Feasibility Study for Treating PCB-Impacted Soil
Aniak Middle School
Aniak, Alaska

January 2004

Submitted To:
Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage, Alaska 99501

By:
Shannon & Wilson, Inc.
5430 Fairbanks Street, Suite 3
Anchorage, Alaska 99518
Phone: 907-561-2120
FAX: 907-561-4483

32-1-16754

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ANIAK MIDDLE SCHOOL
ANIAK, ALASKA

1.0 INTRODUCTION

This report presents the results of our feasibility study for treating polychlorinated biphenyl (PCB) impacted soil at the Aniak Middle School, Aniak, Alaska. The purpose of the feasibility study was to evaluate different alternatives such that the most suitable method for treating PCB-impacted soil for this project can be implemented during the summer of 2004. Authorization for this work was received from the Alaska Department of Environmental Conservation (ADEC) on September 8, 2003, Notice to Proceed (NTP) number 1870002119A. On November 5, 2003 the DEC issued Amendment Number 1 to modify our scope of work for this project to include the demolition and reconstruction of the Wood Shop at the Middle School. Following demolition and prior to reconstruction, the PCB-impacted concrete floor slab of the Wood Shop and underlying soil would be excavated and treated with the selected alternative.

2.0 SITE AND PROJECT DESCRIPTION

2.1 Site Description

Aniak is located approximately 300 miles west of Anchorage and is located within the Kuskokwim River flood plain. Aniak is bordered on the north by the Kuskokwim River and on the south by the Aniak Slough. The Aniak Middle School is located approximately 600 feet southwest of the northwest portion of the Aniak runway and approximately 2,000 feet south of the Kuskokwim River. The site is located in Section 12, Township 17 North, Range 57 West, Seward Meridian, United States Geological Society (USGS) Russian Mission (C-2) quadrangle. A vicinity map with pertinent area features is provided as Figure 1. The property is relatively flat and the surrounding area slopes generally southwest towards the Aniak Slough. The site is situated on a gravel pad overlaying the native alluvial deposits. The Alaska Department of Transportation and Public Facilities (ADOT&PF) currently owns the property and leases the site to the Kuskokwim School District (KSD) and ALASCOM, INC.

The Aniak Middle School was formerly used as a White Alice Communication (WAC) site until approximately 1978. Previous investigations identified soil contaminated with PCBs located on the south and east portions of the Middle School. Two main areas of PCB-impacted soil, designated Areas F and G, were identified south of the school and were capped with a geotextile liner and gravel fill material. In addition, PCB-impacted soil was encountered in

isolated areas around a shop building northwest of the school. A site plan illustrating pertinent site features is presented on Figure 2.

2.2 Project Description

The purpose of this feasibility study was to evaluate viable alternatives for treating PCB impacted soil. Seven different treatment alternatives were evaluated for this effort which includes: excavation and disposal; excavation, screening and disposal; excavation and solvent extraction; limited excavation with disposal and capping; excavation and on-site indirect thermal desorption; in-situ thermal desorption; and excavation and encapsulation in concrete. To support the feasibility study, Shannon & Wilson evaluated the quantity of soil with PCB concentrations greater than 1 part per million (ppm) remaining in the areas of concern at the Aniak Middle School. Subsequent to receiving authorization to perform the feasibility study, the project work scope was amended to include the demolition and reconstruction of the Wood Shop for the purpose of removing the PCB-impacted concrete slab and potentially impacted soil beneath the Wood Shop floor. The costs associated with reconstruction of the Aniak Middle School Wood Shop were estimated by Mr. Ronn Rasmussen of Alaska Construction Management, under subcontract to Shannon & Wilson.

3.0 BACKGROUND

Background information pertaining to the areas of PCB-impacted soil at the site were obtained from: the September 1997 *Final Site Inspection* (SI) *Report, White Alice Communication (WAC) Site*, Aniak, Alaska, prepared by Ecology and Environment, Inc. (E&E); the April 1998 *Site Assessment Report, Middle and High Schools*, Aniak, Alaska, by Shannon & Wilson; the August 1999 letter entitled *Additional Polychlorinated Biphenyl Assessment at Middle School*, Aniak, Alaska, prepared by Shannon & Wilson; and the December 2001 *PCB Cleanup Report*, also prepared by Shannon & Wilson. For this feasibility study, Shannon & Wilson personnel spoke with an architect from Kumin & Associates who was involved in the remodeling of the WAC to its present day configuration. Shannon & Wilson was also provided the original design drawings prepared by Wran-Kumin Inc. for the Kuspuk School District Vocational Center, dated March 9, 1981. A summary of the history and previous work performed at the site, based on our review of the above-mentioned documents, is included in the following paragraphs.

The Aniak WAC was constructed in approximately 1956 and was operated by the United States Air Force (USAF) until approximately 1978. Between September 1979 and November 1980, the KSD contracted two construction companies to remove the electrical and engine generator equipment from the former WAC building. Multiple spills of PCB-containing

transformer oil mixed with antifreeze allegedly occurred during this work. According to Ms. Sandy Jones of Kumin & Associates, the oil in the transformers was spilled out of the equipment to make the transformers light enough to transport by hand outside of the WAC building. The transformer oil was swept off the concrete slab and out the door of the portion of the Middle School currently occupied by the Wood Shop.

A SI performed in 1997 documented concentrations of PCBs that exceed the Toxic Substances Control Act (TSCA) cleanup levels in surface and subsurface soil up to 3 feet below the ground surface (bgs) outside the Middle School building. As a result of these findings, in November 1997, a geotextile liner was placed over this area and approximately 6-inches of clean sand and gravel were placed on top of the liner.

In June 1998, sixteen hand borings were drilled to depths between 2.5 and 8 feet bgs around the southern portion of the Middle School to assess the extent of PCB-impacted soil in these areas. Twenty-five soil samples from these borings, and an additional 35 surface soil samples, were collected for PCB analyses. Based on the analytical results of this assessment, the volume of soil impacted with more than 10 ppm PCBs in these areas was estimated to be between 380 and 460 in-place cubic yards (440 to 530 excavated cubic yards). Additional isolated locations that contained PCB concentrations between 1 and 10 ppm were also identified outside of Areas F and G.

In July and August, 2001, Shannon & Wilson, Inc. conducted limited PCB cleanup activities at the site. A total of 631 supersacks, corresponding to about 872 tons of PCB-impacted material, and one drum of decontamination water, were transported and disposed of at a Treatment, Storage, and Disposal (TSD) facility in Arlington, Oregon. PCB-impacted soil was removed from an area of previously identified PCB impact that was covered with a temporary cover, six previously identified outlying areas, and from an area of PCB impact identified during the August 2001 work effort. Confirmation samples collected from these excavated areas, with the exception of beneath the proposed staging area identified in August 2001, indicate that the soil remaining contains PCB concentrations less than one ppm. PCB-contaminated soil remains beneath the proposed staging area and Areas F and G. The remaining PCB-impacted soil in these areas is currently covered with a temporary cover constructed of a geotextile liner and a gravel cap.

In the course of researching the renovation plans of the Aniak Middle School, it was discovered that a second door on the south side of the Wood Shop was present, prior to renovation. This area is currently under the computer room in a crawl space. Although this area has not been characterized, it is possible that PCB-impacted soil is present. The approximate location of the former door is shown on Figure 2.

4.0 TREATMENT ALTERNATIVES CONSIDERED

Seven treatment alternatives or options were evaluated for this feasibility study, including: excavation and disposal; excavation, screening and disposal; excavation and solvent extraction; limited excavation with disposal and capping; excavation and on-site indirect thermal desorption; in-situ thermal desorption; and excavation and encapsulation in concrete. For each of these options, the costs for excavation, treatment, environmental consulting, and sample analysis are included. The paragraphs below describe each of the seven treatment alternatives following a discussion of the assumed conditions for treatment.

4.1 Assumptions

Our assumptions made for each of the different treatment options tend to be on the conservative side resulting in a higher estimation of price than would be obtained from a competitive bid process. First, to obtain costs for the different treatment options, an estimate of the amount of impacted soil was needed. An in house mapping program, "Surfer 6.0", was utilized to calculate the approximate volume of impacted soil. Inputs for this program included previous PCB concentrations and depth data collected from the site and an assumed 5 ppm concentration decrease per vertical foot. Based on this data and assumptions, we estimated that approximately 2,000 cubic yards of soil with greater than 1 ppm PCBs are present at the site. Secondly, we assumed that 1 cubic yard of soil weighs 1.5 tons. Thirdly, we assumed that the excavation contractor and two environmental consultants would be on site during an eight week excavation schedule. Fourthly we assumed that construction equipment would be available in Aniak, Alaska, but the excavation crew would be from Anchorage, Alaska. Finally, it was also assumed that this project would be implemented within one summer season, not to extend into the winter. Various assumptions pertaining to each treatment alternative are discussed in the following sections. Costs associated with each of the alternatives are estimated to be rough order of magnitude (ROM). A summary of the treatment alternatives is included as Table 1, and ROM costs for each option are included in Table 2.

4.2 Excavation and Disposal

The first treatment option involves excavating impacted soil containing greater than 1 ppm PCBs and disposal at an approved TSD facility. This is the method used for disposal of PCB impacted material during the 2001 cleanup effort. This alternative is typically considered to accrue higher costs per cubic yard of impacted material. Since the impacted material can be disposed of concurrently with the excavation process, it was estimated that the on site portion of the project would last approximately eight weeks.

The total cost for this option is approximately $2,567,000 with a unit cost per cubic yard of about $1,091. This option is a very effective and proven technique in removing and disposing of PCB-impacted soil. The downfall of this option is that the unit cost is higher than other options, and will eventually accrue higher costs, in comparison, if the actual quantity of PCB-impacted soil is greater than 2,000 cubic yards. The positive aspect of excavation and disposal is that the on site work can be competed during the school summer break.

4.3 Excavation, Screening, and Disposal

It was decided at the scoping meeting to evaluate screening out the greater than 2-inch material, to lower the weight being transported, and eventually the costs. After reviewing boring logs, test pit logs, and grain size samples from the surrounding area, it was discovered that there were negligible amounts of greater than 2-inch material by weight. Assuming 5 percent by weight of the 2,000 cubic yards, we estimate that the screening plant would cost approximately $130 per cubic yard of screened material, for a total cost of $260,000. At 5 percent greater than 2-inch, the screening process would save approximately $26,000 in comparison to disposing of all the impacted material. If the greater than 2-inch material is in quantities of less than 4 percent, the screening process will cost more than simply disposing of all the material. For example, at 3 percent greater than 2-inch, set-up and operation of the screening plant ends up costing approximately $26,500 more than disposal of the entire amount of excavated soil. Based on the uncertainty of how much greater than 2-inch material exists at the site, and the costs associated with setting up and operating the screening plant, this treatment alternative is considered questionable. Table 2 shows the costs associated with setting up the screening plant with an assumption of 3 percent greater than 2-inch material.

4.4 Excavation and Solvent Extraction

Terra Kleen was contacted for the option of using a solvent to extract PCBs from the soil. The process begins by loading contaminated soil into extraction tanks (typically roll-off boxes) and adding clean solvent. After a sufficient amount of time passes, allowing for the contaminants to desorb from the soil and dissolve into solution, the contaminant-laden solvent is extracted to a sedimentation tank. Once the sediment has been removed, the contaminant-laden solvent goes to a filtration and purification station where the contaminants are removed from the solvent and concentrated. The clean solvent is then reused to further process and clean PCB-impacted soil. This process has been demonstrated to remove PCBs from impacted soil to less than 1 ppm.

The total cost to treat the estimated 2,000 cubic yards of impacted soil is approximately $2,515,000. The unit cost does have an advantage over excavation and disposal, being

approximately $617 per cubic yard. The advantage to using this alternative is the lower unit cost than the excavation and disposal option. This treatment alternative will take about 14 weeks to process the approximately 2,000 cubic yards of impacted soil. Since treatment will likely occur into the next school year we assume that a fenced, treatment area, separated from the area of school activity will be required. As soil is excavated, it will be transported to a storage cell in the designated treatment area where it will be available for Terra Kleen to process. In addition, the excavation areas will be backfilled immediately requiring that a cleaned-soil fill material area be designated for processed soil containing less than 1 ppm PCBs.

4.5 Limited Excavation with Disposal and Capping

This remedial option focuses on the areas of impacted soil containing PCB concentrations greater than 10 ppm. Current regulations allow for capping PCB impacted soil with concentrations less than 10 ppm with a suitable cover material. The suitable cover can be constructed of concrete, asphalt, soil, or other similar material. The cap needs to be designed to minimize human exposure, water infiltration, and to resist erosion. The EPA has certain minimum requirements which need to be met for a suitable cap, including thickness. If soil is the primary capping material, it needs to be compacted to a minimum thickness of 10 inches over a geotextile liner, designed in accordance with 40 CFR 264.310(a), and if asphalt or concrete is used a minimum thickness of 6 inches is required.

