Applied Environmental Consulting, Inc.

Prospectus

(Revised 2022)

Applied Environmental Consulting, Inc. (AEC) was founded in 1992 by Bernhardt (Ben) C. Warren to provide health physics consulting services to the nuclear industry. The primary services are preparation of applications for the LICENSING of radioactive materials and registration for x-ray units, TRAINING of the workers and oversee the regulatory requirements in the DECOMMISSIONING of industrial facilities and general health physics services to the industrial sector. These services include providing general health physics consulting, training for Authorized Users, dosimetry advise, dose assessments, preparing procedures and application documents, performing audits and assessment of licensed activities, exploring lost source concerns, evaluating potential doses to the public, providing a myriad of certified radiation protection training programs, surveying land areas to identify changes in background radiation and functioning as radiological consultant to sites being decommissioned.

MAIN BUSINESS FOCUS

Applied Environmental Consulting, Inc. focuses its expertise in the industrial sector providing the services to a myriad of industry groups. One common thread between several of the groups is the use of fixed industrial gauges that contain radioactive materials. Another commonality is that those clients that mine and technologically-enhance the naturally-occurring radioactive materials (TENORM) from the ground make the disposal of the equipment problematic and under regulatory oversight. For the fixed gauges, AEC provides certified training for the advanced authorized user (40 hour) and authorized user to include inventorying, gauge leak testing, relocation, surveying and all other regulatory requirements of possessing fixed industrial gauges. Those companies that enhance TENORM must undergo the decommissioning of their plants. This requires a complicated process under regulatory guidelines to complete.

In addition, many customers have industrial x-ray units for use in elemental analysis, microscopy, or radiographic operations. AEC provides the training for the worker, prepares Radiation Protection Programs and performs the required annual reviews and surveys of the program to ensure that the program is providing the program that keeps the doses to the employees as low as reasonably achievable.

FIXED GAUGES

AEC focuses on the health physics support for the industrial sector. One of the primary uses of fixed gauges is the non-tactile (touching) of the product while perform a density measurement. This technique assists the company in keeping the flow of materials moving through the plant. These gauges can be used in several methods, such as the mounting on pipes to monitor the flow of slurries carrying product, placing on conveyor belts to monitor the movement of solids, or placing on tanks or vessels to monitor the fill-

level of liquids, slurries or solids. The use of fixed gauges assists the plant operator in having many monitoring points in the plant that are electronically tied into the control system to quickly identify problems so they can be remedied before a major issue occurs. In addition, the gauges can be used to quantify the density or amount of product that is being moved through the plant. These gauges have discrete sealed sources that emit gamma radiation that is shielded in its source holder. As the shutter is opened, the radiation levels increase allowing the radiation to penetrate the target and reach a detector which quantifies the amount of radiation attenuated, thus automatically calculating the amount of product being measured. These sealed sources create a small risk of exposure and ultimate dose. Keeping these doses as low as reasonable is our goal.

The services provided by AEC include the training of the operators. This includes the 40-hour training course to certify Advanced Authorized Users that have the complete understanding of the radiological requirements of the plant. They are also qualified to be the site Radiation Safety Officers (RSOs). For those companies wanting a general RSO capability, a 24-hour RSO course is offered. Limited authorized user training in the form of an 8-hour training course is provided. In addition, AEC performs the USDOT HAZMAT training for the users at the facility to be able to ship the industrial gauges on the highway. And finally, customized refresher training is provided for the plant personnel as recommended by the RSO.

On-site services include conducting a radiological review of the radiation protection program to assure that the activities of the RSO and plant are maintaining exposures as low as reasonably achievable (ALARA) is performed by AEC annually of all its clients. Also, AEC field health physics technicians inventory the industrial gauges, assist the client in performing leak testing services, clean and care for the gauge and verify the required posting as being accurate.

AEC's clients that possess fixed gauges are members of the Mining and Non-mining groups.

Some of these industries are discussed in more detail below:

MINING

Those companies involved in mining have a unique function in that they are extracting naturally-occurring radioactive materials from the earth and concentrating it in their chemical processes when processing the ores.

Phosphate industry

AEC has been providing professional services to the phosphate industry since 1992. These companies are on annual contracts performing full-service health physics support. There are many services licensing and regulatory functions. AEC has continued to provide on-site radiological support services for the radioactive materials, assisted in preparing and maintaining a broad industrial license and provided quarterly consulting

services for the Radiation Safety Committee. One license has expanded from four to twelve sites under the broad license during the time of contractual relationship. The phosphate companies are authorized for the possession of fixed industrial gauges containing radioactive materials and enhanced naturally-occurring radioactive materials.

