDA denotes minimum detectable activity.

mrem/y denotes millirems per year.

pCi/g denotes picocuries per gram.

Table 3
Radionuclide-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered

Constituent of Concern	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC Status
		Federal	
Radium-226 Strontium-90 Cesium-137	10 CFR 20.1402	Specify radiological criteria for decommissioning of licensed facility under the Nuclear Regulatory Commission (NRC) for unrestricted use for an average member of the critical group Total Effective Dose Equivalent (TEDE) (i.e., dose greater than or equal to 25 millirems [mrem] per year), and ensuring that the residual radioactivity has been reduced to levels that are As Low As Reasonably Achievable (ALARA).	Relevant and appropriate to actions at the site since the criteria provided specifically address cleanup standards and control of constituents of concern (COC) at the site for unrestricted land use. Since the site was not a licensed NRC facility, the requirements are not legally applicable for a remediation conducted at the site. Instead, both are considered relevant and appropriate requirements under the circumstances of the release of the hazardous substances at the site. Specifically, the medium and substances, the actions or activities, and the type of place regulated by the requirements are sufficiently similar to the circumstances at the site and the requirements are well-suited to the site.
Radium-226 Strontium-90 Cesium-137	10 CFR 20.1403	Specify radiological criteria for decommissioning of licensed facility under the NRC for restricted use utilizing institutional controls to achieve TEDE of 25 mrem per year for an average member of the critical group and 100 mrem per year if institutional controls on the site fail.	Relevant and appropriate to actions at the site since the criteria provided specifically address cleanup standards and control of COCs at the site. Institutional controls would be used to limit the radiation dose to potential receptors until the site is no longer required to do so. Since the site was not a licensed NRC facility, the requirements are not legally applicable for a remediation conducted at the site. Instead, both are considered relevant and appropriate requirements under the circumstances of the release of the hazardous substances at the site.
Radium-226 Strontium-90 Cesium-137	40 CFR 192.12(b)(1) and 40 CFR 192.41(b)	Combined exposure limits for cleanup of radon decay products in buildings designated for remedial action.	Relevant and appropriate to sites with radioactive contamination that is currently, or may potentially, result in radon that is caused by site related contamination migrating from the soil into buildings.
Radium-226 Strontium-90 Cesium-137	40 CFR 192.12(a), 40 CFR 192.32(b)(2), and 40 CFR 192.41	Concentration limits for cleanup of radium-226, radium-228, and thorium in soil at sites designated for remedial action.	Relevant and appropriate to sites with soil contaminated with radium-226, radium-228, and/or thorium.

Table 3 (continued)
Radionuclide-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered

Constituent of Concern	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC Status
		State	
Radium-226 Strontium-90 Cesium-137	WAC 246-246-020	A site is acceptable for unrestricted use if: • The residual radioactivity that is distinguishable from background radiation results in a TEDE to an average member of the critical group that does not exceed 0.25 milliSievert (25 mrem) per year, including that from groundwater sources of drinking water. • The residual radioactivity has been reduced to levels that are ALARA. Determination of the levels which are ALARA must take into account consideration of any detriments, such as deaths from transportation accidents, expected to potentially result from decontamination and waste disposal.	Relevant and appropriate to actions at the site since the criteria provided specifically address cleanup standards and control of COCs at the site for unrestricted land use. Since the site was not a licensed State of Washington facility, the requirements are not legally applicable for a remediation conducted at the site. Instead, both are considered relevant and appropriate requirements under the circumstances of the release of the hazardous substances at the site.
Radium-226 Strontium-90 Cesium-137	WAC 246-246-030	Provides the requirements for legally enforceable institutional controls that provide reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 0.25 milliSievert (25 mrem) per year.	Relevant and appropriate to actions at the site since the criteria provided specifically address cleanup standards and control of COCs at the site. Institutional controls would be used to limit the radiation dose to potential receptors. Since the site was not a licensed State of Washington facility, the requirements are not legally applicable for a remediation conducted at the site. Instead, both are considered relevant and appropriate requirements under the circumstances of the release of the hazardous substances at the site.