The costs associated with this option include excavation and disposal of impacted PCB soil greater than 10 ppm and the addition of a 10-inch compacted soil cap with a geotextile liner underneath the cap. Based on previous assessment reports, it was assumed that approximately 50 percent of the material would be greater than 10 ppm. The total cost for this option is approximately $1,349,000 with a unit cost of $1,122 per cubic yard of impacted material removed. As shown in Table 2, the costs for this alternative are less than the excavation and disposal option, due to less soil being removed and disposed. Although this method has been used in the past at this site, there are a few drawbacks. The major drawback to this option is that PCB-impacted soil at levels greater than the state and federal criteria of 1 ppm will remain in the subsurface around the school. Institutional controls, in the form of a deed restriction, will need to be in place to inform future users of the property that PCB impacted soil is on site, and that proper handling and disposal of the contaminated material will be required if disturbed. Additional drawbacks include: long term liability associated with residual contamination; uncertain costs related to future assessment, cleanup and disposal needs; and the landowner would need to agree to the remedy, the institutional controls and maintenance of the cap.

4.6 Excavation and On-Site Indirect Thermal Desorption

This option includes the excavation of the estimated 2,000 cubic yards of impacted soil and on-site treatment in an indirect thermal desorption (ITD) system. The ITD unit essentially works like a rotary kiln, but uses convective heating instead of a direct contact heat source to reduce the risk of forming dioxins and furans. In the process, impacted soil enters the ITD unit and is heated to a temperature at which PCBs become volatile. The PCB vapors and PCB-laden dust are passed through a filter for dust removal, and then to a condenser, where the PCB contaminants are concentrated into a liquid. The final outflow air stream passes through a second filtering system to ensure that no PCB contaminants leave the system. The final products are treated soil and concentrated PCB-laden sediment and PCB contaminants in liquid form. This process has been demonstrated to remove PCBs from impacted soil to less than 1 ppm. This treatment alternative will require 12 weeks to process the approximately 2,000 cubic yards of impacted soil. Since treatment will likely occur into the next school year we assume that a fenced, treatment area, separated from the area of school activity will be required. As soil is excavated, it will be transported to a storage cell in the designated treatment area where it will be available for the ITD process. In addition, the excavation areas will be backfilled immediately requiring that a cleaned-soil fill material area be designated for processed soil containing less than 1 ppm PCBs.

The estimated cost to treat the approximately 2,000 cubic yards of PCB-impacted soil using this alternative is $2,986,000 which is about $400,000 more expensive than the excavate and disposal option. One advantage to using this option is that the unit cost is approximately $884 per cubic yard of impacted material which is about $200 per cubic yard less expensive than the excavate and disposal alternative. One disadvantage is that the system currently does not have an air permit to operate in Alaska, which means that initial testing would need to be performed to secure a permit to operate. The state air permit typically can be obtained in about 12 weeks or less. A required TSCA permit for air, soil, waste and water containment controls is issued in Washington D.C. and requires approximately 18 weeks.

4.7 In-Situ Thermal Desorption

In-situ thermal desorption is a process of heating the soil in place to remove the contaminants. This process begins by installing heating and vapor extraction wells. The heating wells increase the subsurface soil temperature to an average temperature of about 350 degrees Celsius. The vapor extraction wells create a vacuum on the subsurface capturing the contaminants. The vapor extraction wells and a vapor barrier placed on top of the treatment area ensure that contaminants do not leave the impacted area.

Costs to treat PCB-impacted soil typically average about $600 per cubic yard. These costs are based on installation at an easily accessible site, and would be higher for the Aniak site. The time needed to heat in-situ soil would be around 150 days, or approximately 5 months. Initial set up time would add another month to the timeline. Terra Therm indicated they could not guarantee soil temperatures would reach the appropriate level and remain there to remove the contaminants. Terra Therm also indicated that they have operated in the winter, but with limited success. Due to the short summer season, the typical timeline for treatment, and an absence of a guarantee for PCB removal, this alternative was eliminated from further consideration.

4.8 Excavation and Encapsulating in Concrete

This option is generally thought of as a disposal option, as opposed to treatment. The PCB contaminants are not removed from the site in the process, but rather bound in the concrete. It was stated by a representative of the EPA that this type of option is not favored, mainly for the reason that the contaminants are not removed. The EPA's September 2001, Revisions to the PCB Question and Answer Manual states that "low occupancy" cleanup levels would probably be acceptable in a school parking lot, but that "high occupancy" levels would probably be required in a school classroom. Thus, it seems probable that EPA would approve a "low occupancy" determination and concrete encapsulation in or under the parking lot at the Middle School. With an appropriate cap, the "low occupancy" maximum allowable PCB-impacted soil concentration is less than 100 ppm. The concrete would need to be buried and covered with a suitable cap. If soil is the primary capping material, it needs to be compacted to a minimum thickness of 10 inches over a geotextile liner, designed in accordance with 40 CFR 264.310(a), and if asphalt or concrete is used a minimum thickness of 6 inches is required.

We have broken this treatment alternative into two sub-alternatives. The first one, Sub-alternative 1, being encapsulation of all soil containing greater than 1 ppm PCBs into a concrete monolith under EPA approved risk based disposal as discussed in 40 CFR 761.61(c). The second, Sub-alternative 2, is segregating and off-site disposal of all soil greater than 100 ppm PCBs and on-site encapsulation of soil with less than 100 ppm but greater than 1 ppm PCBs. The latter would require EPA approval on a "low occupancy" determination and cleanup level approval under 40 CFR 761.61(a)(4)(i)(B)(3). PCBs encapsulated in the concrete would require a deed notice and institutional controls, as discussed in Section 4.5, to ensure the concrete is not damaged. This alternative should allow soil remaining at the site that contains less than 1 ppm PCBs to be "unregulated" by EPA.

Sub-alternative 1 is estimated to cost $2,368,000, with an incremental cost of about $1,001 per cubic yard. Sub-alternative 2 is estimated to cost $2,363,000, with an incremental cost of

about $999 per cubic yard. The major drawback to this option is that PCB-impacted soil at levels greater than the state and federal criteria of 1 ppm will remain in the subsurface, encapsulated in concrete, and buried in or under the parking lot at the Middle School. Additional drawbacks associated with this alternative include: potential long term liabilities associated with PCBs remaining on-site in the concrete; the need to maintain the concrete; and limitations the concrete may have on future land use opportunities. Institutional controls, in the form of a deed restriction, will need to be in place to inform future users of the property that PCB impacted soil is encapsulated in concrete and buried on site. The landowner would need to agree to the remedy, the institutional controls and maintenance of the concrete and cap.

5.0 WOOD SHOP DEMOLITION AND RECONSTRUCTION

Shannon & Wilson was also requested to develop a cost estimate for demolishing the woodshop/former generator room, disposing of the PCB contaminated concrete and soil containing greater than 1 ppm PCBs, and reconstruct the Wood Shop.

During previous site assessment work conducted at the site, it has been shown that the Wood Shop concrete floor has been impacted with PCBs. Additionally, PCB contaminated oil was swept off of the concrete slab and out of the door of the portion of the former WAC building currently occupied by the Wood Shop. To remove the PCB-impacted materials the entire Wood Shop would be demolished. As shown in Table 3, the estimated ROM cost to demolish the Wood Shop is $80,000. An asbestos and lead-based paint survey, if not already accomplished, would need to be performed. It was assumed that there were no lead-based paints remaining, based on the renovation date of the Wood Shop. It was estimated from the renovation drawings that fire sealant and acoustic panels may contain friable asbestos. Therefore, we have allowed a contingency for asbestos abatement of $10,000, bringing the cost of demolition to about $90,000.

Following demolition of the Wood Shop structure, the concrete floor would be cut up and removed in manageable pieces and shipped to a TSD facility. It is estimated that approximately 45 cubic yards of PCB-impacted concrete will be generated from the floor. Also, the footers will need to be removed, adding approximately 10 cubic yards of PCB-impacted concrete. For estimating purposes, we assume that the concrete material will be treated as discussed for the excavation and disposal alternative. The additional costs associated with excavation and disposal of the PCB-impacted concrete at a TSD facility are estimated to be approximately $54,700.

Soil underneath the Wood Shop that potentially contains greater than 1 ppm PCBs would also be treated by one of the methods previously described in Section 4. Soil directly

beneath the Wood Shop floor has not been analyzed for PCBs. For cost estimation purposes, we assumed that approximately one vertical foot of soil directly beneath the entire floor area would need to be removed or approximately 71 cubic yards. We also estimate that a three feet by seven feet deep area will need to be excavated around the south footer at the locations of the exterior doors to the former WAC building. Approximately 60 cubic yards of impacted soil may be removed from around the footers. For estimating purposes we assume that the PCB-impacted soil will be treated using the excavation and disposal alternative. The costs to excavate and dispose of the PCB-impacted soil beneath the Wood Shop and adjacent to the former and existing doorways are approximately $141,500.

Ronn Rasmussen of Alaska Construction Management developed a construction cost estimate, in FY 2004 dollars, for the reconstruction of the Middle School Wood Shop. Ronn and Shannon & Wilson representatives met with Ms. Sandy Jones of Kumin Associates, Inc., to inspect the remodeling drawings of the Aniak Middle School. Based on these drawings, Ronn was able to develop a cost estimate to reconstruct a similar wood shop. The cost to reconstruct the Wood Shop is approximately $513,300. A copy of the cost estimate is provided in Appendix A. The total cost to demolish and rebuild the Wood Shop would be approximately $799,500, as shown on Table 3.

6.0 DISCUSSION OF FINDINGS

In total, seven treatment alternatives were evaluated. One option, in-situ thermal desorption, was not considered to be a viable option for this project. The screening and disposal option, is viable, but the uncertainty of the quantity of greater than 2-inch material makes this option questionable. The five remaining options include excavation and disposal, limited excavation and disposal with capping, solvent extraction, ITD, and concrete encapsulation. For this project, the major considerations in choosing a treatment option are effectiveness, costs, and implementability.

The effectiveness of the different options were evaluated primarily by the treatment option obtaining less than 1 ppm PCB concentration in the soil. The excavation and disposal option can reach this level of effectiveness due to the soil being disposed off-site. The limited excavation and disposal option and the concrete encapsulation alternatives are not effective in that soil with greater than 1 ppm PCBs will remain. Both the solvent extraction and ITD options have been shown to be effective on previous projects in reducing soil PCB concentrations to less than 1 ppm. The effectiveness of the different options, with the exception of the limited excavation and disposal and concrete encapsulation alternatives, is essentially the same, due to their ability to reduce the PCB level to less than 1 ppm.

Of the five alternatives, the cost for one alternative is significantly lower than the others. The least expensive option is the limited excavation and disposal for approximately $1,349,000. The limited excavation and disposal has the lowest cost, due to only half, or about 1,000 cubic yards, of the PCB-impacted soil being removed. The limited excavation and disposal alternative can also be implemented in less than eight weeks on the project site. The downside of this option is leaving approximately 1,000 cubic yards of PCB-impacted soil in the subsurface at concentrations less than 10 ppm. In our opinion, this is not the best alternative because it results in PCB contaminated material remaining on-site, indefinite liability, uncertain future costs and the potential for exposure to PCBs if the institutional controls fail.

The next least expensive option is the concrete encapsulation Sub-Alternatives 1 and 2 for approximately $2,368,000 and $2,363,000, respectively. The concrete encapsulation alternatives can also be implemented in less than eight weeks on the project site. The downside of this option is that PCB-impacted soil at levels greater than the state and federal criteria of 1 ppm will remain in the subsurface encapsulated in concrete and buried in or under the parking lot at the Middle School. In our opinion, this is not the best alternative because it results in potential long term liabilities associated with PCBs remaining on-site in the concrete; the need to maintain the concrete; and limitations the concrete may have on future land use opportunities.

The excavation and disposal option is an appealing option, when considering the costs to treat the estimated 2,000 cubic yards of PCB-impacted soil and the amount of time needed to complete the project activities at the site. The cost of this option is approximately $2,567,000. The incremental cost to treat soil above and beyond the 2,000 cubic yard estimated quantity is $1,091 per cubic yard. The incremental costs could be a downfall if greater quantities of impacted soil are encountered than the 2,000 cubic yards estimated in this feasibility study. The positive aspect of this option is that it can be implemented within about 8 weeks, and within a school summer break.

The solvent extraction process is also an appealing option for the treatment of the estimated 2,000 cubic yards. The cost of this option is approximately $2,515,000 or about $52,000 less than the excavation and disposal option. Another positive aspect of this treatment option is the lowest incremental costs of the evaluated alternatives at approximately $617 per cubic yard. The drawback to the solvent extraction treatment alternative is the time required to implement treatment, about 14 weeks. In addition, if greater quantities of impacted soil are encountered than estimated in this feasibility study, then the time needed to implement the expanded project will extend into the next school year.