During this contracting history, the decommissioning of their uranium recovery operations was unique. Decommissioning is beyond the simple closing of the plant. The company is not released from the regulatory restrictions until the license is terminated by the regulatory agency. Uranium recovery was the licensing process that allowed the phosphoric acid from the fertilizer production to be processed through a side-circuit to remove the uranium. Then, the uranium-depleted phosphoric acid was returned to the fertilizer production plant to continue the process to make fertilizer. The demolition and closing of these plants occurred when the price of uranium was no longer competitive. This activity included providing the pre-decommissioning survey and developing the decommissioning plan according to regulatory guidelines. The decommissioning plan included the scope and degree of demolition of the facilities by contractors decided by the clients, negotiating the conditions with the regulatory agency, assisting the companies in reviewing demolition contractors, providing training to the site demolition contractors, providing oversight of the procedures and releasable items, performing a post-survey, and preparing the final report. This was used to terminate the radioactive materials license and release any financial bonding required by the State of Florida.

To date AEC has directly coordinated the decommissioning of four uranium recovery plants.

The main phosphoric acid plants that transform the ore to fertilizer also go through decommissioning when their useful life is complete. Since the phosphoric acid plants chemically transform the ore, it enhances and concentrates the naturally-occurring radioactive materials in the ore on the surface of the tanks, pumps, piping and valves to a regulatory concentration called Technologically-Enhanced Naturally Occurring Radioactive Materials (TENORM). In order to obtain relief from the license, a decommissioning plan, similar to the uranium recovery decommissioning, must be completed. The dismantled equipment requires surveying by company personnel training by AEC prior to release for metals salvage. Much of the contaminated equipment is decontaminated on-site prior to obtain releasable status. There are several technologies to include water and grit blasting requiring personal protective equipment by the workers. All these activities required training, technical consulting and support provided by AEC. After demolition of the site, the site is surveyed, sampled and a report completed for the regulators to review and approve.

To date, AEC has been directly involved in the decommissioning of five phosphoric acid sites.

Rare-earth minerals

AEC provided professional services to the rare-earth industry since the mid-90s. Services included performing and assessing doses from the respective applications within a licensed mineral extraction (titanium) facility. This included performing a baseline assessment of the site, the potential exposure pathways using air sampling and area monitors, particle size assessment, worker interviews, and Time & Motion studies. Results were provided to the company's management as to their potential areas of concern and recommendations to minimize worker exposures using administrative and mechanical controls. Services also included performing the renewal of the radioactive materials license. Then began of the decommissioning process of performing a pre-demolition survey, preparing a decommissioning plan, surveying items to be released from the site and sampled the site after the facility was demolished.

Kaolin Mining

AEC has been providing professional services to the kaolin industry since 1992. The kaolin industry mines kaolinite clays for the production of a fine white substance used in many products, such as paint pigments, toothpaste and the white slickness in paper. These companies are on annual contracts in which AEC performs full-service health physics support. These clients are authorized for the possession of fixed industrial gauges containing radioactive materials and enhanced naturally-occurring radioactive materials.

When these plants come to the end of their useful life, decommissioning is required. Similar to the phosphate industry, these plants must go through the regulatory rigors of the decommissioning process.

The decommissioning of two sites in Georgia and one in the State of SC has been completed.

OTHER CLIENT GROUPS

In addition to the above gauges and TENORM clients, AEC consults the industry that possesses and uses radioactive materials in a myriad of methods. AEC has also provided research in the better understanding of the risk of handling the materials.

Research Companies

Clients use radioactive materials tagged to organic compounds which are used as tracers. The purpose is to identify the efficacy and tenaciousness of the research compound. For example, herbicides and pesticides need to be tested to assure that they are effective and do not linger in the environment to assure no more environmental problems, like DDT.

After administration of the tracer to a plant or soil, samples are taken to identify the extent of uptake and persistence. These results are provided the product manufacturer who submits the report to the federal agencies to obtain permits for distribution to the general public. The primary radioactive material is carbon-14 tagged to an organic compound.

To date decommissioning of plots where radioactive materials have been administered have been completed in Florida, Georgia, Texas, Illinois, Mississippi and California.

Pulp & Paper Industry

AEC has been providing professional services to the Pulp & Paper industry for over twenty years. The Pulp & Paper industry uses fixed industrial gauges to monitor the flow of liquid and semi-solid materials through their facilities. These companies are on annual contracts in which AEC performs full-service health physics support. These clients are authorized for the possession of fixed industrial gauges containing radioactive materials and some may have technologically-enhanced naturally-occurring radioactive materials.

When these plants come to the end of their useful life, decommissioning is required. Similar to other fixed gauge industries, these plants must go through the regulatory requirements of the removal, shipping and disposal of these gauges.

Department of Defense Contractors

AEC provides licensing and health physics support to several companies who are contractors to the Department of Defense. The use of radioactive materials is primarily the use of small amounts of discrete sources used in the tactical equipment used by the military.

Veterinary Hospitals

AEC provides licensing, radiation protection training and general health physics support to veterinary hospitals that treat cats with I-131. Cats with overactive thyroids are not very good pets as their metabolism is too high driven by an overactive thyroid. The injection of I-131in the cat allows the radioactive iodine to be concentrated in the thyroid and reduce the metabolism in the cat. The injection, care, handling of the kitty litter and related paraphernalia, monitoring doses to the workers, and contamination control of the laboratory until the cats are ultimately discharged are the primary issues that must be approved through a license prior to receiving radioactive materials.