Table 3 (continued)
Radionuclide-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered

Constituent of Concern	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC Status
Radium-226 Strontium-90 Cesium-137	WAC 246-232-080	Radioactive material must not be transferred except as provided in this section.	Relevant and appropriate for transfer of radiologically contaminated materials from Tetra Tech, EC Inc (TtEC) to the government and Navy contractor for low-level radioactive waste shipment. TtEC has an NRC radioactive material license, and has filed for reciprocity to conduct radiological work within the state of Washington. Radiological work on the project will follow requirements of the Radiation Protection Plan in accordance with the TtEC NRC radioactive material license.
Radium-226 Strontium-90 Cesium-137	WAC 246-246-220	Requirements for use of all ionizing radiation, radiation machines, and radioactive materials to ensure maximum protection of the public health and the maximum safety to all persons at, or in the vicinity of, the place of use, storage, or disposal thereof.	Applicable to all persons who receive, possess, use, transfer, own or acquire any source of radiation,
Radium-226 Strontium-90 Cesium-137	WAC 246-246-221	Establishes standards for protection against radiation hazards.	Relevant and appropriate to actions at the site.
Radium-226 Strontium-90 Cesium-137	WAC 246-246-222	Requirements for notices, instructions, and reports by licensees or registrants to individuals engaged in work under a license or registration.	Applicable to all persons who receive, possess, use, transfer, own or acquire any source of radiation licensed by or registered with the department,
Radium-226 Strontium-90 Cesium-137	WAC 246-246-232	Prescribes rules governing licensing of radioactive materials.	Relevant and appropriate to actions at the site.
Radium-226 Strontium-90 Cesium-137	WAC 246-246-235	Prescribes requirements for issuance of a license.	Relevant and appropriate to actions at the site.

Table 3 (continued)
Radionuclide-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered

Constituent of Concern	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC Status
Radium-226 Strontium-90 Cesium-137	WAC 246-246-247	Establishes application requirements and procedures for the issuance of a radioactive air emissions license and for the regulation of those emissions.	Relevant and appropriate to actions at the site.
Radium-226 Strontium-90 Cesium-137	WAC 246-246-247	Establishes requirements for packaging, preparation for shipment, and transportation of radioactive material.	Relevant and appropriate to actions at the site.
Radium-226 Strontium-90 Cesium-137	WAC 246-246-247	Rules governing generators and brokers of low-level radioactive waste (LLRW) seeking to dispose waste at any commercial disposal facility in the state of Washington.	Relevant and appropriate to actions at the site.

Note(s):

ARAR denotes applicable or relevant and appropriate requirement.

CFR denotes Code of Federal Regulations.

TBC denotes to be considered.

WAC denotes Washington Administrative Code.

Table 4
Location-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered

Location	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC Status
		Federal	
Floodplain	Executive Order No. 11988, Floodplain Management 40 CFR § 6.302(b) and 40 CFR 6, Appendix A, § 6(a)(1), (3), and (5) (at the end of § 6.1007)	Evaluate potential effects of actions in a floodplain to avoid, to the extent possible, adverse effects associated with direct and indirect development of a floodplain. Action that will occur in a floodplain (i.e., lowlands) and relatively flat areas adjoining inland and coastal waters and other flood-prone areas.	Relevant and appropriate because actions will occur in areas near shorelines of Lake Washington, a relatively flat, potentially flood-prone area. Although no development will occur with this removal action, some demolition and renovation of existing structures and earthwork will occur. Substantive compliance will be achieved through avoiding, to the extent practical, long and short-term adverse impacts to floodplain areas by: preservation of natural and existing environment to the extent possible; preservation and protection of existing wetlands if present; restoration of disturbed areas where appropriate following action; and implementing best management practices to control stormwater runoff to adjacent areas and surface waters.
Coastal Zone	Coastal Zone Management Act (16 USC §§ 1451–1464) 16 USC § 1456(c) 15 CFR § 930	Conduct activities in a manner consistent with approved state management programs. Proposed actions must be consistent with state coastal zone management as governed by the Washington State Shoreline Management Act, including the King County's Shoreline Master Program.	Relevant and appropriate because King County shares coastlines with salt water and manages coastlines in accordance with the Coastal Zone Management Act. The requirements of this statute are applicable to construction or development activities along major lakes, such as Lake Washington, which are considered part of the coastal zone.

Table 4 (continued)
Location-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered

Location	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC Status
National Historic Preservation Act	16 USC § 470; 36 CFR 800 40 CFR 6.301(b)	Requires federal agencies to take into account the effect of any federally assisted undertaking or licensing on any property with historic, architectural, archeological, or cultural value that is included in or eligible for inclusion in the National Register of Historic Places. Section 106 consultation with Department of Archaeology and Historic Preservation (DAHP) and local Historic District boards (where appropriate) will ensure substantive compliance conditions are identified which are protective of historic resources during these undertakings.	Applicable because Buildings 2 (Assembly & Repair Shop) and 27 are listed as contributing buildings in the Sand Point Historic District (1998) and the Naval Air Station (NAS) Seattle National Register of Historic Places District (2010). The Navy consulted with the State Historic Preservation Officer with the DAHP. Plans for demolition and renovation of these buildings were determined by the DAHP to have no adverse effect. All work, including renovation and demolition must meet the requirements specified in the consultation memorandum for preservation of historic features of these buildings during demolition or renovation.
Archaeological Resources Protection Act	16 USC § 470	Specifies actions that must be taken to preserve archaeological resources. Section 106 consultation with Department of Archaeology and Historic Preservation (DAHP) and tribes (where appropriate) will ensure substantive compliance conditions are identified which are protective of archaeological resources during these undertakings.	Applicable should suspect archaeological resources be uncovered during the work. The Navy consulted with the DAHP. Substantive compliance with this Act will be met by meeting the requirements specified in the DAHP consultation memorandum to halt work and notify DAHP and tribes if any archaeological resources are uncovered during construction.
Historic Site, Buildings, Objects, and Antiquities Act	16 USC § 461-467	Requires preservation of historic sites, buildings, and objects of national significance.	Applicable because Buildings 2 (Assembly & Repair Shop) and 27 are listed as contributing buildings in the Sand Point Historic District (1998) and the Naval Air Station (NAS) Seattle National Register of Historic Places District (2010). The Navy consulted with the State Historic Preservation Officer with the DAHP. Plans for demolition and renovation of these buildings were determined by the DAHP to

Table 4 (continued)
Location-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered

Location	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC Status
			have no adverse effect. All work, including renovation and demolition must meet the requirements specified in the consultation memorandum for preservation of historic features of these buildings during demolition or renovation.
		State	
Coastal Zone Shoreline	Washington State Shoreline Management Act WAC 173-27-060 90.58 RCW	Requires that federal agency activities in or affecting Washington's coastal zone shall be consistent to the maximum extent practicable with the enforceable policies of the most recent federally approved Washington State coastal zone management program pursuant to the Federal Coastal Zone Management Act. Local agencies (City of Seattle Shoreline Master Program) are designated to review activities for consistency.	Applicable if any activities occur within 200 feet of Lake Washington and have the potential to impact surface water activities.
Endangered Species	16 USC 1531 et seq. 50 CFR Parts 17, 225, 402).	The Endangered Species Act protects fish, wildlife, and plants that are threatened or endangered (T/E) with extinction. T/E species that occur or may occur within the adjacent Lake Washington Watershed include Puget Sound Chinook salmon, bull trout, and steelhead.	Relevant and appropriate. Project activities should not be affecting a T/E-listed species or habitat and no in-water activities are planned, though projects must identify presence of T/E-listed species and determine potential effect. Conduct activities that do not harm or result in a take of these species.

Table 4 (continued)
Location-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered

Location	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC Status
Archaeological and Cultural Resources	Executive Order 05-05 RCW 27.53	Requires state agencies with capital improvement projects to integrate the Department of Archaeology and Historic Preservation (DAHP), the Governor's Office of Indian Affairs, and concerned tribes into their capital project planning process. If there is federal involvement in the project: federal funding, permit, or license. If there is federal funding or permitting, then the Section 106 consultation process of the National Historic Preservation Act applies.	Applicable This statute protects archaeological and cultural sites on both public and private lands in Washington State from unauthorized excavation or disturbance. The Navy consulted with the DAHP. Substantive compliance with this Act will be met by meeting the requirements specified in the DAHP consultation memorandum to halt work and notify DAHP and tribes if any archaeological resources are uncovered during construction. Consultation will also be required with the Seattle Landmarks Preservation Board to address reconstruction of Building 27 south hangar wall.

Note(s):

ARAR denotes applicable or relevant and appropriate requirement.

CFR denotes Code of Federal Regulations.

RCW denotes Revised Code of Washington.

TBC denotes to be considered.

USC denotes United States Code.

WAC denotes Washington Administrative Code

Table 5
Action-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered

Action	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC Status
General Remediation Including Excavation and Demolition	RCW 90.48. Construction and industrial storm water general	Construction site operators are required to be covered by a Construction Stormwater General Permit if they are engaged in clearing, grading, and excavating activities that disturb one or more acres and discharge stormwater to surface waters of the state. Smaller sites may also require coverage if they are part of a larger common plan of development that will ultimately disturb one acre or more. Operators of regulated construction sites are required to: Develop stormwater pollution prevention plans, implement sediment, erosion, and pollution prevention control measures, and obtain coverage under this permit.	Applicable for site activities involving excavation, grading, or other soil disturbance activities exceeding 1 acre. Should the project activities result in disturbance of 1 or more acres of land, a SWPPP will be developed to meet the substantive compliance requirements of the Construction Stormwater General Permit which includes implementation and maintenance of appropriate best management practices (BMP) to control erosion, control pollution, and control runoff during construction until the site is stabilized. Even if the one acre threshold is not met for this ARAR, appropriate BMPs will still be evaluated and implemented during fieldwork to control runoff, erosion, and keep pollutants out of stormwater.

Table 5 (continued)
Action-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered

Action	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC Status
Discharge of Aqueous Waste to Surface Water	Clean Water Act Effluent Guidelines 40 CFR 122 and 125 State Discharge Permit Program; National Pollutant Discharge Elimination System (NPDES) Program (WAC 173-216, -220)	Provides requirements for point source discharges of pollutants to surface water. No pollutants shall be discharged to any surface water of the state from a point source, except as authorized by an individual permit issued pursuant to chapters 216 or 220, or as authorized by a general permit issued pursuant to chapter 173-226 WAC.	Relevant and appropriate to discharges of pollutants that will or may enter a surface water body from activities such as building demolition, excavation and clearing activities, or treated wash water to surface water if point-source discharged. Onsite discharges must comply with substantive requirements of the individual or general NPDES permit. If the discharge is considered an "offsite" discharge, dischargers must comply with both the substantive and administrative requirements of the permit. Management of nonpoint-source construction stormwater will be addressed through substantive compliance with the Construction Stormwater General Permit if land disturbance exceeds one acre, including implementation of BMPs for erosion control, runoff control, and pollution prevention. Actual NPDES program requirements will be reviewed as part of project final design.
Air Emissions	Clean Air Act National Ambient Air Quality Standards Particulates 40 CFR 50 40 CFR 52, Subpart WW	40 CFR 50 establishes maximum concentrations for particulate matter and fugitive dust emissions. 40 CFR 52, Subpart WW outlines the implementation, maintenance and enforcement of National Ambient Air Quality Standards in the State of Washington.	Applicable for on-site activities that generate particulate matter and fugitive dust emissions from land disturbing activities, vehicle traffic, or during activities such as demolition. Standards have been deferred to the state. See State Air Quality Regulations.
	40 CFR 61 Subpart H and I	National Emission Standards for Hazardous Air Pollutants under the Clean Air Act, that apply to radionuclides.	Relevant and appropriate at sites with cleanup of radioactive contamination.

Table 5 (continued)
Action-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered

Action	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC Status
	WAC 173-480-040 Ambient standard WAC 173-480-070 Emission monitoring and compliance procedures	Emissions of radionuclides to the ambient air shall not cause a maximum effective dose equivalent of more than 10 mrem per year to the whole body to any member of the public.	Relevant and appropriate to potential emissions from work under the removal action. Substantive compliance will be achieved through implementation of DOH-approved procedures and methods set forth in WAC 246-247; calculating the dose to members of the public at the point of maximum annual air concentration in an unrestricted area where any member of the public may be.
	WAC 246-247-040 WAC 246-221-070	These regulations require all new construction and significant modifications of emissions units to utilize best available radionuclide control technology (BARCT) and require all existing emission units and nonsignificant modifications to utilize As Low As Reasonable Achievable Control Technology (ALARACT) in controlling emissions to the environment.	Applicable because fugitive, diffuse, and point source emissions of radionuclides to the ambient air may result from activities, such as demolition. Substantive compliance will be achieved through implementation of BARCT and ALARACT and meeting the limitations on radioactive air emissions contained in WAC 246-247-040

Table 5 (continued)
Action-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered

Action	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC Status
	40 CFR 61.145(Subpart M) National Emission Standard for Asbestos Regulation III, Article 4: Asbestos Control Standards (Puget Sound Clean Air Agency)	Emission standards for demolition and renovation. To determine which requirements of paragraphs (a), (b), and (c) of this section apply to the owner or operator of a demolition or renovation activity and prior to the commencement of the demolition or renovation, thoroughly inspect the affected facility or part of the facility where the demolition or renovation operation will occur for the presence of asbestos, including Category I and Category II nonfriable ACM. Specifically Section 145 indicates that some or all of the standards - b) notification requirements and c) - procedures for asbestos emission control apply based on whether at least 260 linear feet of pipes or at least 160 square feet of other components or at least 35 cubic feet of facility components where the length of area could not be measured previously or not.	Relevant and appropriate if asbestos containing materials are present and will be removed to some degree during demolition and renovation. The substantive requirements of this ARAR will be met by evaluating the existing building asbestos survey information; and if required, conducting additional evaluation of suspect ACM should it be encountered as well as following the emission control requirements in part c of this section by following requirements of the Puget Sound Clean Air Agency, the delegated state asbestos NESHAP authority. Asbestos handling will be by qualified and appropriately licensed personnel only.
	Chapter 70.94 RCW WAC 173-400 and 173-470 General standards for maximum emissions	Ambient air quality standards for total suspended particulates and fine particulates. The term “fugitive emissions” refers to unintended emissions made airborne by forces of wind, man's activity, or both. Mandates that reasonable precautions be taken to prevent particulate matter from becoming airborne and must maintain and operate the source to minimize emissions. Puget Sound Clean Air Agency (PSCAA) Regulation I, Section 9.15 contains precautions to minimize visible fugitive dust emissions.	These regulations may be applicable in connection with activities that demolish existing structures; remove/transport/ convey debris and/or excavated materials; disturb the soil during excavation; disturb soil or other exposed surfaces during construction of haul roads, etc.

Table 5 (continued)
Action-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered

Action	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC Status
Generation of Hazardous Wastes and Testing of Solid Waste	RCRA methods for identification and evaluation of solid and hazardous wastes 40 CFR 261, Subparts A, B, C and D- 40 CFR 262.11	Specific requirements for what a solid waste is and identifying when a solid waste is regulated as a hazardous waste. Establishes analytical requirements for testing solid waste to determine if regulated as hazardous waste. Determination may be by generator knowledge and/or testing of a representative sample of the waste. Listed of hazardous waste is not based on sampling data.	Applicable because solid wastes will be generated during this project, including demolition debris, concrete, asphalt, soil, sludge, piping, etc. All solid wastes must be evaluated at the point of generation to determine if they are hazardous waste. Based on the scope and site information, no listed hazardous waste is anticipated and hazardous waste quantities (characteristic wastes) if any are generated, are believed to be minimal. All waste must be properly characterized prior to disposal. Also see Washington State Dangerous Waste Regulations.
Generation of Hazardous Wastes	Washington Administrative Code (WAC) 173-340 WAC 173-340-515 Model Toxics Control Act (MTCA) chapter 70.105D RCW	Promugated under the Model Toxics Control Act (MTCA) to establish administrative processes and standards to identify, investigate, and cleanup facilities where hazardous substances have come to be located. MTCA defines a two-step process for establishing cleanup requirements for individual sites. This chapter implements chapter 70.105D RCW, which provides a workable process to accomplish effective and expeditious cleanups in a manner that protects human health and the environment. It is intended to address releases of hazardous substances caused by past activities. An independent cleanup action for a release of nonradiological hazardous constituents.	Applicable because solid wastes will be generated during this project, including demolition debris, concrete, asphalt, soil, sludge, piping, etc. All solid wastes must be evaluated at the point of generation to determine if they are dangerous or hazardous waste. Based on the scope and site information, no listed dangerous or hazardous waste is anticipated and waste quantities (characteristic wastes) if any are generated, are believed to be minimal. All waste must be properly characterized prior to disposal at an appropriate disposal facility.

Table 5 (continued)
Action-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered

Action	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC Status
Disposal Off Site	RCRA Land Disposal Restrictions 40 CFR 268, Subparts A, B, C, D, and E "Land Disposal Restrictions," WAC 173-303-140(4)	Establishes restrictions on land disposal of untreated hazardous wastes and provides treatment standards for hazardous wastes that are to be land disposed. These treatment standards are to a great extent concentration-based. However, certain wastes are required to be treated by a specified technology prior to land disposal.	Relevant and appropriate if hazardous waste is disposed of on site or transported off-site to be land disposed requires compliance with administrative and substantive requirements. Hazardous waste generation is not anticipated during the TCRA.
Disposal Off Site	Dangerous Waste Regulations WAC 173-303	This regulation applies for the evaluation of a solid waste to determine if such waste is or is not a dangerous or mixed waste (radiological and RCRA hazardous). These state rules regulate the generation, handling, storage, and disposal of dangerous waste and include the RCRA definitions of hazardous waste within. Washington also has a category of dangerous waste called "State-Only Dangerous Waste," which does not meet the definition of a RCRA hazardous waste. Guidance document for sampling building debris with lead-based paint: http://www.ecy.wa.gov/programs/hwtr /demodebris/pages2/sampleplans.html.	Applicable because solid wastes will be generated during this project, including demolition debris, concrete, asphalt, soil, sludge, piping, etc. All solid wastes must be evaluated at the point of generation to determine if they are dangerous waste. Substantive requirements of these regulations are applicable to solid waste managed during the removal action. Specifically, solid waste generated for removal from the site during this removal action would be subject to the dangerous waste designation procedures to ensure proper management. For example, disposal of lead-base paint is not specifically regulated but results of a representative sample of waste containing lead-based paint will determine if it is a dangerous waste. Where waste disposal will take place in a permitted solid waste landfill that is outside the site boundaries, both substantive and administrative requirements of applicable regulations must be met.

Table 5 (continued)
Action-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered

Action	Law/Regulation	Requirement of Law/Regulation	ARAR/TBC Status
	Washington Solid Waste Management Act (RCW 70.95) Solid Waste Handling Standards (WAC 173-350) RCRA Subtitle D 42 USC 6941-6949; 40 CFR Parts 275, 258	These regulations are applicable to the disposal of nonhazardous waste generated during remedial activities. These standards set minimum functional performance standards for the proper handling and disposal of solid waste, identifies functions necessary to assure effective solid waste handling programs at both the state and local level, and follows priorities for the management of solid waste.	Applicable for disposal of solid waste characterized as nonhazardous. Because the disposal of soil and debris will take place in a permitted solid waste landfill that is outside the site boundaries, both substantive and administrative requirements of applicable regulations must be met for this activity.
	49 United States Code 5101–5127 49 Code of Federal Regulations [CFR] Parts 171–173, 177 WAC 446-50, Chapter 46.48 RCW WAC 246-231	These regulations are applicable to the movement of hazardous materials on public highways. The Washington State Patrol adopted by reference the federal Hazardous Materials Transportation Act regulations governing transportation of hazardous materials on public highways. WAC 24-231 applies to the packaging, preparation for shipment, and transportation of radioactive material, which will be performed by the government-designated waste contractor.	Relevant and appropriate if waste generated is hazardous and must be transported to a treatment or disposal facility, the following regulations are applicable: • 49 CFR Part 171, describing general requirements and hazardous waste shipments • 49 CFR Part 172, providing a table of hazardous materials and prescribing labeling and placarding • 49 CFR Part 173, providing general requirements for shipping and packaging by shippers 49 CFR Part 177, regulating hazardous material shipment by highways
	40 CFR 61.150	Contains regulations for the disposal handling and disposal of regulated asbestos wastes during demolition or renovation. Requires no visible emissions during collection, processing, packaging and transport of any asbestos containing waste material and use of adequately wet methods. Wrapping, marking, labeling, transport, and disposal, including recordkeeping, are specified.	Relevant and appropriate if asbestos-containing materials will be removed and disposed of. Asbestos containing material includes Category 1 or Category 2 nonfriable asbestos containing materials (>1 percent non friable). Offsite activities will comply with administrative and substantive requirements.

Table 5 (continued)
Action-Specific Applicable or Relevant and Appropriate Requirements and To Be Considered

Note(s):

ARAR denotes applicable or relevant and appropriate requirement.

CFR denotes Code of Federal Regulations.

RCRA denotes Resource Conservation and Recovery Act.

RCW denotes Revised Code of Washington.

TBC denotes to be considered.

WAC denotes Washington Administrative Code.

Appendix A
Navy Assessment of Derived Concentration Guideline Limits for Radium-226, Strontium-90, and Cesium-137 Contamination at Former Naval Station Puget Sound at Sand Point

NAVY ASSESSMENT OF DERIVED CONCENTRATION GUIDELINE LIMITS FOR RADIUM-226, STRONTIUM-90, AND CESIUM-137 CONTAMINATION AT FORMER NAVAL STATION PUGET SOUND AT SAND POINT

Introduction

Former Naval Station Puget Sound at Sand Point (NAVSTA PS) was previously used by the Navy as Naval Air Station, Seattle, WA (NAS Seattle) from 1925 to 1970. During this time, aircraft maintenance was performed in Buildings 2 and 27. As part of the aircraft maintenance operations, the Navy refurbished radioluminescent aircraft instruments and gauges using paint containing Radium-226 (Ra-226). Aviation instrument shops were located in the South Shed of Building 27 and on the second floor of Building 2. Military and commercial handling of radioluminescent paint and devices was not strictly controlled until the 1970s. Consequently, Ra-226 contamination has been found in building materials, sinks, piping, storm drain catch basins, and outdoor land areas.

The Navy intends to start cleanup activities in the summer at NAVSTA PS in the summer of 2013. As part of this process, Derived Concentration Guideline Limits (DCGLs) must be established. DCGLs are basically the cleanup levels that will be used based on the risk or dose to the public from residual contamination after cleanup. These radionuclide-specific values are derived through assessment of activity/dose relationships for an exposure pathway scenario. To perform the assessment, the Navy used the Residual Radioactivity (RESRAD) model and computer code (RESRAD 6.5) for soil and sediment and RESRAD BUILD for buildings. Several exposure pathway scenarios were evaluated. These scenarios included industrial worker and recreationist.

Regulatory Requirements

DCGLs for radiological contamination can be established by assessing dose or risk, depending on the regulatory agency. Like the Nuclear Regulatory Commission (NRC), the Washington State Department of Health (DOH) uses a 25 millirem per year (mrem/y) limit with “as low as reasonably achievable” (ALARA) considerations. Both the Environmental Protection Agency (EPA) and the State of Washington Department of Ecology (DOE) use risk based standards. The EPA has promulgated guidance that 15 mrem/y dose may be acceptable to establish release criteria to ensure public safety. Dose can be assessed by using the RESRAD or RESRAD BUILD models. DOE is the lead regulatory agency for the radiological cleanup at NAVSTA PS.

Exposure Scenario

To perform the assessment for soil and sediment, RESRAD identifies four exposure scenarios: Resident Farmer, Suburban Resident, Industrial Worker, and Recreationist. The contaminated areas are part of Warren G. Magnuson Park which is operated by the City of Seattle and manned by Parks and Recreation employees and used by the general public. Per the deeds of conveyance, the property has multiple land use restrictions and shall be used and maintained for public park and recreation purposes in perpetuity.

Background Assessment

To conduct the remediation and final status survey, the contractor will perform a background investigation and establish a site background levels for Ra-226, Sr-90, Cs-137. The need for remediation will be evaluated by comparing the survey results to the established DCGLs above the determined site background levels.

RESRAD Modeling Parameter Selection

For assessment for soil and sediment, RESRAD identifies four exposure scenarios: Resident Farmer, Suburban Resident, Industrial Worker, and Recreationist. The City of Seattle is currently operating the contaminated sites as part of Warren G. Magnuson Park, which is available to the public for sports, recreation, and leisure. Future residential use is not authorized under the existing land deed restrictions. The Navy selected Industrial Worker and Recreationist as the appropriate exposure scenarios for the current and future land use. As the land is deeded for recreational use, the Recreationist exposure scenario is appropriate for individuals visiting the site for leisure and recreation activities. However, as the land use does include buildings and grounds that require some degree of maintenance and staffing, an Industrial Worker exposure scenario is appropriate for modeling individuals who perform work onsite full time.

While the Navy does not usually leave the radon pathway on when assessing outdoor areas, to consider all possible scenarios, assessments were made with the radon pathway on and off. Additionally, Lead-210 (Pb-210), a daughter product of Ra-226, in secular equilibrium with Ra-226, was included as the most conservative case. RESRAD modeling was conducted using the recommended exposure pathways from the RESRAD Users Manual Table 2.2 and key parameters from Table 2.3 with some exceptions.

The RESRAD code default parameter defines a 10,000 square meter contaminated soil mass that is 2 meters thick and has no material cover (clean soil). This was changed to 1,000 square meters and a one meter depth to match the contamination scenarios found at the former NAVSTA PS during the remedial investigation previously conducted on-site.

The number of hours in proximity to the soil/sediment must be considered for the assessments. The Recreationist scenario default of 50 hours in a given year was revised to 520 hours to be more representative of the recreational facility's use, reflecting an average of 10 hours per week performing recreational activities. The indoor and outdoor fractions were adjusted for the Industrial Worker scenario from 75% indoors and 25% outdoors during a typical work year of approximately 2000 hours to distribute the worker's time to 50% indoors and 50% outdoors (occupancy factors of 0.115 respectively). As the recreational site incorporates outdoor (e.g., grounds maintenance) with indoor (e.g., material storage) activities, the equivalence of occupancy factors is more appropriate than modeling incorporating the majority of the worker's time spent indoors.

RESRAD BUILD does not provide various scenarios to be used for modeling although the time in the building can be specified.

RESRAD Modeling Results

Soil

Scenario	15 mrem/y Ra-226+D w/ Rn	15 mrem/y Ra-226+D w/o Rn	25 mrem/y Ra-226+D w/ Rn	25 mrem/y Ra-226+D w/o Rn	15 mrem/y Cs-137+D	25 mrem/y Cs-137+D	15 mrem/y [a] Sr-90+D	25 mrem/y [a] Sr-90+D
	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g
Recreationist	11.4	11.4	19.0	19.0	31.4	52.3	9.45	15.75
Industrial Worker	1.07	7.39	1.79	12.31	25.63	42.7	2720.67	4534.4

Note: [a] The large difference between the DCGL modeling results for the Recreationist and Industrial Worker scenarios is attributed to the fact that 99.9% of the dose in the Recreationist scenario is attributed to the meat ingestion exposure pathway, which is not an applicable exposure pathway for the Industrial Worker.

Building Surfaces

Radionuclide	Criteria (dpm/100cm^2)*	Dose (mrem/yr)
Ra-226+D	100	1.71
Sr-90+D	1000	0.685
Cs-137+D	5000	1.64

*Criteria from AEC Regulatory Guide 1.86

Conclusions

After reviewing the assessments and taking into account the concerns of the regulatory agencies, the Navy has concluded the 15 mrem/yr annual dose best fits the site work. Using this limit, the RESRAD Industrial Worker scenario for soil/sediment with the radon pathway turned on and an occupancy factor of 0.115 indoor and 0.115 outdoor, or the Recreationist scenario with an outdoor occupancy factor of 0.59, whichever value was more restrictive, was selected. As shown above, this results in a Ra-226 DCGL of 1.07 pCi/g above background. The Cs-137 and Sr-90 DCGLs are 25.63 pCi/g and 9.45 pCi/g, respectively. For the buildings, the Navy recommends using release limits of AEC Regulatory Guide 1.86 which is also less than 15 mrem/y. It should be noted that the Navy will conduct dose modeling based on the final status survey samples after remediation has been completed and provide the finalized dose results in the Final Status Survey Report. By doing this, the actual dose will be lower than those listed above.