The most expensive of the four options considered is to treat the base quantity of 2,000 cubic yards by ITD for approximately $2,986,000. The permitting process, mobilization, and demobilization costs are high in comparison to the other options, but may be reduced if other projects in the region are realized. The incremental cost associated with this option is approximately $884 per cubic yard. The incremental unit costs for ITD are higher than for solvent extraction but lower than for excavation and disposal.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our evaluation of the seven treatment alternatives only five appear to be viable to treat the PCB-impacted soil at the project site. One viable alternative, limited excavation and disposal, leaves about 1,000 cubic yards of soil at the site with PCB concentrations greater than 1 ppm but less than 10 ppm. Therefore it is not considered to be an effective long term alternative. Of the four remaining alternatives the concrete encapsulation option is the most cost effective, followed by solvent extraction, excavation and disposal, and then indirect thermal desorption. Only the concrete encapsulation and excavation and disposal alternatives can be implemented during the school summer break. The concrete encapsulation alternative results in potential long term liabilities associated with PCBs remaining on-site in the concrete. Solvent extraction and indirect thermal desorption require extending the treatment time into the next school year. They will also need a designated area for placement of the 2,000 cubic yards of treated soil having less than 1 ppm of PCBs.

In conclusion, it is our opinion that the best option for treatment is the excavation and disposal option. This option was chosen due to the estimated costs and the timeline associated with this treatment option. The cost difference between the excavation and disposal option and the solvent extraction is considered to be negligible. Incremental treatment costs for the excavation and disposal alternative are about $474 greater than the solvent extraction alternative. In our opinion, the difference between the incremental costs is justified by completion of the project within a school summer break, thereby reducing the potential exposure of people in and around the school to PCB-impacted soil and to lessening the disruption to staff, students, and nearby residents.

Including the demolition of the Wood Shop, disposal of PCB-impacted soil and concrete, and reconstruction of the Wood Shop the total cost for the entire project is approximately $3,367,000, as shown on Table 3. Please note that these are ROM costs that should be used for estimation purposes only. As discussed in Section 3.0, PCB-impacted soil is suspected in a crawl space under the computer room on the south side of the Wood Shop. We recommend additional sampling and analysis of soil in the crawl space beneath the computer room prior to initiating cleanup at other areas of the site. Costs related to future assessment,

cleanup and disposal needs, if any, associated with contaminated soil beneath the computer room are uncertain and can only be determined following completion of the recommended sampling and analysis.

8.0 CLOSURE/LIMITATIONS

This report was prepared for the exclusive use of our client and their representatives for evaluating the site as it relates to the environmental aspects discussed herein. The conclusions and recommendations contained in this report are based on information provided from the observed site conditions and other conditions described herein. It is further assumed that the conditions observed are representative of the conditions throughout the site. The data presented in this report should be considered representative of the time of our site assessment. Changes due to natural processes or human activity can occur on the site. In addition, changes in government codes, regulations, or laws may occur. Because of such changes beyond our control, our observations and interpretations applicable to this site may need to be revised.

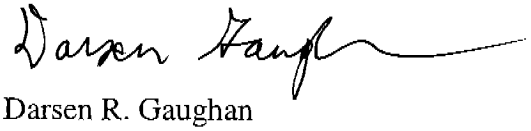
Shannon & Wilson has prepared the attachment in Appendix B, "Important Information About Your Environmental Site Assessment/Evaluation Report," to assist you and others in understanding the use and limitations of our report.

We appreciate this opportunity to be of service and your confidence in our firm. If you have questions or comments concerning this submittal, please call Mr. Stafford Glashan or the undersigned at (907) 561-2120.

Sincerely,

SHANNON & WILSON, INC.

Prepared By:



Darsen R. Gaughan
Engineer II

Reviewed By:

Timothy M. Terry, C.P.G.
Associate

srb: sjg

TABLE 1 - TREATMENT ALTERNATIVE SUMMARY

Treatment Alternative	Cost to Treat 2,000 cubic yards	Incremental Cost for each cubic yard greater than 2,000	Completed during (12 week) summer break	Institutional controls required for closure	Comments
1. Excavation and Disposal	$2,567,276	$1,091	Yes	No	Proven Effective at Site.
2. Excavation, Screen, and Disposal	$2,558,334	$1,087	Yes	No	Potentially Cost Effective if greater than 5% oversize.
3. Excavation and Solvent Extraction	$2,515,013	$617	No	No	Potential Permitting Issues. Possible Operation in Winter Conditions.
4. Limited Excavation, Disposal, and Capping	$1,348,535	$1,122	Yes	Yes	PCB Impacted Soil Remaining at Site. Potential Difficulty Receiving Agency and/or Public Approval.
5. Excavate and Treat by Indirect Thermal Desorption	$2,985,840	$884	No	No	Potential Permitting Issues. Possible Operation in Winter Conditions.
6. In-Situ Thermal Desorption	Not Available	Not Available	No	No	Soil Temperatures Not Guaranteed to Remove PCBs
7a. Excavation and Concrete Encapsulation	$2,367,781	$1,001	Yes	Yes	PCB Impacted Concrete Remaining at Site. Potential difficulty reveiving agency and/or Public Approval.
7b. Excavation and Disposal of Soil with PCBs > 100 ppm and Concrete Encapsulation of Soil with PCBs > 1 ppm but < 100 ppm	$2,362,745	$999	Yes	Yes	PCB Impacted Concrete Remaining at Site. Potential difficulty reveiving agency and/or Public Approval.

TABLE 2 - ROUGH ORDER OF MAGNITUDE (ROM) COSTS

TREATMENT ALTERNATIVE

1 - Excavation and Disposal

Excavation Effort							$314,008
Excavation Equipment and Personnel							
Mobilization/Demobilization	1	lump sum	@	$9,000	ea	$9,000	
Barrier Fence for Site	1	lump sum	@	$6,000	ea	$6,000	
Excavate and Stockpile Non-Impacted Material	700	cy	@	$24	/cy	$16,800	
Excavate Impacted Material	2000	cy	@	$24	/cy	$48,000	
Backfill Excavation with Non-Impacted Material	700	cy	@	$11	/cy	$7,700	
Backfill Excavation with Imported Gravel	1300	cy	@	$26	/cy	$33,800	
Per Diem	56	days	@	$300	/day	$16,800	
Environmental Consultant							
Project Management	10	hours	@	$134	/hour	$1,340	
Excavation Monitoring and Sampling	56	days	@	$1,560	/day	$87,360	
Per Diem and Vehicle	56	days	@	$250	/day	$14,000	
Mobilization/Demobilization	1	ea	@	$5,000	ea	$5,000	
Miscellaneous Equipment	56	days	@	$150	/day	$8,400	
Reporting Efforts	1	ea	@	$1,750	ea	$1,750	
Laboratory Analytical Sample Analysis							
190 Confirmation Samples	190	samples	@	$90	each	$17,100	
Contingency (15%)						$40,958	
Storage, Transportation, and Disposal Effort							$2,253,269
Storage, Transportation, and Disposal							
Load Supersacks	2000	cy	@	$76	/cy	$152,000	
Transport Supersacks to Barge Landing	2000	supersacks	@	$50	ea	$100,000	
Transportation							
Container Rental (159 Containers)	41	days	@	$525	/day	$21,525	
Non-Regulated (Aniak-TSDF)	119	containers	@	$8,181	ea	$973,539	
Regulated (Aniak-TSDF)	40	containers	@	$10,827	ea	$433,080	
Disposal (Regulated and Non-Regulated)							
Non-Regulated	2250	tons	@	$22	/ton	$49,500	
Regulated	750	tons	@	$116	/ton	$87,000	
Supplies							
Supersacks, Documentation, Labeling	2000	supersacks	@	$33	ea	$66,000	
Documentation, Placarding, Labeling, Misc. etc.						$6,250	
Labor, Airfare, Per Diem (3 @ 10 hrs./day)	26	days	@	$2,520	/day	$65,520	
Environmental Consultant							
Project Management	10	hours	@	$134	/hour	$1,340	
Disposal Monitoring	30	hours	@	$62	/hour	$1,860	
Reporting Efforts	1	ea	@	$1,750	ea	$1,750	
Contingency (15%)						$293,905	
						Excavation and Disposal Total:	**$2,567,276**

Incremental Unit Costs **$1,091**

(Per additional cubic yard of material to be treated)

TABLE 2 - ROUGH ORDER OF MAGNITUDE (ROM) COSTS

TREATMENT ALTERNATIVE

2 - Excavation, Screen, and Disposal

Excavation Effort							$314,008
Excavation Equipment and Personnel							
Mobilization/Demobilization	1	lump sum	@	$9,000	ea	$9,000	
Barrier Fence for Site	1	lump sum	@	$6,000	ea	$6,000	
Excavate and Stockpile Non-Impacted Material	700	cy	@	$24	/cy	$16,800	
Excavate Impacted Material	2000	cy	@	$24	/cy	$48,000	
Backfill Excavation with Non-Impacted Material	700	cy	@	$11	/cy	$7,700	
Backfill Excavation with Imported Gravel	1300	cy	@	$26	/cy	$33,800	
Per Diem	56	days	@	$300	/day	$16,800	
Environmental Consultant							
Project Management	10	hours	@	$134	/hour	$1,340	
Excavation Monitoring and Sampling	56	days	@	$1,560	/day	$87,360	
Per Diem and Vehicle	56	days	@	$250	/day	$14,000	
Mobilization/Demobilization	1	ea	@	$5,000	ea	$5,000	
Miscellaneous Equipment	56	days	@	$150	/day	$8,400	
Reporting Efforts	1	ea	@	$1,750	ea	$1,750	
Laboratory Analytical Sample Analysis							
190 Confirmation Samples	190	samples	@	$90	each	$17,100	
Contingency (15%)						$40,958	
Storage, Transportation, and Disposal Effort							$2,244,326
Storage, Transportation, and Disposal							
Install Windscreen for Screening Plant	1	screen	@	$1,000	ea	$1,000	
Load Screening Plant	2000	cy	@	$66		$132,000	
Load Supersacks	2000	cy	@	$40	/cy	$80,000	
Transport Supersacks to Barge Landing	1900	supersacks	@	$50	ea	$95,000	
Transportation							
Container Rental (151 Containers)	41	days	@	$499	/day	$20,459	
Non-Regulated (Aniak-TSDF)	113	containers	@	$8,181	ea	$924,453	
Regulated (Aniak-TSDF)	38	containers	@	$10,827	ea	$411,426	
Disposal (Regulated and Non-Regulated)							
Non-Regulated	2137	tons	@	$22	/ton	$47,014	
Regulated	713	tons	@	$116	/ton	$82,708	
Supplies							
Supersacks, Documentation, Labeling	2000	supersacks	@	$33	ea	$66,000	
Documentation, Placarding, Labeling, Misc. etc.						$5,938	
Labor, Airfare, Per Diem (3 @ 10 hrs./day)	32	days	@	$2,520	/day	$80,640	
Environmental Consultant							
Project Management	10	hours	@	$134	/hour	$1,340	
Disposal Monitoring	30	hours	@	$62	/hour	$1,860	
Reporting Efforts	1	ea	@	$1,750	ea	$1,750	
Contingency (15%)						$292,738	
						Excavation, Screening, and Disposal Total:	**$2,558,334**
Incremental Unit Costs (Per additional cubic yard of material to be treated)							**$1,087**