GENERAL RADIATION SERVICES TO INDUSTRY

AEC has provided site assessment surveys of raw land to land reclaimed during the mining operations. The purpose is to identify the background levels and if there are any elevated levels potentially needing remediation prior to construction of major projects, such as golf courses and resorts.

AEC performed a dose reconstruction for workers in a salvage yard due to a source being "lost" from a licensee. Performed interviews with the potentially affected employees, performed Time & Motion studies to determine doses to all the handlers and drivers and provided a final report to the licensee.

AEC provided health physics services, licensing and As Low As Reasonably Achievable (ALARA) assessments to a company engaged in the manufacture and distribution of brachytherapy implants containing I-125 prostate seeds.

AEC provides licensing and health physics consulting services to a laboratory using krypton-85 (noble radioactive gas) in specialty lamps, including commercial aircraft. AEC assisted client obtain radioactive materials license and a federal exempt distribution license.

AEC obtained a license for a major metals smelting company after a cesium-137 industrial gauge was inadvertently smelted and contaminated the plant. After shutdown and decontamination with a cost of over $10MM, a license was required for the residual radioactivity that could not be removed.

AEC provides radon studies for plant having phosphogypsum stacks in the phosphate industry requiring closure and periodic radon testing. In addition, radon tests were performed to determine worker exposure in mining tunnels where background radiation is release and accumulates. AEC provided recommendations as to the mitigation of the air concentrations.

AEC provided radioactive waste management consulting to a large company with over 40,000 contaminated and rusted 55 gallon drums as to a viable and competitive disposal option.

AEC provides facility design, licensing and regulatory support for a company beginning a TENORM decontamination facility for the industry.

AEC has provided other site remediation and decommissioning projects. In addition to those described above, AEC has performed the decontamination and decommissioning of several sites with various types of radionuclides, to include: thorium oxide and tritium. This included remediation of laboratory facilities to the removal of soils and obtaining the final decommissioning approval. Of these clients (3) the decommissioning was completed in Florida.

AEC provides health physics services to clients with laboratory sedigraph and other tabletop x-ray units to include the radiation protection training for the users, survey of the x-ray units, preparation of the radiation protection program, assist in regulatory concerns and registration of new units and disposal of unusable units. This also includes the assistance in the proper radiation safety management of portable x-ray units, such as XRF

handheld units. For these, AEC prepares a logbook for use by the client to manage the control, use and security for each unit.

AEC PERFORMING RESEARCH

Florida Institute of Phosphate Research

AEC conducted a multi-year research project to determine external and internal radiation doses to workers in the Florida phosphate industry due to Technologically-Enhanced Naturally-Occurring Radioactive Materials (TENORM). The study included a comparison of external dosimetry methods using pressurized ion chambers, scintillation survey meters, optically stimulated luminescent dosimeters, and lithium fluoride TLDs. Inhalation doses were estimated using air samplers in working zones and published dose conversion factors. Total effective dose equivalents were calculated using measured parameters and uncertainty analysis methods including Monte Carlo techniques to generate dose distributions. A formal document was published and is available under the Florida Institute of Phosphate Research - publication number 05-046-155.

In addition, AEC performed a study to provide information as to the characterization of objects contaminated with TENORM within the industry. Technical enhancement is the separation of the principal radionuclides, namely uranium and radium-226, with the resultant material not in equilibrium. TENORM is currently defined by most of the regulatory agencies; however, the compliance criteria differ between states. Seven facilities participated in the study that lasted twelve months. Current practices at each site were reviewed with results being anonymous. Each site maintained a “lay-down” area or “boneyard” where items were collected, segregated and surveyed prior to determining the disposition. Samples were taken from debris, metals, and other items destined for landfills, salvers and phosphogypsum stacks. Collective sample analyses indicated the enhancement being 72% favoring uranium and 25% favoring radium. Thirty-five percent of the uranium samples had activity 10 times greater than the radium activity. Over 50% of the discarded items went to salvers, of which 66% had background radiation levels. One hundred tons of debris destined for off-site disposition consisted of approximately 4.5 millicuries of uranium and 8 millicuries of radium. One hundred thirty-six total samples were taken with detailed descriptions delineating identification, radiation levels, estimated mass and whether having fixed or removable contamination. A formal document was published and is available under the Florida Institute of Phosphate Research - publication number 05-059-191.

AEC’s founder developed a 40-hour radiation protection training program for the Florida Institute of Phosphate Research to use in conjunction with their partner, the International Atomic Energy Agency (IAEA). This training was tailored into three categories of training for the MANAGEMENT, the site ENGINEERS and the WORKERS. The IAEA is offering this training program to their clients in the world-wide phosphate production arena and associated disciplines.