TABLE 2 - ROUGH ORDER OF MAGNITUDE (ROM) COSTS

TREATMENT ALTERNATIVE

3 - Excavation and Solvent Extraction

Excavation Effort							$314,008
Excavation Equipment and Personnel							
Mobilization/Demobilization	1	lump sum	@	$9,000	ea	$9,000	
Barrier Fence for Site	1	lump sum	@	$6,000	ea	$6,000	
Excavate and Stockpile Non-Impacted Material	700	cy	@	$24	/cy	$16,800	
Excavate Impacted Material	2000	cy	@	$24	/cy	$48,000	
Backfill Excavation with Non-Impacted Material	700	cy	@	$11	/cy	$7,700	
Backfill Excavation with Imported Gravel	1300	cy	@	$26	/cy	$33,800	
Per Diem	56	days	@	$300	/day	$16,800	
Environmental Consultant							
Project Management	10	hours	@	$134	/hour	$1,340	
Excavation Monitoring and Sampling	56	days	@	$1,560	/day	$87,360	
Per Diem and Vehicle	56	days	@	$250	/day	$14,000	
Mobilization/Demobilization	1	ea	@	$5,000	ea	$5,000	
Miscellaneous Equipment	56	days	@	$150	/day	$8,400	
Reporting Efforts	1	ea	@	$1,750	ea	$1,750	
Laboratory Analytical Sample Analysis							
190 Confirmation Samples	190	samples	@	$90	each	$17,100	
Contingency (15%)						$40,958	
Treatment Efforts							$2,201,005
Terra Kleen Solvent Extraction							
Mobilization							
Project Meetings, Shipping Preparation and Personnel Relocation						$93,336	
Equipment Shipping (Extraction Bins, Distillation System, GAC Units, Solvent)						$395,362	
Installation/Set-up in Aniak						$111,563	
Barrier for Treatment Area						$15,000	
Construct Temporary Holding Cell						$10,000	
Transport Material to Treatment Bins and Load	2000	cy	@	$5	/cy	$10,000	
Treatment							
Labor	66	days	@	$2,102	/day	$138,732	
Electricity	66	days	@	$231	/day	$15,246	
Solvent & Sieves	2000	cy	@	$78.50	/cy	$157,000	
Equipment Rental, Fuel, Spent Solvent, etc.	66	days	@	$8,866	/day	$585,156	
Lab Fees	200	ea	@	$70	ea	$14,000	
Unload Treatment Bins and Temporarily Store	2000	cy	@	$11	/cy	$22,000	
Decontaminate/Demobilize							
Labor						$43,112	
Equipment Shipping (Extraction Bins, Distillation System, Misc.)						$233,921	
Fill Along Shoulder of Road	2000	cy	@	$26	/cy	$52,000	
Per Diem For Loader Operator	66	days	@	$190	/day	$12,540	
Environmental Consultant							
Project Management	10	hours	@	$134	/hour	$1,340	
Treatment Monitoring	30	hours	@	$62	/hour	$1,860	
Reporting Efforts	1	ea	@	$1,750	ea	$1,750	
Contingency (15%)						$287,088	
						Excavation and Solvent Extraction Total:	**$2,515,013**
Incremental Unit Costs							**$617**
(Per additional cubic yard of material to be treated)							

TABLE 2 - ROUGH ORDER OF MAGNITUDE (ROM) COSTS

TREATMENT ALTERNATIVE

4 - Limited Excavation, Disposal, and Capping

Excavation Effort							$209,864
Excavation Equipment and Personnel							
Mobilization/Demobilization	1	lump sum	@	$9,000	ea	$9,000	
Barrier Fence for Site	1	lump sum	@	$6,000	ea	$6,000	
Excavate and Stockpile Non-Impacted Material	700	cy	@	$24	/cy	$16,800	
Excavate Impacted Material	1000	cy	@	$24	/cy	$24,000	
Backfill Excavation with Non-Impacted Material	700	cy	@	$11	/cy	$7,700	
Backfill Excavation with Imported Gravel	1000	cy	@	$26	/cy	$26,000	
Per Diem	30	days	@	$300	/day	$9,000	
Environmental Consultant							
Project Management	10	hours	@	$134	/hour	$1,340	
Excavation Monitoring and Sampling	30	days	@	$1,560	/day	$46,800	
Per Diem and Vehicle	30	days	@	$250	/day	$7,500	
Mobilization/Demobilization	1	ea	@	$5,000	ea	$5,000	
Miscellaneous Equipment	30	days	@	$150	/day	$4,500	
Reporting Efforts	1	ea	@	$1,750	ea	$1,750	
Laboratory Analytical Sample Analysis							
190 Confirmation Samples	190	samples	@	$90	each	$17,100	
Contingency (15%)						$27,374	
Storage, Transportation, and Disposal Effort							$1,138,671
Storage, Transportation, and Disposal							
Load Supersacks	1000	cy	@	$76	/cy	$76,000	
20-mil Petroleum Resistant Cover (80'x80')	6400	sq ft		$0.60	/sq ft	$3,840	
Transport Supersacks to Barge Landing	1000	supersacks	@	$50	ea	$50,000	
Transportation							
Container Rental (80 Containers)	41	days	@	$264	/day	$10,824	
Non-Regulated (Aniak-TSDF)	60	containers	@	$8,181	ea	$490,860	
Regulated (Aniak-TSDF)	20	containers	@	$10,827	ea	$216,540	
Disposal (Regulated and Non-Regulated)							
Non-Regulated	1125	tons	@	$22	/ton	$24,750	
Regulated	375	tons	@	$116	/ton	$43,500	
Supplies							
Supersacks, Documentation, Labeling	1000	supersacks	@	$33	ea	$33,000	
Documentation, Placarding, Labeling, Misc. etc.						$3,125	
Labor, Airfare, Per Diem (3 @ 10 hrs./day)	13	days	@	$2,520	/day	$32,760	
Environmental Consultant							
Project Management	10	hours	@	$134	/hour	$1,340	
Disposal Monitoring	30	hours	@	$62	/hour	$1,860	
Reporting Efforts	1	ea	@	$1,750	ea	$1,750	
Contingency (15%)						$148,522	
						Limited Excavation, Disposal and Capping Total:	**$1,348,535**
Incremental Unit Costs							**$1,122**
(Per additional cubic yard of material to be treated)							

TABLE 2 - ROUGH ORDER OF MAGNITUDE (ROM) COSTS

TREATMENT ALTERNATIVE

5 - Excavate and Treat by Indirect Thermal Desorption

Excavation Effort							$314,008
Excavation Equipment and Personnel							
Mobilization/Demobilization	1	lump sum	@	$9,000	ea	$9,000	
Barrier Fence for Site	1	lump sum	@	$6,000	ea	$6,000	
Excavate and Stockpile Non-Impacted Material	700	cy	@	$24	/cy	$16,800	
Excavate Impacted Material	2000	cy	@	$24	/cy	$48,000	
Backfill Excavation with Non-Impacted Material	700	cy	@	$11	/cy	$7,700	
Backfill Excavation with Imported Gravel	1300	cy	@	$26	/cy	$33,800	
Per Diem	56	days	@	$300	/day	$16,800	
Environmental Consultant							
Project Management	10	hours	@	$134	/hour	$1,340	
Excavation Monitoring and Sampling	56	days	@	$1,560	/day	$87,360	
Per Diem and Vehicle	56	days	@	$250	/day	$14,000	
Mobilization/Demobilization	1	ea	@	$5,000	ea	$5,000	
Miscellaneaous Equipment	56	days	@	$150	/day	$8,400	
Reporting Efforts	1	ea	@	$1,750	ea	$1,750	
Laboratory Analytical Sample Analysis							
190 Confirmation Samples	190	samples	@	$90	each	$17,100	
Contingency (15%)						$40,958	
Treatment Efforts							$2,671,832
Indirect Thermal Desorption (ITD) Unit							
Preconstruction Activities Labor	894	hours	@	$84.0	/hour	$75,096	
Preconstruction Activities Materials						$9,568	
Barrier Fence for Treatment Area						$15,000	
Construct Temporary Holding Cell	1	ea	@	$10,000	ea	$10,000	
Transport Impacted Material to Holding Cell	2000	cy	@	$5	/cy	$10,000	
ITD Mob/Decon/Demob Labor	538	hours	@	$105.20	/hour	$56,598	
ITD Mob Shipping/Equipment and Materials						$121,337	
ITD Decon/Demob Shipping/Equipment						$114,765	
Personnel Mob/Demob Airfare/Per Diem/Materials						$19,627	
Site Preparation and Trials Labor	1326	hours	@	$106.50	/hour	$141,219	
Site Preparation and Trials Materials						$138,614	
Transport and Load Impacted Material	2000	cy	@	$5	/cy	$10,000	
Process Soil Labor	6090	hours	@	$102.80	/hour	$626,052	
Process Soil Materials, Equip, Subs, etc.						$716,253	
Unload and Stockpile Cleaned Material	2000	cy	@	$11	/cy	$22,000	
Fill Along Shoulder of Road	2000	cy	@	$26	/cy	$52,000	
Contractor QC and Off-site Management						$31,873	
Process Compliance, and Disposal of Residuals						$79,233	
Final Submittal						$42,608	
Per Diem						$25,200	
Environmental Consultant							
Project Management	20	hours	@	$134	/hour	$2,680	
Treatment Monitoring	30	hours	@	$62	/hour	$1,860	
Reporting Efforts	1	ea	@	$1,750	ea	$1,750	
Contingency (15%)						$348,500	
						Excavate and Treat by ITD Total:	**$2,985,840**
Incremental Unit Costs							**$884**
(Per additional cubic yard of material to be treated)							

TABLE 2 - ROUGH ORDER OF MAGNITUDE (ROM) COSTS

TREATMENT ALTERNATIVE

6. In-Situ Thermal Desorption (Eliminated - Soil Temperatures Not Guaranteed to Remove PCBs)

TABLE 2 - ROUGH ORDER OF MAGNITUDE (ROM) COSTS

TREATMENT ALTERNATIVE

7a - Excavation and Concrete Encapsulation

Excavation Effort							$270,078
Excavation Equipment and Personnel							
Mobilization/Demobilization	1	lump sum	@	$9,000	ea	$9,000	
Barrier Fence for Site	1	lump sum	@	$6,000	ea	$6,000	
Excavate and Stockpile Non-Impacted Material	700	cy	@	$24	/cy	$16,800	
Excavate Impacted Material	2000	cy	@	$24	/cy	$48,000	
Backfill Excavation with Non-Impacted Material	300	cy	@	$11	/cy	$3,300	
Backfill Excavation with Imported Gravel	0	cy	@	$26	/cy	$0	
Per Diem	56	days	@	$300	/day	$16,800	
Environmental Consultant							
Project Management	10	hours	@	$134	/hour	$1,340	
Excavation Monitoring and Sampling	56	days	@	$1,560	/day	$87,360	
Per Diem and Vehicle	56	days	@	$250	/day	$14,000	
Mobilization/Demobilization	1	ea	@	$5,000	ea	$5,000	
Miscellaneous Equipment	56	days	@	$150	/day	$8,400	
Reporting Efforts	1	ea	@	$1,750	ea	$1,750	
Laboratory Analytical Sample Analysis							
190 Confirmation Samples	190	samples	@	$90	each	$17,100	
Contingency (15%)						$35,228	
Transportation and Encapsulation Effort							$2,097,704
Transportation and Encapsulation							
Construct Temporary Holding Cell	1	ea	@	$10,000	ea	$10,000	
Transport Impacted Material to Holding Cell	2000	cy	@	$11	/cy	$22,000	
Excavate Add'l Soil For Concrete Placement	600	cy	@	$24	/cy	$14,400	
Prepare Excavation for Concrete Pouring	1	ea	@	$2,000	ea	$2,000	
Transport Soil from Holding Cell to Mix Area	2000	cy	@	$5	/cy	$10,000	
Form and Pour PCB-Impacted Concrete	2300	cy	@	$725	/cy	$1,667,500	
20-mil Petroleum Resistant Membrane Cover	10000	sq ft		$0.60	/sq ft	$6,000	
Cover Concrete/Membrane with Soil	400	cy	@	$11	/cy	$4,400	
Fence and Placard Area	1	ea	@	$10,000	ea	$10,000	
Fill Along Shoulder of Road	600	cy	@	$15	/cy	$9,000	
Per Diem (6 persons)	336	mandays	@	$190	/day	$63,840	
Environmental Consultant							
Project Management	10	hours	@	$134	/hour	$1,340	
Disposal Monitoring	30	hours	@	$62	/hour	$1,860	
Reporting Efforts	1	ea	@	$1,750	ea	$1,750	
Contingency (15%)						$273,614	
						Excavation and Concrete Encapsulation Total:	**$2,367,781**
Incremental Unit Costs (Per additional cubic yard of material to be treated)							**$1,001**

TABLE 2 - ROUGH ORDER OF MAGNITUDE (ROM) COSTS

TREATMENT ALTERNATIVE

7b. Excavation and Disposal of Soil with PCBs > 100 ppm and Concrete Encapsulation of Soil with PCBs > 1 ppm but < 100 ppm

Excavation Effort (See Sub-Alternative 7a)							$270,078
Storage, Transportation, Disposal and Encapsulation Effort							$2,092,668
Storage, Transportation, and Disposal of Soil with PCBs > 100 ppm							
Load Supersacks	100	cy	@	$76	/cy	$7,600	
Transport Supersacks to Barge Landing	100	supersacks	@	$50	ea	$5,000	
Transportation							
Container Rental (8 Containers)	41	days	@	$26	/day	$1,082	
Non-Regulated (Aniak-TSDF)	0	containers	@	$8,181	ea	$0	
Regulated (Aniak-TSDF)	8	containers	@	$10,827	ea	$86,616	
Disposal (Regulated and Non-Regulated)							
Non-Regulated	0	tons	@	$22	/ton	$0	
Regulated	150	tons	@	$116	/ton	$17,400	
Supplies							
Supersacks, Documentation, Labeling	100	supersacks	@	$33	ea	$3,300	
Documentation, Placarding, Labeling, Misc. etc.						$313	
Labor, Airfare, Per Diem (3 @ 10 hrs./day)	2	days	@	$2,520	/day	$5,040	
Transportation and Encapsulation Effort							
Transportation and Encapsulation of Soil with PCBs > 1 ppm but < 100 ppm							
Construct Temporary Holding Cell	1	ea	@	$10,000	ea	$10,000	
Transport Impacted Material to Holding Cell	1900	cy	@	$11	/cy	$20,900	
Excavate Add'l Soil For Concrete Placement	570	cy	@	$24	/cy	$13,680	
Prepare Excavation for Concrete Pouring	1	ea	@	$2,000	ea	$2,000	
Transport Soil from Holding Cell to Mix Area	1900	cy	@	$5	/cy	$9,500	
Form and Pour PCB-Impacted Concrete	2128	cy	@	$725	/cy	$1,542,800	
20-mil Petroleum Resistant Membrane Cover	9500	sq ft		$0.60	/sq ft	$5,700	
Cover Concrete/Membrane with Soil	380	cy	@	$11	/cy	$4,180	
Fence and Placard Area	1	ea	@	$10,000	ea	$10,000	
Fill Along Shoulder of Road	590	cy	@	$15	/cy	$8,850	
Per Diem (6 persons)	320	mandays	@	$190	/day	$60,800	
Environmental Consultant							
Project Management	10	hours	@	$134	/hour	$1,340	
Disposal Monitoring	30	hours	@	$62	/hour	$1,860	
Reporting Efforts	1	ea	@	$1,750	ea	$1,750	
Contingency (15%)						$272,957	
Excavation, Limited Disposal, and Concrete Encapsulation Total:							**$2,362,745**
Incremental Unit Costs (Per additional cubic yard of material to be treated)							**$999**

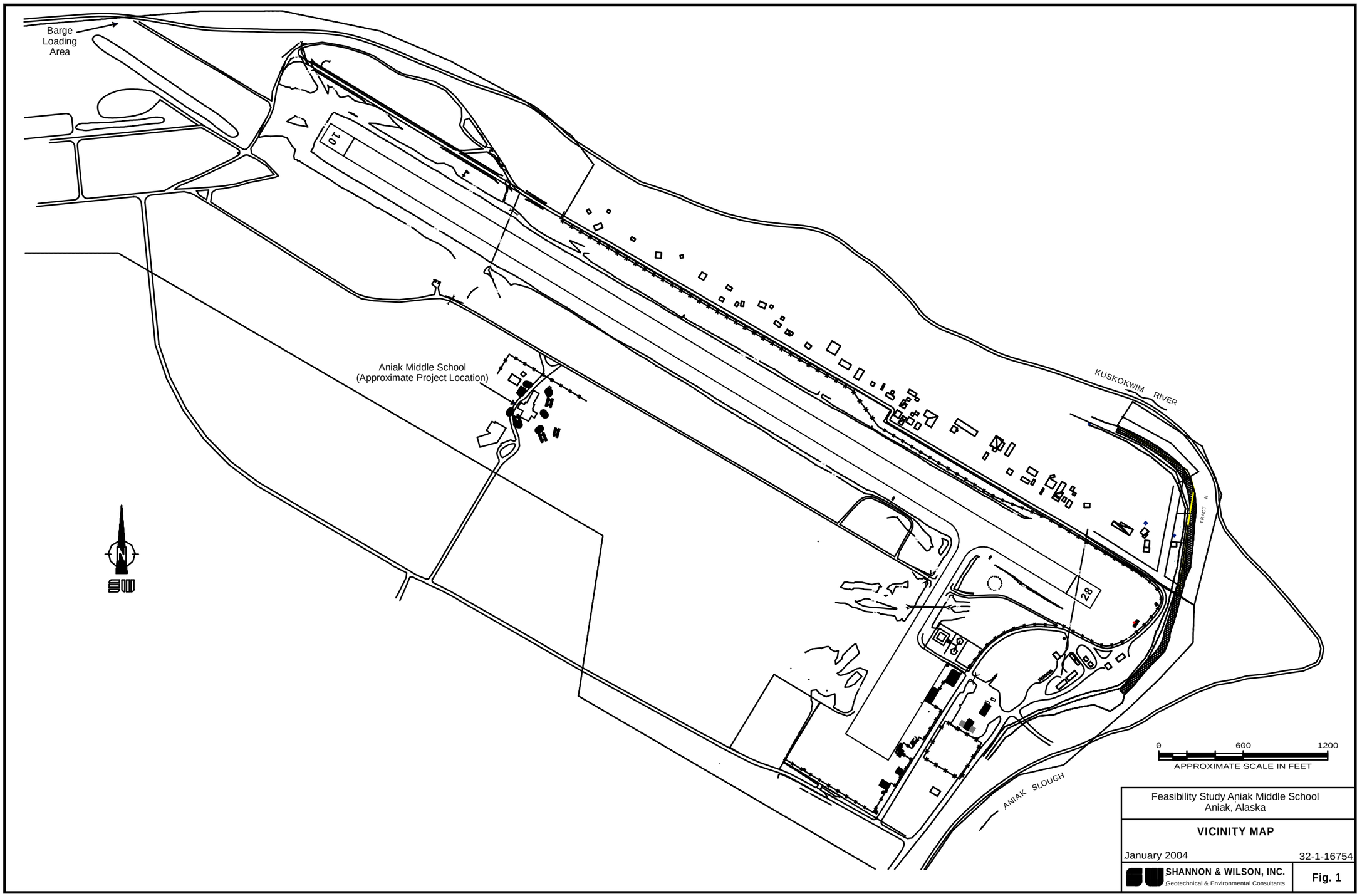
TABLE 3 - PROJECT TOTAL COSTS

Wood Shop Costs

Demolition	
Building Demolition	$90,000
Concrete Disposal	$54,700
Soil Underneath Wood Shop Disposal	$141,500
Reconstruction	
Reconstruction of the Building	$513,300
Wood Shop Total Cost:	**$799,500**

Treatment Alternative Costs

Excavation and Disposal	
Excavate and Dispose of Soil	$2,567,276
Project Grand Total:	**$3,366,776**



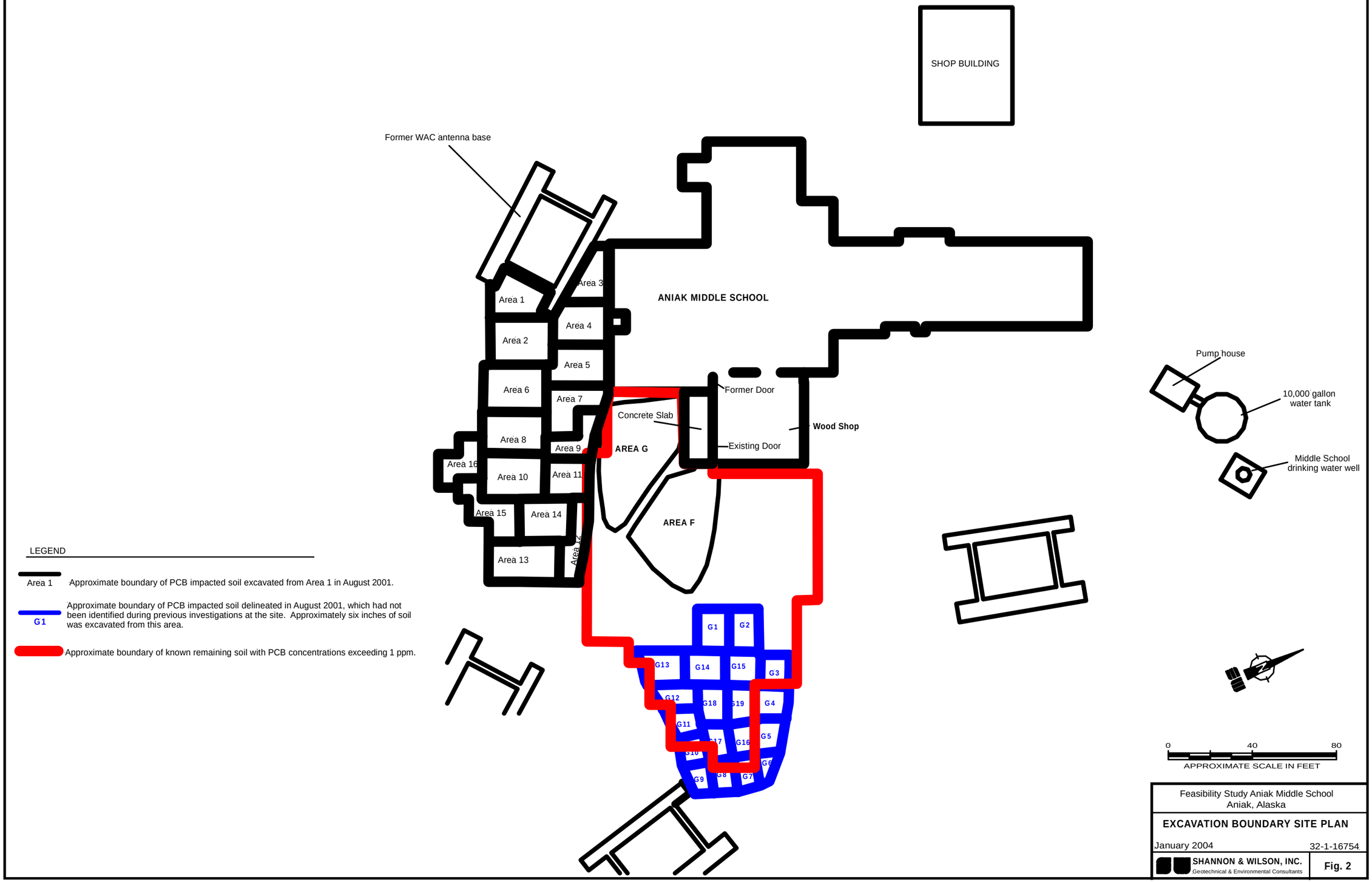
Feasibility Study Aniak Middle School
Aniak, Alaska

VICINITY MAP

January 2004 32-1-16754

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. 1



Feasibility Study Aniak Middle School
Aniak, Alaska

EXCAVATION BOUNDARY SITE PLAN

January 2004 32-1-16754

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. 2

APPENDIX A

WOOD SHOP RECONSTRUCTION COSTS

ANIAK MIDDLE SCHOOL WOODSHOP - ESTIMATED COSTS TO RECONSTRUCT
Kuspuk School District - Aniak, Alaska
Conceptual Cost Estimate 11-21-03

ANIAK MIDDLE SCHOOL WOODSHOP
ESTIMATED COSTS TO RECONSTRUCT
Kuspuk School District
Aniak, Alaska
Conceptual Cost Estimate 11-21-03

Study By: Shannon & Wilson, Inc.
Estimated By: Alaska Construction Management

Prepared By: Alaska Construction Management
907-258-4326

Preparation Date: 11/21/03
Effective Date of Pricing: 11/21/03

ANIAK MIDDLE SCHOOL WOODSHOP
ESTIMATED COST TO RECONSTRUCT
Kuspuk School District Aniak, Alaska
Conceptual Cost Estimate - November 21, 2003

Study Conducted By: Shannon & Wilson, Inc.; Anchorage, Alaska; Tim Terry, PE, Project Manager, 907-561-2120

Estimated By: Alaska Construction Management, Inc; Anchorage, Alaska, Ronn Rasmussen, Construction Cost Consultant; 907-258-4326

Project Description:

This report is a conceptual-level construction cost estimate for the (hypothetical) reconstruction of the Woodshop wing of the Aniak Middle School in Aniak, Alaska.

This estimate is part of the larger study conducted by Shannon & Wilson to investigate options pertaining to the remediation of PCB contaminates in the concrete floor slab and soils in the immediate vicinity of the Aniak Middle School Woodshop. The Client has requested that a determination be made of the order-of-magnitude costs for the reconstruction of the Woodshop in the event that the facility is demolished in order to remove the contaminated floor slab and below grade soils.

This estimate does not include costs for the demolition of the existing facility, and it does not contain any costs associated with the remediation of soils. These issues are addressed in the main report prepared by Shannon & Wilson.

The original design drawings prepared by Wran-Kumin, Inc ("Kuspuk School District Vocational Center", March 9, 1981) were used to prepare this estimate. The scenario according to which this estimate was prepared assumes that the facility will be rebuilt to its original configuration. However, if the project does go forward, it is probable that a new Woodshop facility would be designed that incorporates modern materials and methods, which more adequately address the school district's current programming requirements. Even though it is unlikely that a new facility would be reconstructed that matches the original design in every detail, this cost estimate is intended to assist in creating a reasonable preliminary budget for future construction.

This conceptual-level estimate includes costs for 1.) On-site labor, material, equipment subcontracts and freight; 2.) Contractor general conditions (job overhead); 3.) Contractor markups for home office expenses, profit, and bond; 4.) Estimated design and engineering fees; and 5.) Ten percent (10%) contingency.

ESTIMATED CONSTRUCTION COST (11-21-03): $513,320

DETAILED ESTIMATE DETAIL PAGE

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PROJECT SW3A01: ANIAK MIDDLE SCHOOL WOODSHOP - ESTIMATED COSTS TO RECONSTRUCT
Conceptual Cost Estimate - November 21, 2003
** PROJECT DIRECT SUMMARY - SUBTOTAL **

	QUANTITY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
1 Substructure								
1. 1 Foundation Excavation/Backfill	144		6,067	607	722	0		7,397
1. 2 Foundation Footings & Walls	281		12,368	59	11,669	0		24,096
1. 3 Slab On Grade	141		6,356	74	8,102	0		14,533
TOTAL Substructure	566		24,792	741	20,493	0		46,026
2 Superstructure								
2. 1 Roof Structural Frame	242		10,540	0	12,479	0		23,019
2. 2 Exterior Wall Structure	114		4,944	0	3,760	0		8,704
2. 3 Interior Stair Construction	29		1,243	0	500	0		1,743
TOTAL Superstructure	384		16,727	0	16,739	0		33,466
3 Exterior Closure								
3. 1 Exterior Walls	177		7,695	0	11,221	0		18,917
3. 2 Exterior Windows	6		261	0	450	0		711
3. 3 Exterior Personnel Doors	8		326	0	950	0		1,276
3. 4 Exterior Specialty Doors	32		1,392	0	2,450	0		3,842
TOTAL Exterior Closure	222		9,675	0	15,071	0		24,746
4 Roofing								
4. 1 Roof Coverings	149		6,902	0	16,960	0		23,862
4. 2 Roof Insulation and Fill	37		1,535	244	2,097	0		3,875
TOTAL Roofing	186		8,436	244	19,057	0		27,737
5 Interior Construction								
5. 1 Partitions	51		2,221	0	1,442	0		3,662
5. 2 Interior Personnel Doors	32		1,371	0	3,450	0		4,821
5. 3 Interior Specialties	2		90	0	165	0		255
5. 4 Casework	75		2,740	0	1,250	0		3,990
TOTAL Interior Construction	160		6,420	0	6,307	0		12,728
6 Interior Finishes								
6. 1 Wall Finishes	184		7,592	0	5,890	0		13,482
6. 2 Flooring and Floor Finishes	30		1,344	0	1,650	0		2,994

	QUANTITY UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
6. 3 Ceiling and Ceiling Finishes		120	5,107	0	4,400	0	9,507
TOTAL Interior Finishes		334	14,043	0	11,940	0	25,983
7 Plumbing							
7. 1 Plumbing Fixtures		3	138	0	257	0	395
7. 2 Domestic Water Supply		8	439	0	231	0	670
7. 3 Sanitary Waste and Vent System		6	324	152	225	0	700
TOTAL Plumbing		16	901	152	712	0	1,765
8 HVAC							
8. 1 Terminal and Package Units		84	4,636	0	22,328	0	26,964
8. 2 Controls and Instrumentation		0	0	0	0	642	642
TOTAL HVAC		84	4,636	0	22,328	642	27,606
9 Equipment & Furnishings							
9. 1 Reinstall Woodshop Equipment		80	3,481	0	100	0	3,581
TOTAL Equipment & Furnishings		80	3,481	0	100	0	3,581
10 Electric Power And Lighting							
10. 1 Service and Distribution		34	1,965	0	2,122	0	4,087
10. 2 Branch Raceway & Wire		107	5,998	0	1,972	0	7,969
10. 3 Wiring Devices		41	2,430	0	1,809	0	4,239
10. 4 Lighting Equipment		35	1,925	0	2,541	0	4,466
TOTAL Electric Power And Lighting		217	12,317	0	8,443	0	20,760
11 Electrical Systems							
11. 1 Alarm Systems		30	1,763	0	1,283	0	3,046
TOTAL Electrical Systems		30	1,763	0	1,283	0	3,046
TOTAL ANIAK MIDDLE SCHOOL WOODSHOP		2,279	103,191	1,136	122,474	642	227,443
Contractor's General Conditions							142,954
SUBTOTAL							370,398
Contractor's Home Office Expense (5%)							18,520

	QUANTITY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
SUBTOTAL								388,918
Contractor's Profit (10%)								38,892
SUBTOTAL								427,809
Contractor's Bond (1%)								4,278
TOTAL INCL INDIRECTS								432,087
Design & Engineering Fees (8%)								34,567
SUBTOTAL								466,654
Contingency (10%)								46,665
TOTAL INCL OWNER COSTS								$513,320

** CONTRACTOR SETTINGS **

	AMOUNT	PCT	PCT S	RISK	DIFF	SIZE	PERIOD	INVEST	ASSIST	SUBCON
GC General Contractor (Prime)										
Contractor's General Conditions			C							
Contractor's Home Office Expense (5%)		5.00								
Contractor's Profit (10%)		10.00								
Contractor's Bond (1%)		1.00								
ME Mechanical Subcontractor										
Contractor's General Conditions		10.00								
Contractor's Home Office Expense (5%)		5.00								
Contractor's Profit (10%)		10.00								
Contractor's Bond (1%)		1.00								
EL Electrical Subcontractor										
Contractor's General Conditions		10.00								
Contractor's Home Office Expense (5%)		5.00								
Contractor's Profit (10%)		10.00								
Contractor's Bond (1%)		1.00								

General Contractor (Prime)	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
General Contractor (Prime)								
Overhead Items - GC								
Project Personnel								
Project Manager (@ 50 hours/mo)			50.00	2009.50	0.00	0.00	0.00	2009.50
	4.00	WK	200	8,038	0	0	0	8,038
General Superintendent (Field)			50.00	2009.50	0.00	0.00	0.00	2009.50
	10.00	WK	500	20,095	0	0	0	20,095
Expeditor/Purchasing			40.00	1740.61	0.00	0.00	0.00	1740.61
	4.00	WK	160	6,962	0	0	0	6,962
TOTAL Project Personnel			860	35,095	0	0	0	35,095
Field Office Equipment & Expense								
Field Office / Tool Shed			0.00	0.00	0.00	100.00	0.00	100.00
	10.00	WK	0	0	0	1,000	0	1,000
Office Supplies			0.00	0.00	0.00	50.00	0.00	50.00
	10.00	WK	0	0	0	500	0	500
Telephone, Fax & Answering Mach			0.00	0.00	0.00	100.00	0.00	100.00
	10.00	WK	0	0	0	1,000	0	1,000
Telephone Bills			0.00	0.00	0.00	500.00	0.00	500.00
	3.00	MO	0	0	0	1,500	0	1,500
TOTAL Field Office Equipment & Expense			0	0	0	4,000	0	4,000
Temporary Utilities								
Latrines			0.00	0.00	0.00	25.00	0.00	25.00
	10.00	WK	0	0	0	250	0	250
Electricity Bill - Allowance			0.00	0.00	0.00	100.00	0.00	100.00
	10.00	WK	0	0	0	1,000	0	1,000
TOTAL Temporary Utilities			0	0	0	1,250	0	1,250

General Contractor (Prime)		QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Submittals, Testing, Inspections									
	Shop Drawings & Reports, and As-builds.	1.00	JOB	40.00 40	1740.61 1,741	0.00 0	250.00 250	0.00 0	1990.61 1,991
	Photographs	3.00	MO	0.00 0	0.00 0	0.00 0	50.00 150	0.00 0	50.00 150
	Testing - Allowance (Concrete, etc.)	1.00	LS	0.00 0	0.00 0	0.00 0	2500.00 2,500	0.00 0	2500.00 2,500
	TOTAL Submittals, Testing, Inspections			40	1,741	0	2,900	0	4,641
Small Tools & Consumables									
	Small Tools - Purchase	2.50	MO	0.00 0	0.00 0	0.00 0	400.00 1,000	0.00 0	400.00 1,000
	Safety Supplies	1.00	JOB	0.00 0	0.00 0	0.00 0	100.00 100	0.00 0	100.00 100
	Rough Hardware - Miscellaneous	1.00	JOB	0.00 0	0.00 0	0.00 0	500.00 500	0.00 0	500.00 500
	TOTAL Small Tools & Consumables			0	0	0	1,600	0	1,600
Project Equipment									
	Project Equipment Budget - Assume local rental available on as-need basis. 1.) Pickup truck; 2.) Job truck; 3.) Forklift/Manlift/Hoisting Equipment; 4.) Loader/Backhoe. Allowance. Includes fuel, oil & grease.	1.00	JOB	0.00 0	0.00 0	15000.00 15,000	0.00 0	0.00 0	15000.00 15,000
	TOTAL Project Equipment			0	0	15,000	0	0	15,000
Freight									
	Freight - Building Materials, Barge freight expense to Aniak from Seattle and/or Anchorage. For order-of-magnitude estimate of total shipping weight for building materials and equipment, assume 40 LB of	80000	LB	0.00 0	0.00 0	0.50 40,000	0.00 0	0.00 0	0.50 40,000

General Contractor (Prime)		QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
	materials will be required per one square foot of new construction at 50 cents/LB. Actual area of new construction is approximately 2.000 square feet.								
	Additional air freight for miscellaneous small items, if required, Allowance.	1.00	JOB	0.00 0	0.00 0	1000.00 1,000	0.00 0	0.00 0	1000.00 1,000
TOTAL	Freight			0	0	41,000	0	0	41,000
Material Handling & Storage									
	Offload barge & transport materials to jobsite	120.00	MH	1.00 120	43.52 5,222	0.00 0	0.00 0	0.00 0	43.52 5,222
	Materials storage and weather protection materials	1.00	JOB	0.00 0	0.00 0	0.00 0	500.00 500	0.00 0	500.00 500
TOTAL	Material Handling & Storage			120	5,222	0	500	0	5,722
Project Travel									
	Travel Time - Superintendent	4.00	RT	16.00 64	696.24 2,785	0.00 0	0.00 0	0.00 0	696.24 2,785
	Travel Time - Labor	4.00	RT	16.00 64	696.24 2,785	0.00 0	0.00 0	0.00 0	696.24 2,785
	Travel Fares	8.00	RT	0.00 0	0.00 0	0.00 0	600.00 4,800	0.00 0	600.00 4,800
TOTAL	Project Travel			128	5,570	0	4,800	0	10,370
Subsistence & Camp									
	Food and Housing for superintendent, outside carpenters/laborers, and subcontractors. Budget allowance.	240.00	MD	0.00 0	0.00 0	0.00 0	80.00 19,200	0.00 0	80.00 19,200
TOTAL	Subsistence & Camp			0	0	0	19,200	0	19,200

General Contractor (Prime)	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Project Maintenance								
Periodic Cleanup			7.99	347.84	0.00	0.00	0.00	347.84
	8.00	WK	64	2,783	0	0	0	2,783
Final Cleanup			23.98	1043.53	0.00	250.00	0.00	1293.53
	1.00	JOB	24	1,044	0	250	0	1,294
TOTAL Project Maintenance			88	3,826	0	250	0	4,076
Insurance								
Builder's Risk Coverage - Budget			0.00	0.00	0.00	1000.00	0.00	1000.00
	1.00	LS	0	0	0	1,000	0	1,000
TOTAL Insurance			0	0	0	1,000	0	1,000
TOTAL Overhead Items - GC			1,236	51,454	56,000	35,500	0	142,954

Foundation Excavation/Backfill	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Substructure								
Foundation Excavation/Backfill								
Excavate nominal 4' deep by 6' wide trench on west, south, and east sides for new continuous concrete footings and foundation walls. (Excavate soils which have been treated and cleaned by others).			0.40	17.13	6.40	0.00	0.00	23.53
	90.00	CY	36	1,542	576	0	0	2,118
Hand trim at bottom of excavation for continuous footings.			0.03	1.38	0.00	0.00	0.00	1.38
	360.00	SF	12	495	0	0	0	495
Perimeter rigid insulation, 2" thick, at exterior of foundation walls			0.03	1.45	0.00	1.20	0.00	2.65
	600.00	SF	20	870	0	722	0	1,592
Backfill and compact soils around foundation footings and walls, vibrating plate			0.30	12.43	0.15	0.00	0.00	12.58
	60.00	CY	18	746	9	0	0	755
Compact soils under slab, vibrating plate. (Assume treated and clean fill suitable for constructing the woodshop foundation and slab will have been placed by others).			0.30	12.43	0.15	0.00	0.00	12.58
	150.00	CY	45	1,864	23	0	0	1,886
Fine grade for slab, by hand			0.67	27.52	0.00	0.00	0.00	27.52
	20.00	SQ	13	550	0	0	0	550
TOTAL Foundation Excavation/Backfill			144	6,067	607	722	0	7,397

Foundation Footings & Walls	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Foundation Footings & Walls								
Forms in place, continuous strip footings, 10" high.	240.00	SF	0.09 20	3.66 879	0.00 0	1.50 360	0.00 0	5.16 1,239
Forms in place, foundation	1000.00	SF	0.12 120	5.19 5,193	0.00 0	2.00 2,000	0.00 0	7.19 7,193
Reinforcing in place, continuous footings, #5 bar	360.00	LB	0.02 7	1.00 360	0.00 0	0.40 144	0.00 0	1.40 504
Reinforcing in place, foundation walls, #5	1200.00	LB	0.03 36	1.51 1,816	0.00 0	0.40 480	0.00 0	1.91 2,296
Reinforcing in place, dowels, 2' long, deformed, #5, for tie-in to slab on grade	60.00	EA	0.05 3	2.51 151	0.00 0	0.75 45	0.00 0	3.26 196
Concrete mix, regular weight, 3500 psi. Assume that concrete will be batched on-site in portable concrete mixers using local aggregates. Assume 6 to 7 sacks of cement per 1 CY concrete mix. Budget allowance.	24.00	CY	0.00 0	0.00 0	0.00 0	350.00 8,400	0.00 0	350.00 8,400
Place concrete in continuous footings, direct chute	8.00	CY	2.00 16	83.07 665	2.47 20	0.00 0	0.00 0	85.54 684
Place concrete, foundation walls, direct chute	16.00	CY	2.00 32	83.07 1,329	2.47 39	0.00 0	0.00 0	85.54 1,369
Curing, sprayed curing compound	1000.00	SF	0.01 8	0.33 329	0.00 0	0.10 100	0.00 0	0.43 429
Anchor bolts, 3/8" x 10"	40.00	EA	0.20 8	8.70 348	0.00 0	3.50 140	0.00 0	12.20 488
Strip forms, footings and	1250.00	SF	0.02 30	1.04 1,298	0.00 0	0.00 0	0.00 0	1.04 1,298
TOTAL Foundation Footings & Walls			281	12,368	59	11,669	0	24,096

Slab On Grade	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Slab On Grade								
Poly Vapor Barrier .25 mm			0.25	10.93	0.00	6.11	0.00	17.04
	20.00	CSF	5	219	0	122	0	341
Expansion joint, premolded, bituminous fiber, 1/2" x 6"			0.05	2.18	0.00	1.00	0.00	3.18
	180.00	LF	9	392	0	180	0	572
Reinforcing in place, slab on grade, #3 to #7 rebar			0.01	0.67	0.00	0.40	0.00	1.07
	4000.00	LB	53	2,684	0	1,600	0	4,284
Concrete mix, regular weight, 3500 psi. Assume that concrete will be batched on-site in portable concrete mixers using local aggregates. Assume 6 to 7 sacks of cement per 1 CY concrete mix. Budget allowance.			0.00	0.00	0.00	300.00	0.00	300.00
	20.00	CY	0	0	0	6,000	0	6,000
Place concrete, slab on grade, direct chute			1.50	62.30	1.85	0.00	0.00	64.15
	40.00	CY	60	2,492	74	0	0	2,566
Finish floors, monolithic, float finish			0.67	28.53	0.00	10.00	0.00	38.53
	20.00	CSF	13	571	0	200	0	771
TOTAL Slab On Grade			141	6,356	74	8,102	0	14,533
TOTAL Substructure			566	24,792	741	20,493	0	46,026

Roof Structural Frame	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Superstructure								
Roof Structural Frame								
Columns. Provide and install timber columns to support glulam beams. Six columns, nominal sizes 6"x6" x 14'	252.00	BF	0.02 4	0.73 183	0.00 0	2.00 504	0.00 0	2.73 687
Beams. Glued-laminated construction. Install three elevated glulam beams at 16' OC, each beam spanning 40 LF (120 LF, Total). Nominal size 5-1/8" x 30".	1800.00	BF	0.03 60	1.45 2,611	0.00 0	2.50 4,500	0.00 0	3.95 7,111
Joist. Wood joist system at intermediate level spanning between elevated glued-laminated beams. Assume TJI's or 2"x12" @ 2' OC. (1280 SF).	700.00	LF	0.04 28	1.74 1,220	0.00 0	2.00 1,400	0.00 0	3.74 2,620
Pony Walls. 2"x6" walls to support roof framing. Three pony walls, 10' high at centerline and sloped at 4:12 pitch each side to eaves. Located above glued-laminated beams.	600.00	SF	0.04 24	1.74 1,044	0.00 0	1.50 900	0.00 0	3.24 1,944
Roof Framing. 2"x10" joist and blocking at roof.	1500.00	SF	0.04 60	1.74 2,611	0.00 0	1.00 1,500	0.00 0	2.74 4,111
Sheathing. Plywood, CDX, nominal 5/8" thick. Structural sheathing for 1.) Intermediate level above glued-laminated beams, 2.) Pony walls and gable end (one-side per each wall); and 3.) Roof	3300.00	SF	0.02 66	0.87 2,872	0.00 0	0.75 2,475	0.00 0	1.62 5,347
Rough hardware and framing connectors. Add approximately 5%.	1.00	LS	0.00 0	0.00 0	0.00 0	1200.00 1,200	0.00 0	1200.00 1,200
TOTAL Roof Structural Frame			242	10,540	0	12,479	0	23,019

Exterior Wall Structure	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Exterior Wall Structure								
Exterior wall framing. Bottom and top plates, double, 2" x 8"	650.00	BF	0.03 20	1.31 850	0.00 0	1.00 650	0.00 0	2.31 1,500
Exterior wall framing. Studs. 2" x 8" @ nominal 14' high	2000.00	BF	0.03 50	1.09 2,180	0.00 0	0.73 1,460	0.00 0	1.82 3,640
Sheathing. Plywood, CDX, nominal 5/8" thick. Structural sheathing for exterior walls. From foundation wall up to eave. Includes gable end.	2200.00	SF	0.02 44	0.87 1,914	0.00 0	0.75 1,650	0.00 0	1.62 3,564
TOTAL Exterior Wall Structure			114	4,944	0	3,760	0	8,704

Interior Stair Construction		QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Interior Stair Construction									
	Stair construction. Rebuild stairs up to existing mezzanine level at north end of woodshop. Rough-in faming includes stair stringers, stair treads, and miscellaneous blocking.	500.00	BF	0.06 29	2.49 1,243	0.00 0	1.00 500	0.00 0	3.49 1,743
TOTAL	Interior Stair Construction			29	1,243	0	500	0	1,743
TOTAL	Superstructure			384	16,727	0	16,739	0	33,466

Exterior Walls	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Exterior Closure								
Exterior Walls								
Exterior Skin								
Wood product lap siding, assume pre-finished	2200.00	SF	0.05	2.18	0.00	4.00	0.00	6.18
			110	4,787	0	8,800	0	13,587
TOTAL Exterior Skin			110	4,787	0	8,800	0	13,587
Insulation and Vapor Barrier								
Tyvek building paper			0.33	14.51	0.00	5.76	0.00	20.26
	22.00	CSF	7	319	0	127	0	446
Wall insulation, 6" thick, R19, 15" W, fiberglass batt			0.01	0.44	0.00	0.62	0.00	1.06
	2200.00	SF	22	957	0	1,368	0	2,326
TOTAL Insulation and Vapor Barrier			29	1,277	0	1,495	0	2,771
Interior Skin								
Polyethylene vapor barrier			0.30	13.06	0.00	5.76	0.00	18.81
	22.00	CSF	7	287	0	127	0	414
TOTAL Interior Skin			7	287	0	127	0	414
Exterior Louvers and Screens								
Louver, aluminum w/screen, at gable			1.50	65.27	0.00	100.00	0.00	165.27
	1.00	EA	1	65	0	100	0	165
TOTAL Exterior Louvers and Screens			1	65	0	100	0	165
Exterior Soffits & Fascia								
Plywood soffit at roof eaves and gable			0.13	5.66	0.00	2.50	0.00	8.16
	140.00	LF	18	792	0	350	0	1,142
Fascia, 2" x 8", (prefinished or painted to match siding and metal roof).			0.08	3.48	0.00	2.50	0.00	5.98
	140.00	LF	11	487	0	350	0	837
TOTAL Exterior Soffits & Fascia			29	1,280	0	700	0	1,980

Exterior Walls	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
TOTAL Exterior Walls			177	7,695	0	11,221	0	18,917

Exterior Windows	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Exterior Windows								
Windows								
Windows at east side. Assume			2.00	87.03	0.00	150.00	0.00	237.03
arctic casement windows, nominal size 2' x 2' each.	3.00	EA	6	261	0	450	0	711
TOTAL Windows			6	261	0	450	0	711
TOTAL Exterior Windows			6	261	0	450	0	711

Exterior Personnel Doors	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Exterior Personnel Doors								
Man Door								
Door frame, insulated metal	1.00	EA	1.50 2	65.27 65	0.00 0	150.00 150	0.00 0	215.27 215
Exterior personnel door, 3' x 7', insulated hollow metal, with small window, safety glazed.	1.00	EA	2.00 2	87.03 87	0.00 0	400.00 400	0.00 0	487.03 487
Exterior door hardware, including lockset, kick plate, door closure, and weather-stripping.	1.00	SET	4.00 4	174.06 174	0.00 0	400.00 400	0.00 0	574.06 574
TOTAL Man Door			8	326	0	950	0	1,276
TOTAL Exterior Personnel Doors			8	326	0	950	0	1,276

Exterior Specialty Doors	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Exterior Specialty Doors								
Overhead Door								
Overhead door, commercial quality, 14' x 12', sectional, insulated, including tracks and frame	1.00	EA	23.98 24	1043.53 1,044	0.00 0	1600.00 1,600	0.00 0	2643.53 2,644
Add for electric trolley operator	1.00	EA	8.00 8	348.12 348	0.00 0	850.00 850	0.00 0	1198.12 1,198
TOTAL Overhead Door			32	1,392	0	2,450	0	3,842
TOTAL Exterior Specialty Doors			32	1,392	0	2,450	0	3,842
TOTAL Exterior Closure			222	9,675	0	15,071	0	24,746

Roof Coverings		QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Roofing									
Roof Coverings									
	Grace Ice & Water Shield			0.50	21.76	0.00	100.00	0.00	121.76
		10.00	SQ	5	218	0	1,000	0	1,218
	#30 asphalt felt underlayment			0.14	6.41	0.00	20.00	0.00	26.41
		28.00	SQ	4	179	0	560	0	739
	Metal roofing system, Includes ridge cap, flashing, accessories, and trim. Tie new roofing into existing roof at valley to provide a clean break.	28.00	SQ	5.00	232.31	0.00	550.00	0.00	782.31
				140	6,505	0	15,400	0	21,905
TOTAL	Roof Coverings			149	6,902	0	16,960	0	23,862

Roof Insulation and Fill	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Roof Insulation and Fill								
6 mil polyethylene, above ceilings	13.00	SQ	0.33 4	14.51 189	0.00 0	11.27 147	0.00 0	25.78 335
Ceiling insulation, 15" thk, R30, w/open access, fiberglass	1300.00	SF	0.03 33	1.04 1,346	0.19 244	1.50 1,950	0.00 0	2.72 3,540
TOTAL Roof Insulation and Fill			37	1,535	244	2,097	0	3,875
TOTAL Roofing			186	8,436	244	19,057	0	27,737

Partitions		QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Interior Construction									
Partitions									
Interior Partition Framing									
	Metal stud partitions 20 ga 6" W, 16" OC, 8' H, non-load bearing. Non-structural partition framing at Room 29 (Painting), Room 30 (Tools), Room 32 (Office), and Corridor 28 (Entry). Assume 9' high walls. (NOTE: The current demolition plan [by others] assumes that the existing mezzanine above these areas will remain, supported by temporary bracing during removal of the floor slab. The new room partitions would be built to the underside of the existing mezzanine.)	800.00	SF	0.05 40	2.18 1,741	0.00 0	1.00 800	0.00 0	3.18 2,541
	Acoustical wall insulation, 6"	800.00	SF	0.01 11	0.60 480	0.00 0	0.80 642	0.00 0	1.40 1,122
	TOTAL Interior Partition Framing			51	2,221	0	1,442	0	3,662
	TOTAL Partitions			51	2,221	0	1,442	0	3,662

Interior Personnel Doors	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Interior Personnel Doors								
Standard Interior Doors								
Corridor Door & Frame. Fire Door. Assume sidelight & glazing.	1.00	EA	8.00 8	348.12 348	0.00 0	1000.00 1,000	0.00 0	1348.12 1,348
Door hardware, corridor door. Panic bar, door closure, kick plate.	1.00	SET	4.00 4	174.06 174	0.00 0	500.00 500	0.00 0	674.06 674
Interior room door frames, hollow metal, painted	3.00	EA	2.00 6	87.03 261	0.00 0	125.00 375	0.00 0	212.03 636
Interior room doors, hollow metal, painted, 3' x 7'	3.00	EA	2.00 6	87.03 261	0.00 0	275.00 825	0.00 0	362.03 1,086
Door hardware, room doors. Lockset, closure, kick plate.	3.00	SET	2.50 8	108.79 326	0.00 0	250.00 750	0.00 0	358.79 1,076
TOTAL Standard Interior Doors			32	1,371	0	3,450	0	4,821
TOTAL Interior Personnel Doors			32	1,371	0	3,450	0	4,821

Interior Specialties	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Interior Specialties								
Fire Extinguisher								
Fire extinguisher cabinet for portable fire extinguishers. Verify quantity.	1.00	EA	2.00 2	89.65 90	0.00 0	75.25 75	0.00 0	164.90 165
Fire extinguishers, 20 lb, standard type, portable, dry chemical.	1.00	EA	0.00 0	0.00 0	0.00 0	90.00 90	0.00 0	90.00 90
TOTAL Fire Extinguisher			2	90	0	165	0	255
TOTAL Interior Specialties			2	90	0	165	0	255

Casework	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Casework								
Workbenches								
Workbenches along east wall, 3' high, 2" x 4" construction, three plywood tiers with chamfered edge and t rim. Pegboard backing. Budget allowance,	50.00	LF	1.51	54.79	0.00	25.00	0.00	79.79
			75	2,740	0	1,250	0	3,990
TOTAL Workbenches			75	2,740	0	1,250	0	3,990
TOTAL Casework			75	2,740	0	1,250	0	3,990
TOTAL Interior Construction			160	6,420	0	6,307	0	12,728

Wall Finishes	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Interior Finishes								
Wall Finishes								
Gypsum Wallboard Finishes								
Interior side of exterior walls - Gypsum wallboard, standard, 5/8" thk	2200.00	SF	0.03 63	1.24 2,735	0.00 0	0.40 880	0.00 0	1.64 3,615
Interior partitions - Gypsum wallboard, standard, 5/8" thk	1600.00	SF	0.04 64	1.74 2,785	0.00 0	0.40 640	0.00 0	2.14 3,425
Add - For penetration resistant gypsum wallboard	3800.00	SF	0.00 0	0.00 0	0.00 0	0.40 1,520	0.00 0	0.40 1,520
TOTAL Gypsum Wallboard Finishes			127	5,520	0	3,040	0	8,560
Painting to Walls								
Tape, texture and paint walls	38.00	SQ	1.50 57	54.53 2,072	0.00 0	75.00 2,850	0.00 0	129.53 4,922
TOTAL Painting to Walls			57	2,072	0	2,850	0	4,922
TOTAL Wall Finishes			184	7,592	0	5,890	0	13,482

Flooring and Floor Finishes		QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Flooring and Floor Finishes									
Resilient Accessories									
	Resilient wall base			0.04	1.79	0.00	1.25	0.00	3.04
		200.00	LF	8	358	0	250	0	608
	Floor mat at corridor entry			0.05	2.24	0.00	10.00	0.00	12.24
		40.00	SF	2	90	0	400	0	490
	TOTAL Resilient Accessories			10	448	0	650	0	1,098
Concrete Floor Application									
	Concrete floor finishes. Floor sealer/hardener. Allowance.	2000.00	SF	0.01 20	0.45 896	0.00 0	0.50 1,000	0.00 0	0.95 1,896
	TOTAL Concrete Floor Application			20	896	0	1,000	0	1,896
	TOTAL Flooring and Floor Finishes			30	1,344	0	1,650	0	2,994

Ceiling and Ceiling Finishes	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Ceiling and Ceiling Finishes								
Gypsum Wallboard Ceiling Finish								
Gypsum board ceilings, standard,			0.04	1.74	0.00	0.40	0.00	2.14
5/8" thk	2000.00	SF	80	3,481	0	800	0	4,281
TOTAL Gypsum Wallboard Ceiling Finish			80	3,481	0	800	0	4,281
Acoustical Ceiling Tiles & Panel								
Acoustical ceiling panels, in			0.02	0.87	0.00	2.50	0.00	3.37
woodshop. Budget allowance.	1200.00	SF	24	1,044	0	3,000	0	4,044
TOTAL Acoustical Ceiling Tiles & Panel			24	1,044	0	3,000	0	4,044
Paint Ceilings								
Tape, texture and paint ceilings			2.00	72.71	0.00	75.00	0.00	147.71
	8.00	SQ	16	582	0	600	0	1,182
TOTAL Paint Ceilings			16	582	0	600	0	1,182
TOTAL Ceiling and Ceiling Finishes			120	5,107	0	4,400	0	9,507
TOTAL Interior Finishes			334	14,043	0	11,940	0	25,983

Plumbing Fixtures	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Plumbing								
Plumbing Fixtures								
Sink								
Hand wash sink			2.67	107.84	0.00	200.00	0.00	307.84
	1.00	EA	3	138	0	257	0	395
TOTAL Sink			3	138	0	257	0	395
TOTAL Plumbing Fixtures			3	138	0	257	0	395

Domestic Water Supply	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Domestic Water Supply								
Pipes and Fittings								
Copper piping, Less than 1" diameter. Plumbing hot, cold, and hot water return. Tie into existing potable water system. (For hand wash sink.)			0.08	3.51	0.00	1.50	0.00	5.01
	60.00	LF	5	270	0	115	0	386
Piping insulation			0.05	2.19	0.00	1.50	0.00	3.69
	60.00	LF	3	169	0	115	0	284
TOTAL Pipes and Fittings			8	439	0	231	0	670
TOTAL Domestic Water Supply			8	439	0	231	0	670

Sanitary Waste and Vent System	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Sanitary Waste and Vent System								
Waste Pipe and Fittings								
Under slab piping - Inspect and repair existing under slab waste piping. Reuse. Budget allowance.	1.00	LS	4.00	171.28	118.28	50.00	0.00	339.57
			4	220	152	64	0	436
TOTAL Waste Pipe and Fittings			4	220	152	64	0	436
Floor Drain								
New floor drain fixture	1.00	EA	2.00	80.88	0.00	125.00	0.00	205.88
			2	104	0	160	0	264
TOTAL Floor Drain			2	104	0	160	0	264
TOTAL Sanitary Waste and Vent System			6	324	152	225	0	700
TOTAL Plumbing			16	901	152	712	0	1,765

Terminal and Package Units	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
HVAC								
Terminal and Package Units								
Unit Heater								
Unit heater, heavy duty.			20.00	886.00	0.00	2000.00	0.00	2886.00
Ceiling mounted, vertical.	1.00	EA	20	1,137	0	2,566	0	3,703
Budget.								
TOTAL Unit Heater			20	1,137	0	2,566	0	3,703
Saw Dust Collection System								
New dust collection system.			60.00	2556.57	0.00	15000.00	0.00	17556.57
Budget allowance.	1.00	EA	60	3,281	0	19,248	0	22,529
TOTAL Saw Dust Collection System			60	3,281	0	19,248	0	22,529
Ceiling Fan								
Ceiling Fan			4.00	170.44	0.00	400.00	0.00	570.44
	1.00	EA	4	219	0	513	0	732
TOTAL Ceiling Fan			4	219	0	513	0	732
TOTAL Terminal and Package Units			84	4,636	0	22,328	0	26,964

Controls and Instrumentation	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Controls and Instrumentation								
HVAC Controls								
Thermostats and HVAC controls.			0.00	0.00	0.00	0.00	500.00	500.00
	1.00	LS	0	0	0	0	642	642
TOTAL HVAC Controls			0	0	0	0	642	642
TOTAL Controls and Instrumentation			0	0	0	0	642	642
TOTAL HVAC			84	4,636	0	22,328	642	27,606

Reinstall Woodshop Equipment		QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Equipment & Furnishings									
Reinstall Woodshop Equipment									
	Reinstall Owner's woodshop equipment including the following items: wood lathe, planer and joiner, radial arm saw, table saw, jig saw, sander, grinder, band saw, movie screens, and miscellaneous portable equipment, and paint spray booth. Budget allowance.	1.00	JOB	80.00 80	3481.22 3,481	0.00 0	100.00 100	0.00 0	3581.22 3,581
	TOTAL Reinstall Woodshop Equipment			80	3,481	0	100	0	3,581
	TOTAL Equipment & Furnishings			80	3,481	0	100	0	3,581

Service and Distribution	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Electric Power And Lighting								
Service and Distribution								
New "Panel C", including circuit			16.00	730.07	0.00	1200.00	0.00	1930.07
breakers.	1.00	EA	16	937	0	1,540	0	2,477
Feeder Conduit 1.5" dia.			0.12	5.48	0.00	3.75	0.00	9.23
Including couplings and fittings. Tie into existing power in main school building. Budget allowance.	50.00	LF	6	351	0	241	0	592
Feeder conductors			0.02	0.81	0.00	0.95	0.00	1.77
	200.00	LF	4	208	0	245	0	453
Grounding rod, clamp, wire and			8.00	365.04	0.00	75.00	0.00	440.04
connections	1.00	EA	8	468	0	96	0	565
TOTAL Service and Distribution			34	1,965	0	2,122	0	4,087

Branch Raceway & Wire	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Branch Raceway & Wire								
EMT conduit w/couplings, fittings. interior conduit raceway for power devices and lighting fixtures. Includes allowance for junction boxes, flexible conduit, etc.	750.00	LF	0.10 75	4.29 4,124	0.00 0	1.25 1,203	0.00 0	5.54 5,327
Wire, 600 volt, type THWN-THHN, copper, stranded, #10	4.00	MLF	8.00 32	365.04 1,874	0.00 0	149.73 769	0.00 0	514.77 2,642
TOTAL Branch Raceway & Wire			107	5,998	0	1,972	0	7,969

Wiring Devices	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Wiring Devices								
Wiring device, receptacle, duplex	30.00	EA	0.75 23	34.22 1,317	0.00 0	30.00 1,155	0.00 0	64.22 2,472
Wiring device, receptacle, special purpose (Waterproof outlets, range outlets, dryer outlet, etc.)	1.00	EA	1.00 1	45.62 59	0.00 0	60.00 77	0.00 0	105.62 136
Miscellaneous equipment connections (wood working machines, ceiling fan, unit heater, etc.). Allowance.	18.00	EA	1.00 18	45.62 1,054	0.00 0	25.00 577	0.00 0	70.62 1,631
TOTAL Wiring Devices			41	2,430	0	1,809	0	4,239

Lighting Equipment	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Lighting Equipment								
Ceiling mounted light fixtures - Woodshop Area	9.00	EA	2.00 18	85.71 990	0.00 0	125.00 1,444	0.00 0	210.71 2,434
Ceiling mounted light fixtures - Office/Tool area. Fluorescent fixtures.	3.00	EA	2.00 6	85.71 330	0.00 0	125.00 481	0.00 0	210.71 811
Switches including boxes and cover plates	4.00	EA	1.50 6	64.28 330	0.00 0	30.00 154	0.00 0	94.28 484
Exit Lights	2.00	EA	1.50 3	64.28 165	0.00 0	80.00 205	0.00 0	144.28 370
Exterior wall mounted light fixture. HID	1.00	EA	2.00 2	85.71 110	0.00 0	200.00 257	0.00 0	285.71 367
TOTAL Lighting Equipment			35	1,925	0	2,541	0	4,466
TOTAL Electric Power And Lighting			217	12,317	0	8,443	0	20,760

Alarm Systems	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	SUBCNTR	TOTAL COST
Electrical Systems								
Alarm Systems								
Fire Alarm Systems								
Fire alarm system, including detection devices (smoke detectors, temperature detectors), conduit & wire. Tie into existing building system. Budget allowance.			29.98	1373.78	0.00	1000.00	0.00	2373.78
	1.00	LS	30	1,763	0	1,283	0	3,046
TOTAL Fire Alarm Systems			30	1,763	0	1,283	0	3,046
TOTAL Alarm Systems			30	1,763	0	1,283	0	3,046
TOTAL Electrical Systems			30	1,763	0	1,283	0	3,046

No errors detected...

* * * END OF REPORT * * *

APPENDIX B

"IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT"

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Attachment to 32-1-16754
Dated: January 2004
To: ADEC
Re: Aniak Middle School

Important Information About Your Geotechnical/Environmental Report

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors which were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland