NUCLEAR METALS, INC.

13 November 1990

United States Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406

Attention: Mr. John Kinneman
Mr. Francis Costello

Reference: License No. SMB-179
Subject : Holding Basir Remediation Project

Gentlemen:

During the course of the last unannounced routine inspection, a request was made by Mr. Costello that NMI provide the NRC with a written status report of our progress with remediation of our Holding Basin. As you know, NMI discontinued discharge to the Holding Basin in 1985 and capped it with an impermeable Hypalon cover in 1986. This correspondence will summarize subsequent activities to date and indicate our plans for the immediate future.

Extraction of Representative Sample

Beginning in the month of February, 1989, NMI sought permission from the State of Massachusetts Department of Environmental Protection (DEP) to extract a representative 20,000 pound sample of impoundment sludge for the purpose of demonstrating the feasibility of recovering certain Holding Basin constituents. After responding to two rounds of questions posed by DEP, NMI was granted approval of plans to extract the 20,000 lbs. of sludge in July of 1989. In August NMI issued a Request For Proposal (RFP) to a pre-qualified list of contractors. Field visits and bidding for the sampling work took place in two rounds between August and September 18, 1989, at which time the contract was awarded to Environmental Applications, Inc. (EA) of Waltham, Massachusetts. (EA was also the selected contractor who installed the Holding Basin cover in 1986.)

The extraction began in October 1989 and was completed in December of 1989, meeting all requirements of the DEP and our own internal radiation safety guidelines called out in SMB-179, our source material license. The sample was packaged in DOT specification 30 gallon drums and staged within an existing building immediately adjacent the Holding Basin which we have previously referred to in license correspondence as the "acid house". An internal report, entitled "Holding Basin Sludge Sampling Project", was written and carries a final report date of July, 1990. This report documents the procedures employed to extract the 10 tons of sludge and pertinent training, health/safety and environmental information used and collected during the project. (A copy of this report is appended to this letter.)

9102270230 910211
REG1 LIC40
SMB-179 PDR

Resource Recovery Work

The original contractor selected to perform the resource recovery feasibility work on the 20,000 lb. sample, for a number of reasons, declined to bid on the project after we had excavated the representative lot of Holding Basin Sludge. The prospective contractor advised NMI that a principal reason for his decision was a basic reorientation of his business plans. NMI then reinstated the search for a company to process the Basin sludge, since it has always been our intent to evaluate the resource recovery option and its potential for reducing the volume of material requiring low level waste burial and improving the overall economics of the project.

In June of 1990 NMI again solicited proposals for resource recovery processing of the excavated sludge. We received, in late June, a proposal and presentation by a group of companies from the Denver, Colorado area, headed by Industrial Compliance Technologies (ICT), a division of Industrial Compliance Inc. ICT is in the business of managing waste recovery/remediation projects of the size and scope of our Holding Basin effort. Two other companies participated in the proposal, Hazen Research, Inc., based in Golden, Colorado and Wastren, Inc. of Westminster, Colorado. Both have experience in uranium resource management that complements ICT.

In July of 1990, a group of I representatives visited these three companies to explore the details of their proposal. These discussions proved fruitful, and NMI issued a purchase order to ICT in September to perform a Phase 1 effort. This effort will be 14 weeks in duration and is intended to answer significant questions about the technical and economical feasibility of recovery of Basin constituents. A comprehensive regulatory review wil also be provided. A final report for Phase 1 is due by mid-January 1991. This report will provide NMI with a Capital Equipment and Operating cost estimate for the entire project and, more fundamentally, will tell us if resource recovery is a path we should continue to pursue. Phase 2 would build upon information generated in Phase 1 and should entail performing an engineering evaluation and process demonstration using at least 1,000 lbs. of sludge. Phase 3 work would be the full scale project, should we elect to pursue it. We are confident at this writing that ICT and their project team members, Hazen Research and Wastren, Inc., bring a high order of expertise and competence to the definition of this alternative.

Utah Disposal Option

As has been previously reported to you, NMI has been awaiting the issuance of an amendment to the license of the Clive, Utah site managed by Envirocare of Utah, Inc. This amendment would allow the site to receive certain NRC licensed wastes. We began consideration of the bulk disposal option in Utah in December of 1987 with our initial contact of the site operator. We have observed steady progress over the past three years toward licensing the site to receive NRC regulated materials such as our Holding Basin sludge. We have reported these developments to Mr. Costello from time to time, often sending background documents as they became available to us.

This past spring (May 1990) the state of Utah's agreement with the NRC to regulate certain activities related to the control of radioactive materials was amended to include authority to regulate the land disposal of source, byproduct and special nuclear material. (54FR49143 has a description of the amendment.) The Utah Bureau of Radiological Control (Utah-BRC) has indicated that they will license the Envirocare site to receive select materials such as large volumes of waste containing small concentrations of NRC regulated radionuclides. Holding Basin sludge and the contaminated soil immediately adjacent to and below the Basin have already been determined to be suitable for internment at the Envirocare site by the site operator and the Utah-BRC. It is our understanding that the NRC (State, Local, and Indian Tribes Program Office) is in the process of a final re-review of the matter with the Utah-BRC. We have been told that the amendment will probably be issued by the end of CY90.

This disposal option will be especially attractive should the resource recovery process referred to above prove to be either technically or economically unfeasible. It is conceivable that both options will be used in a complementary way, with resource recovery being performed on the sludge and bulk disposal being used for disposition of underlying soils and secondary wastes from resource recovery.

Either of these alternatives will require the excavation of the contents of the Basin. Therefore NMI is concurrently proceeding with detailed plans for this activity. A preliminary to physical removal of the sludge will be the erection of a temporary structure which will cover the entire Basin. This structure will minimize the impacts of weather on the operation and will be a major element of NMI's contamination control and health/safety program. An RFQ was issued on 17 September 1990, and seven contractors were represented at a bidders' conference the following week, during which the technical and environmental aspects of the project were clarified. Five proposals were submitted and are currently being reviewed by NMI. Contract award should be made before the end of the year. Emplacement of the enclosing structure will itself be a significant undertaking. The spring and summer of 1991 are scheduled for this task and for the finalization of details and ancillary work (e.g. temporary loading dock) to support an accelerated excavation campaign during the spring and summer of 1992.

Summary

We have described above the actions taken to date by NMI to remediate the neutralized acid Holding Basin which has been out of service for some five years. Our commitment to this project began several years ago when we made several major changes to our manufacturing process for depleted uranium materials. Closed loop acid pickling and waste water treatment operations have enabled NMI to replace process discharges to the Basin with an environmentally sound alternative, whereby no process waters are released from our facilities. We have described these operations in detail in past license amendment correspondence with the Region. Isolation of the Basin material from the environment by the impermeable cover further reduced the likelihood of ground water contamination by diverting possible rainwater/surface water infiltration. Our extensive ground water sampling program (over 30 sampling points 2X per year since 1980) continues to show no evidence of sludge (uranium/copper) migration more than a few feet from the Basin proper. There are no indications of elevated uranium/copper values in ground water on or off the NMI site. Elevated nitrate levels (the result of past use of nitric acid) have shown significant reduction since capping in 1986, and wells adjacent to the Basin (thru May 1990 sampling round) are of drinking water quality for all parameters sampled. This information further confirms the statements made in NRC document SECY-90-121 that the Basin presents "no immediate threat" and that the radiological hazard is under complete control by a management that is capable and willing to complete the remediation work.

We continue to work matters with the Massachusetts-DEP regarding the provisions of Chapter 21E of the Massachusetts General Laws. Since October of 1988 when these laws became effective, we have had to comply with the provisions of the Massachusetts Contingency Plan (MCP) which require all activities related to our remediation work to be pre-approved by DEP. These requirements were explained to Region I representatives during a meeting at King of Prussia offices in December of 1988. They are of a broader scope and deal with the entire NMI site, of which the Holding Basin is a part. We have been told unofficially by DEP that the excavation of the Basin for resource recovery or disposal can be accomplished before we complete all the formal steps of the MCP process. A formal letter from DEP stating this position has been requested. As a result, we do not believe that MCP requirements will interfere with the schedule of actions discussed above.

We are also coordinating our activities closely with the Town of Concord, primarily by scheduled progress reports at regular meetings of the Board of Health. Last January the Massachusetts DEP designated NMI as a "Public Involvement Program" (PIP) site. This action formalizes community relations and communication activities that we believe are completely compatible with the final remediation of the Holding Basin, a goal shared by all parties.

During the coming year we look forward to initiating detailed discussions with the Region concerning this project. Critical issues such as acceptable release limits and reporting requirements are among many topics that will be defined by such discussions. We will continue to update NRC on both regulatory and technical developments as we move forward, and we would also be happy to discuss with you, in greater depth, any of the items covered in this letter. NMI appreciates your invaluable and continuing assistance as we proceed with this important project.

Sincerely,

Frank J. Vumbaco

Frank J. Vumbaco, Manager
Health and Radiation Safety

FJV/dw

Attachment

HOLDING BASIN SLUDGE SAMPLING PROJECT

FINAL REPORT

JULY 1990

Submitted By:

NMI NUCLEAR METALS, INC.

2229 Main Street • Concord, Massachusetts 01742

1.0 BACKGROUND:

Nuclear Metals, Inc. (NMI) considers that one option for dispositioning its metal hydroxide holding basin is to process the basin sludge for its recoverables which have a value. The objective is to recover the depleted uranium and copper while returning other constituents such as gravel or calcium compounds to a non-radioactively contaminated state. Extensive interest has been received from a potential bidder to process the basin and is currently being evaluated for its technical merit. It would be necessary for that vendor or any other firm wishing to process the sludge to first perform preliminary chemical process and analytical work with sufficient representative sludge to perfect and prove-out the process.

Consequently, a Request For Proposal (RFP) was issued to a list of qualified contractors during August of 1988 to extract 20,000 pounds of representative material from the basin. Field visits and bidding took place in two rounds between August and September 18, 1989 when the contract was issued for the sampling phase.

The sampling plan had the benefit of Department of Environmental Protection (DEP) review. Formal introduction to DEP of the resource recovery option took place as part of NMI's Waiver Application/Preliminary Assessment/Interim Site Classification/Phase I Investigation submission which was sent to DEP on December 22, 1988. This submission was in keeping with the Massachusetts Contingency Plan (MCP) 310 CMR Part 40. Several phone conversations coupled with confirmatory correspondence led to DEP verbal approval of the plan on June 28, 1989. Formal written approval was received on July 10, 1989 and was followed by a DEP site visit on July 19, 1989. The Concord Board of Health and the Nuclear Regulatory Commission (NRC) were also informed and updated of the sampling plan during this same time period. With all agencies in agreement, NMI was able to issue the above mentioned contract in September.

Environmental Applications, Inc. (EA) of Waltham, Ma. was selected as the contractor to remove the sample from the basin. Between September 25 and October 11, 1989 several discussions were held between NMI and EA regarding the details of the extraction scheme and the safety as well as environmental controls that would be implemented. EA's personnel who would be working at the site received NMI's health and safety training consistent with NMI's NRC license requirements.

2.0 SAMPLING EFFORT:

EA began site work on October 16, 1989 by surveying and laying out a 10 foot by 10 foot alpha numeric grid pattern on the basin's Hypalon cover. The Hypalon cover had been installed in December of 198^ to seal the basin sludge from rain water infiltration and to eliminate any potential for sludge particulates becoming airborne through wind dispersion. The sampling plan included the requirement to not impair the cover from protecting the environment. The grid pattern provided a means to identify the location from which a given portion of the sample was to be removed. The depth of the sludge sampled from a given grid coordinate was to be identified by topographic elevations. For control purposes, the work site was divided into two zones. The first zone was that area covered by the Hypalon cover and the sludge packaging area adjacent to the cover. The second zone was that area outside of zone one, but within the fenced area around the basin. Personnel entering zone one wore NMI provided work uniforms covered by a Tyvek paper suit, gloves, shoe covers and safety glasses. Selected individuals in close proximity to the sludge wore breathing zone air samplers (BZA's) to record any potential exposures to uranium. Shoe covers, disposable suits and gloves were removed upon leaving zone one. Safety glasses were required in both zone one and two. All were required to wear radiation film badges and monitor upon exiting zone two. Contractor personnel were required to submit urine samples on a weekly frequency as a quality assurance of the air sampling and engineering controls. An NMI health physics technician was assigned to the project and was available at all times to insure that all controls and requirements were met. Routine spot audits were performed by health physics management throughout the project. NMI's Facilities Department routinely had a project manager present at the work site who also shared the responsibility for worker and environmental safety. High volume air samples were taken in three locations around the basin to monitor environmental levels of airborne uranium.

Fifty one sample locations were selected as being sufficient to provide the required 20,000 pounds of representative sludge. Fifteen inch diameter PVC pipe (see Figure 1.) was sunk through a cut hole in the cover at each sample location using a 1400 pound steel dead weight (see Figure 2.). A 35 ton hydraulic truck crane with a 92 foot telescoping boom was used to position and lower the weighted pipe. The PVC pipe was to act as a casing once the sludge core was removed to keep the local area from subsiding, thus maintaining the original plane of the cover. Plastic sheet was placed at each location prior to the cutting through and sinking of the casings. This was to capture any sludge that potentially could fall as a result of having to slightly raise and re-lower some casings before they penetrated to the gravel base of the basin. The casings were cut off approximately six inches above cover, the plastic picked up and discarded as contaminated waste.

The cover area around the casing (see Figure 3.) was confirmed free of contamination by radiological counting of wipe or smear samples. A thirty gallon container (see Figure 4.) was bonded to the Hypalon cover using Silicon II adhesive as a temporary seal until all casings were in place and such time as sampling was completed and permanent patches were installed.

After all casings were sunk and temporarily sealed, the actual sampling phase began. A new plastic sheet was tightly fitted around the bucket and the bucket cut off about 10 inches above the cover (see Figure 5.). The sampling device (see Figure 6.) consisted of a 10 inch steel pipe 10 and 1/4 feet long, a 3 foot square steel weight and a 10 foot steel boxed pneumatic cylinder mounted above. Total weight was 1,850 pounds. The steel pipe portion was sleeved with a 10 foot length of 12" diameter plastic tubing. The sampling device was lowered by the crane into the sludge contained in the casing (see Figure 7.) while holding up the plastic tubing so that it did not enter the casing. Corings of sludge were removed in about 3 foot increments. The sampling device was then raised to a position immediately above the casing, a bottom steel retaining plate slid into position and the bottom sealed in a plastic bag (see Figure 8.) The purpose of the 12" flexible tubing and the plastic bag was to contain any sludge which might fall from the outer surface of the sample pipe. The crane swung the sample device over to the drum filling area which was located adjacent to the basin. The path over the Hypalon cover from the sample location to the drum filling area was covered with plastic sheeting as a back-up to capture any sludge during transport. The drum filling area consisted of a receiving valved hopper and a scissor lift from which an operator could attach an air line to the pneumatic cylinder. Operators at the hopper (see Figure 9.) would remove the plastic bag and closure plate. The operator of the lift would then pressurize (80 to 120 psig) the cylinder causing the piston to push out the sludge coring into the hopper. Some hammering on the outside surface of the sample pipe was necessary at times to start the core moving. The sludge was metered from the hopper through the bottom valve into 16 gallon drums. Each drum contained about 3 to 4 foot of sludge coring. The drum filling area was located on plastic sheet which was bermed on four sides to contain any sludge per chance it should fall during drumming. This containment was considered particularly important should sudden rain occur, in which case the potentially contaminated rain water would then be contained. The sampled location was temporarily re-sealed at that time by sliding the cut-off 30 gallon bucket back over the portion of the bucket still bonded to the Hypalon cover. The two bucket portions were taped together and the plastic sheet removed. Again the cover was tested to insure no contamination was present before moving to the next sample location. At most times, there were no more than two sample locations open. This provided better control of the job site and allowed quick closure in case of sudden inclement weather.

The sludge from certain areas of the basin was difficult to remove from the sample device. This was overcome by lining the inside of the sample pipe with a large plastic bag prior to taking the sample. In the area of grid coordinates C6 to C9 where the basin is the deepest, the sludge was found to be more fluid and tended not to remain in the sample device as it was raised out of the casing. This was overcome by using a back-up sample device which was similar to the first, but contained a pneumatically operated butterfly valve at the pipe bottom. Before raising the device out of the casing, the butterfly valve was closed to contain the sludge in the pipe. The valve was opened at the drum filling station allowing the sludge to drop into the hopper.

Permanent patching of the sample locations took place after the 51 corings were taken and temporarily sealed. The process involved heating the patch area in a portable tent (see Figure 10.) to a temperature recommended for patching. EA subcontracted the patching work to the company which fabricated the original Hypalon cover. Patching involved cutting the PVC casing off at the sludge level and positioning two partially overlapping 3/16" thick foam boards under the cover and over the casing top to provide a flat surface for bonding and to support the patch. The patch itself was cut from a newly supplied section of Hypalon and typically was a 30 inch square in order to provide at least 6 inches of bonded surface around the cut hole. The immediate surface of the cover was abraded and cleaned to expose un-weathered cover material. A "liquid Hypalon" adhesive was applied and the patch positioned taking care to work out any folds and to roller press the surfaces together. A bead of Silicon II adhesive was liberally applied around the outer edges of the patch for additional protection of the patch edges (see Figure 11.). The patch area was then wipe tested to confirm it to be free of uranium contamination. The NMI health physics technician was present during the patching of each hole to ensure each patch was properly applied. An air lance had been considered as a method to check the quality of bond, however, it was found that 100% visual inspection during all steps of the patching process ensured complete bonding of the entire surface. The air lance would have only been a check of the completeness of bond at the outer edge. Once the NMI health physics technician was satisfied with the quality of the patch it was marked with an "X" in yellow paint to indicate acceptance. The marking also provides an indication of areas where foot traffic should be avoided during any future routine maintenance inspections of the cover. After all holes were patched, a 100% visual inspection of the cover was conducted and a radiological wipe survey was performed (65 wipes total) to confirm that it was free of any uranium contamination.

The basin sampling project is considered essentially complete with 19,463 pounds of representative sludge removed, the cover effectively re-sealed thus returning the basin to a stable condition with no adverse impacts to personnel or the environment.

3.0 RADIOLOGICAL AND ENVIRONMENTAL EFFORTS:

The emphasis of this section will be to detail the results of the radiological and environmental monitoring which took place in support of the sludge sampling project. A Special Radiological Work Permit (SRWP) to establish procedures and control mechanisms for the sampling program was prepared prior to the start of any work (see Figure 12.). The SRWP for controlling worker and environmental exposures to uranium were provided to all workers, NMI and EA, in the radiation orientation training session. The detailed requirements can be found in the two documents affixed to Figure 12. and include the following major areas: Controlled Area Boundaries; Protective Equipment; Health Physics Monitoring; Contamination Control and Reporting Requirements.

3.1 CONTROLLED AREA BOUNDARIES:

The access to the work site was simplistically established at the fence boundary which encloses the basin. All entry to this bounded area required orientation radiation safety training, adherence to the SRWP or escort by an individual trained in radiation safety and knowledgeable in the requirements of the SRWP. The entrances to this area were posted as "Radiation Work Permit Controlled Area" to insure no unauthorized access to this area. A site plan is attached to identify the limits of the controlled area that was established (See Figure 13).

The boundaries established were found to be adequate for the purpose of access control and no deviations were required for the duration of the project.

3.2 PROTECTIVE EQUIPMENT:

The area of protective equipment was deemed to only be necessary for the workers who had the likelihood of coming in contact with basin materials (sludge). Standard protective clothing was issued including: NMI company uniforms; outer coveralls (disposable); gloves and safety glasses.

The protective equipment issued was acceptable and met the desired intent for the control of direct personnel exposure to sludge. The only deviation to the SRWP was the need to wear two pair of the disposable booties due to the water that was on the cover and the added durability of two pairs.

3.3 HEALTH PHYSICS MONITORING:

The health physics monitoring can be summarized into three categories, external dosimetry, internal dosimetry and general radiological surveys including worker "frisking". The radiological surveys are described in more detail in the next section on contamination control.

Worker frisking was accomplished using a GM (pancake probe) survey meter. Frisking was done on each worker who exited the controlled area to insure protective measures taken to control contamination were effective. The action limit for frisking was set at any detectable reading above ambient background. The frisking station was set up within the acid house for the duration of the project.

There was only one instance of detectable contamination during the project. This occurred when a contractor supervisor was called on site by subordinates to rectify an unusual mechanical deficiency. The corrective actions taken by the contractor caused a failure of the disposable shoe covers. Contamination was present on the soles of both shoes and was decontaminated with soap and water before release. Further occurrences of this type were not encountered during the project.

3.4 External Dosimetry:

All contractor personnel were issued radiation dosimetry for the duration of the project. The devices issued were film badges that are provided to NMI through Landauer Inc., a third party accredited vendor. The results of the external dosimetry are shown on Figure 14. There were no deviations from the external dosimetry program other than replacements of lost devices through out the project. The NRC radiation exposure limits are expressed in two ways, the first is for non-occupational workers or members of the general public which is 500 millirem per year, the other is for radiation workers, which is 5000 millirem per year. The results of a 10 millirem radiation dose per employee, as an average, for the duration of the two and one half month project and an individual high of 15 millirem supported the initial evaluation that external exposures encountered while handling the sludge materials in the basin environment would be minimal.

3.5 Internal Exposures:

As described in the SRWP internal exposures were evaluated using breathing zone air (BZA) samplers. These samplers were rotated through the contractor work force during the initial stage of the project.

As experience was gained as to what job tasks indicated the highest probability for potential airborne exposure to uranium, the BZA's were issued more exclusively to these job tasks. Overall only two tasks indicated an airborne uranium exposure probability. The two tasks were: cutting the cover open and assisting the sample device lowering into the sludge and assisting the unloading of sludge into the hopper.

The cutting of the cover exposed dry (de-watered) sludge which when punctured by the sampling device had the potential of generating a short puff of airborne material. In recognition of this potential, great care was taken to specify procedures which called for wetting down the de-watered sludge before and during the insertion of the sampling device into the basin. The BZA sampling of this task indicated a total dose of 5.6 millirem was committed to the individual performing this job over the duration of the project.

The unloading of the sampler into the hopper was a more challenging task to control from an airborne exposure standpoint. The initial stages of the sampling encountered several instances where the sludge did not come out of the sampler under it's own weight or even through pneumatic mechanisms that were designed into the sampler to overcome this problem if it was encountered. The resulting technique for relieving a sample that was "hung-up" inside the sampler was to push pneumatically from the top while hitting the outside of the sample device manually with a sledge hammer.

To control the potential exposure from the release of material from the contaminated outer surfaces of the sampler while it was being hit manually, the worker would first wet the areas that were noticeable dry and coated with sludge. In addition a small "kiddy" swimming pool was placed below the hopper within the plastic lined bermed area to contain any loose materials that may fall. The results of the BZA sampling of the worker performing this task of hitting the sampler to release the sample indicated a total dose of 20.9 millirem was committed to the individual performing this job over the duration of the project.

The above noted doses of 20.9 millirem and 5.6 millirem along with a 1.4 millirem dose commitment were the only internal doses recorded by this BZA sampling technique for the entire project.

As a quality assurance check on the BZA's weekly urine samples were requested from all contractors working within the site boundaries. With the constant changing of contractor personnel it became difficult to maintain a consistent weekly submission from each worker. For the worker who had a BZA sample result of 20.9 millirem the corresponding urinalysis values projected a committed dose of 4.5 millirem.

NMI

This worker also recorded the highest individual urine sample result for the entire project of 7.0 micrograms per liter. All other workers recorded urine concentrations of 5 micrograms per liter or less for all their submissions through out the duration of the project.

The internal dosimetry evaluation of the individual who indicated the highest BZA results for the project is shown on Figure 15. This evaluation concluded a committed effective whole body dose of 4.5 millirem for the project.

As a side note the analysis technique for uranium in urine has a normal resulting lower limit of detection of 3 to 5 micrograms per liter and in addition normal dietary intake of uranium in food can result in uranium in urine values well above the lower limit of detection. Double digit results for uranium in urine for an individual never occupationally exposed to uranium are not uncommon.

With the above note in mind as well as the difficulty in interpreting intakes from urine bioassay samples the doses recorded for all workers are those resulting from the evaluation of the extensive BZA sampling program. The internal dosimetry results for the project are presented in Figure 14 and are well below the regulatory limits.

3.6 CONTAMINATION CONTROL:

As outlined in the SRWP, the controlling radiological contamination limits for the project were set at 22 disintegrations per minute (DPM) of removable alpha and 220 DPM of removable beta-gamma contamination. The control of contamination was mainly required in two locations. The first was at the point of insertion of the sampler into the sludge and the second was at the hopper where the sludge was transferred from the sampler into drums.

At both these locations plastic was laid out around the areas to prevent inadvertent contamination of the basin cover or underlying soil in the case of the hopper. Once an operation at a particular location was complete the plastic was carefully removed and disposed of in a designated container for such "contaminated" materials. Then the areas which the plastic covered were smeared and analyzed by gas flow proportional counting to determine acceptance to the specified removable contamination limits. Areas which did not meet the limits were washed with an ethylenediaminetetracetic acid (EDTA) and soap solution and re-surveyed. All protective clothing was removed prior to workers leaving the basin cover area and disposed of in the specified container.

The tools and/or equipment that required release from the area were surveyed for both fixed and removable contamination. Release was authorized when the previously mentioned limits were met.

As mentioned in other sections of this report various techniques were employed to reduce or eliminate contamination. The two of most significance were the wetting down of all areas that exhibited noticeable drying of sludge.

The second was in the control of the sampler which when extracted from a sampled hole would be grossly contaminated on the outer surface with sludge. Several attempts were made to control the loss of this material to other areas during it's aerial traverses between the sample hole and the hopper. Initial attempts to drape plastic sheets around the exterior of the extracted sampler and lay plastic sheets under the path of the crane supported sampler between the hole and the hopper. This technique soon proved to be of little value due to the wind blowing the now contaminated plastic and making the control of contamination much more difficult.

The solution to this aerial transfer of the contaminated sampler was to attach an accordion type flexible conduit (see Figures 7, 8, and 9) around the outside of the sampler. The lower end of the sampler was fitted with a tire inner tube that was attached to the conduit. When the sampler was inserted into a hole the worker would hold the tube so that the sampler would slip down and through the tube while the conduit would collapse. When the sampler was extracted the worker would again hold the tube and the sampler would be pulled up and through the tube while the conduit would be stretched back to the original length of the sampler. Once the sampler was out of the hole a plastic bag would be put up and over the ends of the sampler and elongated conduit and fastened with a rubber cord. This last step would prevent any loose material from escaping while the sampler was in transit. This solution worked extremely well as there were no exposed contaminated surfaces while the sampler was passing between the two control points, the sample hole and the hopper.

Once a hole was sampled and a patch placed and sealed, the area would be smeared for removable contamination and decontaminated if found to be above the indicated limits.

Once the project was completed the entire basin cover was re-surveyed for removable contamination and found to be within the limits specified.

All tools and equipment were surveyed and if needed decontaminated and surveyed for release. There were no tools and or personnel items retained due to excess contamination.

3.7 ENVIRONMENTAL MONITORING:

For the basin sampling project, in addition to the surveys of the cover, environmental monitoring included sampling for airborne uranium.

Due to the nature of the basin and it's historic use, the localized area within the fenced boundaries and the soils within these bounds have been identified by previous surveys to contain varying small amounts of uranium. An effort to evaluate uranium in soil before and after the sampling of the sludge was not thought to provide any meaningful information at this time. For this basin sampling project no soil samples were evaluated.

During the pre-work meetings the need to do supplemental ground water monitoring on site was evaluated. Based on the decision to limit sampling to the basin sludge and not to extend any samples to ground water NMI's ground water consultants, Goldberg, Zoino and Associates (GZA), did not recommend any supplemental ground water sampling. The next scheduled semi-annual sampling round took place from 21 to 25 May 1990. The results of this sampling round were evaluated by GZA for any potential impact on ground water from the sludge sampling program. The GZA evaluation concluded that the sludge sampling program had no impact on the underlying ground water.

The only area in which supplemental environmental sampling was thought to be advantageous was airborne levels of uranium. The Department of Environmental Protection (DEP) concurred with the sampling plan and in addition to the perimeter and off site high volume air samplers two additional samplers were installed in close proximity to the basin. With the use of one existing perimeter sampler in conjunction with the two new samplers the basin work area was triangulated by air monitoring devices. The locations of these devices can be found on Figure 13.

The samplers were operated one month prior to the start of the basin activities (September 1989) to establish a base line uranium in air concentration and continuously post completion of the project (January 1990).The results of the air monitoring are presented on Figure 16.

For the work days at the basin in October the average wind direction was 270 degrees. This relates to a wind direction blowing from east to west. For the work days in November, the average wind direction was 240 degrees. This indicates wind blowing towards the west/south-westerly direction. Simplistically it appears from the data that there was a small amount of localized airborne uranium seen be samplers #09 and #10 during the working periods, however this does not seem to corollate with wind direction for the same period.

It may be that with the limited data at these two locations, #09 and #10, that what may appear to be small elevations in uranium airborne concentrations at the time of the basin work may be natural variations in plant emissions at these previously un-sampled locations. With the basin in such close proximity to the plant what may be occurring is localized wind turbulence in the wake of the plant structures and surrounding topography.

The underlying conclusion that is apparent from this data is that the largest airborne uranium concentration observed during the basin activities as identified by the air monitoring stations, whether solely due to basin activity or what is more realistically a summation of plant and basin activities, is approximately 0.025% of the Nuclear Regulatory Commission (NRC) limit (5E-12 microcuries per milliliter) as found in 10 CFR 20, Appendix B, Table II.

If one were to convert this data (0.025% of the NRC limit) to an exposure value for the basin workers located in this area for the two months of sampling the resultant dose would equate to approximately 21 microrem (one microrem is 1/1000 of a millirem).

FIGURES 1 to 11

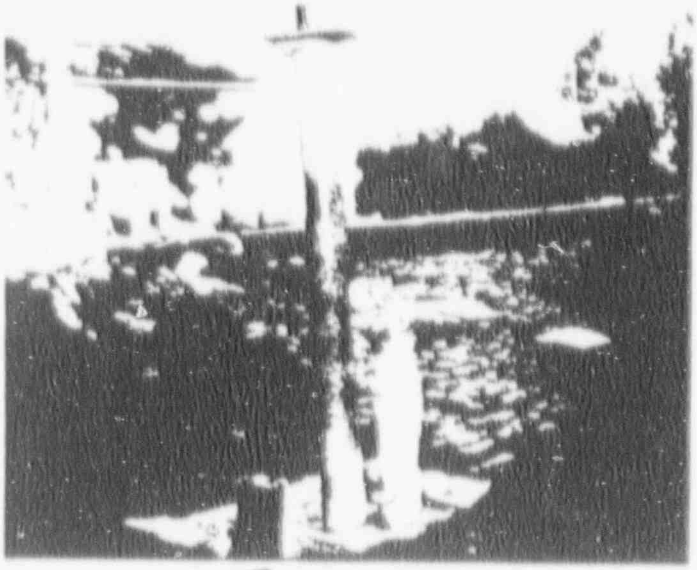


FIG. 1

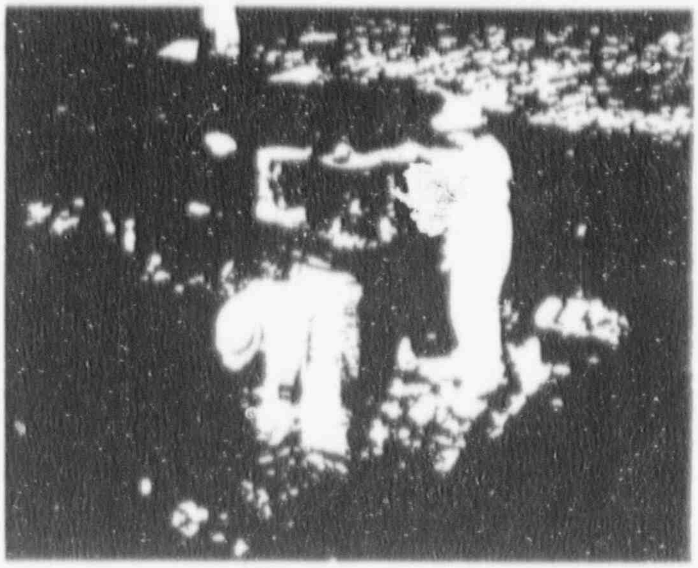


FIG. 2

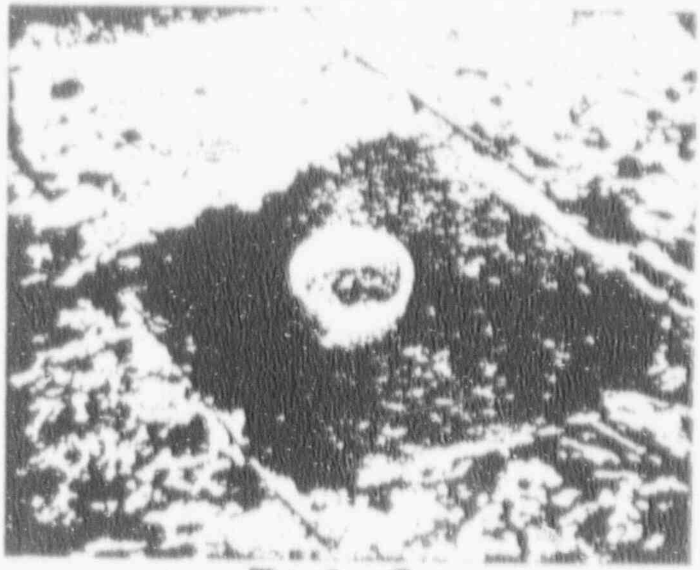


FIG. 3

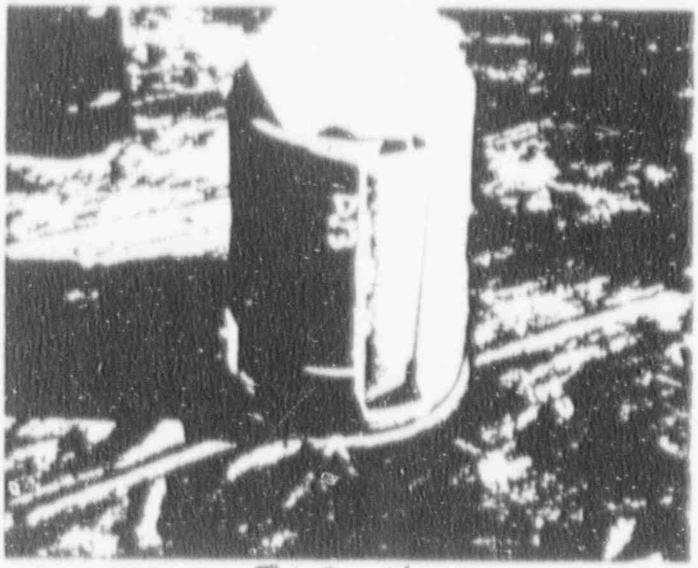


FIG. 4

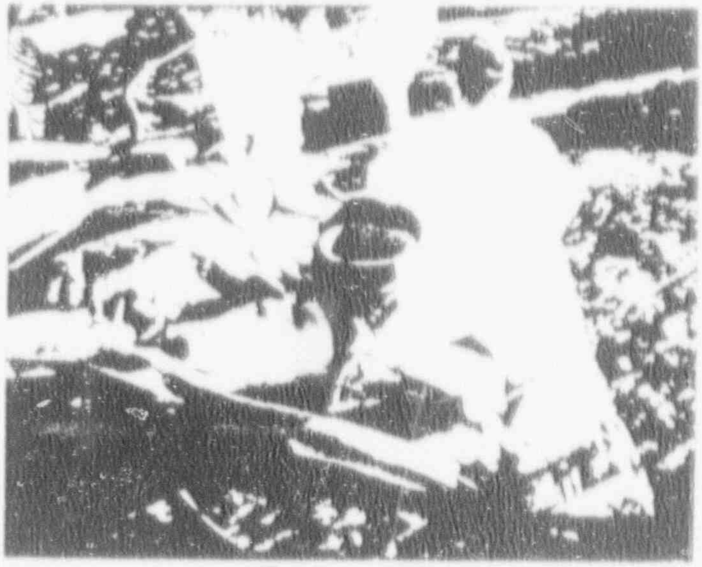


FIG. 5

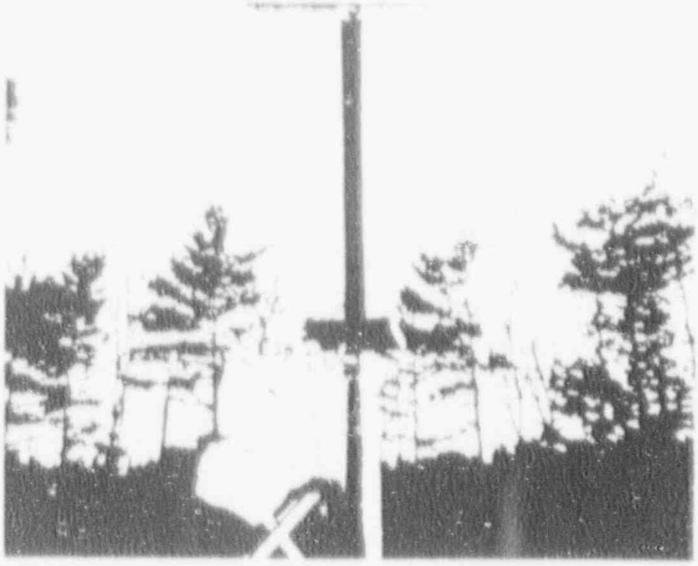


FIG. 6

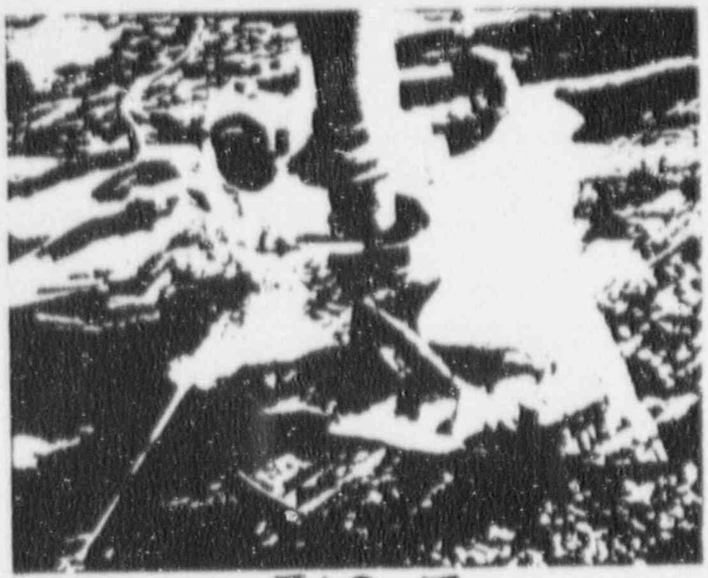


FIG. 7

FIG. 8

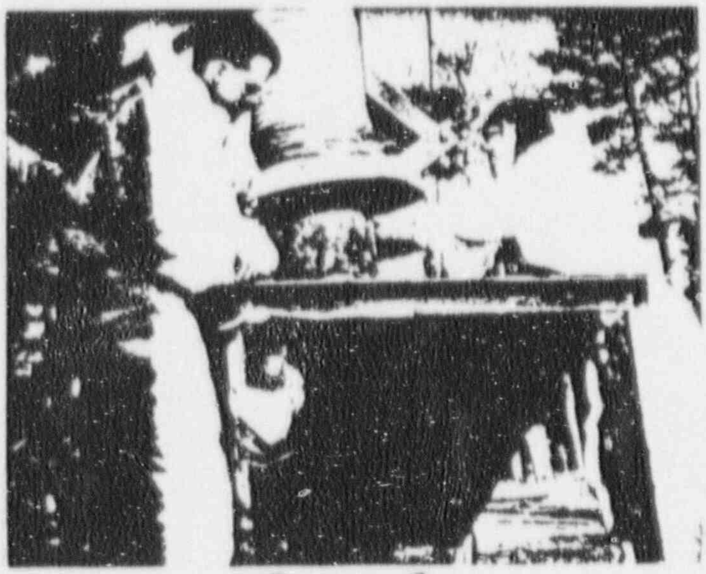


FIG. 9

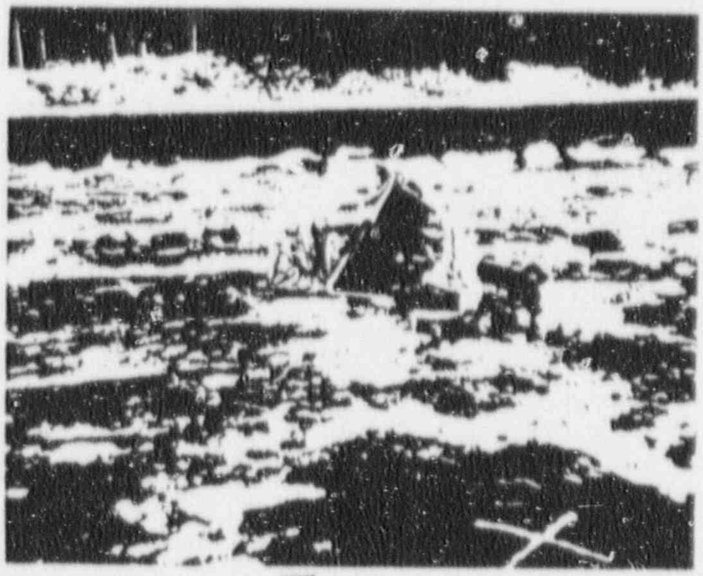


FIG. 10

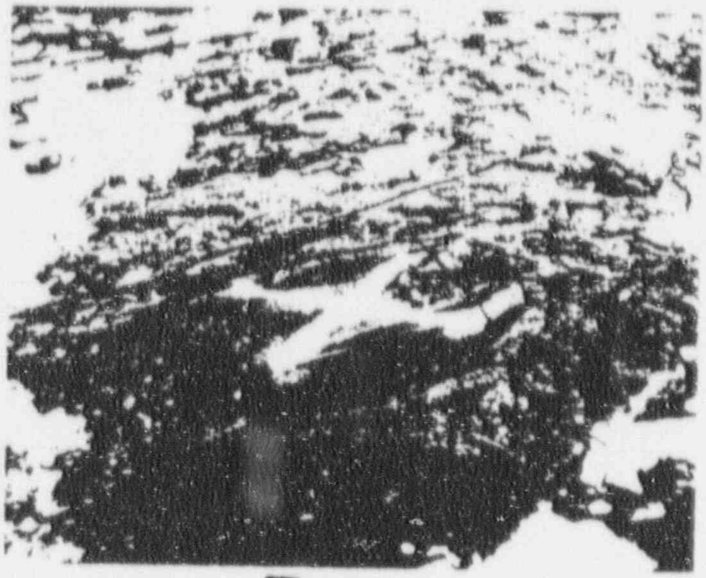


FIG. 11

FIGURE 12

NMI

STANding

Radiological Work Permit

Health Physics

No. 590-1466

TO BE COMPLETED BY REQUESTOR

Submittal Date: 10/16/89 Supervisor & Dept.: G. Shinopulas 590

Location: Holding Basin Est. Time: 6 weeks (STANding)

Description of work: (use separate sheet if necessary)

See Attached [illegible] letter of 2 June 1989 to DEP And Rwp Supplemental Information Attached

Personnel performing work: Environmental Associates (Contractors)

FOR HEALTH PHYSICS USE ONLY

Monitoring Requirements

	HP Audit	
✓ WB Film	__ None Required	__ Special Shielding
__ Wrist TLD	__ Start of Job	__ Work Area Release
__ Finger TLD	✓ Continuous	✓ BZAS AS outlined on Attached Supplemental Sheets

Protective Clothing Requirements

Head	Body	Hands	Feet	Respiratory
__ Disp. Hat	✓ Paper Suit	__ Lead Gloves	✓ Shoe Covers	__ Full Face Mask
__ Disp. Hood	✓ Standard Uniform	✓ Surg. Gloves	✓ Work Shoes	__ 1/2 Face Mask
__ Face Shield		__ Leather Gloves	__ Rubbers	__ SCBA
__ Other	__ Other	✓ Other Rubber coated	__ Other	__ Other

Radiation Conditions - Estimated by survey meter #

Location	WB (mrem/hr)	Skin (mrem/hr)	Ext. (mrem/hr)	Wk. Time	Dose (mrem)
					WB
					Skin
					Ext.

Sampling Results

Name	Dose (mrem)	Air Concentration (µCi/l)	Urinalysis (µg/l)	Removable Contamination α (dpm/100cm²)	β

Comments:

Authorization - Operational Period: STANding Rwp (Approx 6 weeks)

Pre-job conference required? YES: 10/9 - 10/13 w/ EA & HP NO:

	Name	Date		Name	Date
Workers:	Lawrence Bayer [illegible]		Supervisor	[signature]	10/17/89
	[signature]		HP Tech	[signature]	10/18/89
	[signature]		HP Staff	[signature]	10/16/89
	[signature]				
	[signature]				

HP

HP FORM NO. 91 August 26, 1983

NUCLEAR METALS, INC.

2 June 1989

The Commonwealth of Massachusetts
Department of Environmental Quality Engineering
Metropolitan Boston - Northeast Region
5 Commonwealth Avenue
Woburn, MA 01801

Attn: Ms. Rodene DeRice

RE: Sampling of Holding Basin
DEQE Case No. 3-295

Dear Ms. DeRice:

This letter constitutes NMI's reply to DEQE's questions concerning our plan to extract a representative sample of material from our Holding Basin to perform a resource recovery process demonstration. Please refer to our previous letter dated 24 February 1989.

It is our hope that upon receipt and review of the enclosed information DEQE will grant final approval of our extraction plans. It is our understanding that we need your approval before we can contractually engage the companies which will perform this work.

1. Coring Procedure

The sample will be collected from approximately 80 locations (intersections) on a grid pattern of about 15 feet between sample locations. Each location will be sequentially sampled as described below.

Support netting will be placed around the sample point. Plastic sheeting will also be placed on and around the sample point and also to cover foot traffic areas. This will provide additional means to control material migration and a way to secure the work area quickly and efficiently at the end of the work day or should adverse weather conditions unexpectedly arise. A light portable frame will then be placed on the netting over the sample location. The Hypalon cover will be cut sufficiently to allow a mechanical drive device, which is supported on the frame, to advance a 10 inch PVC casing to the bottom of the sludge. A cylindrical sampling device will then be advanced into the sludge within the casing by the drive device. When filled, the sampling device will be withdrawn and its contents transferred directly to a transporting container. The container will be carried to the drum filling station located on the perimeter road on the north edge of the basin. This area will also be protected with plastic sheeting which will be drawn up and around the drums at

2229 Main Street, Concord, Massachusetts 01742 [illegible] 369-5410

the end of the work day. Drums will be filled, closed, sealed, cleaned, identified, labelled and weighed in this area.

After a given casing is emptied of sludge, its top will be capped flush with the basin cover, and the opening in the cover will be sealed with a Hypalon patch. The patch will be tested for water tightness. The support netting, plastic sheeting and support frame will then be moved to the next sampling location and the process repeated.

The drums will be transported from the filling area to a staging area immediately to the south of the basin along an existing adjacent perimeter road. They will be moved one at a time, confined and chained into the bucket of a midsize, large wheeled construction vehicle, which has been used in this area several times in the past. Within the staging area drums will be placed on plastic, checked to ensure that their outer surfaces are free of sludge, recleaned and rechecked if necessary, prepared for shipment per USDOT (49 CFR) standards for LSA materials and staged for shipment.

All work areas are located within a secure fenced area. The basin and drum filling and staging areas are continuously monitored 24 hours per day, seven days per week, by video camera. Additionally, NMI's security group will perform an on-site inspection every two hours.

2. Minimization of Dust

It is our experience that the basin material has a consistency similar to that of toothpaste and that airborne dispersion will not be a significant problem. Should dry regions of the sludge be encountered simple hand held water spray misters, such as those used for spraying household plants, will be used to moisten the particular area of concern. NMI will control this operation closely to insure effective dust prevention.

3. Air Monitoring Program

The air sampling program will be based on the complimentary use of several types of air samplers. The first is the use of the existing environmental air samplers, the locations of which are shown on the enclosed map. These samplers are part of NMI's Environmental Surveillance Program (ESP) which is an integral part of NMI's Nuclear Regulatory Commission (NRC) license. These ESP samplers also have a large established data base which will facilitate the early detection of any upward trend.

These samplers normally operate at 20 cubic feet of air per minute and have a sampling duration of one month. The glass fiber filter media used is forwarded to an NRC licensed facility for a fluorometric determination of the total uranium content of the sample. In addition to the use of the existing samplers NMI will install two additional samplers of the same type at the locations indicated. These samplers have excellent sensitivity and have indicated uranium concentrations as low as 0.001% to 0.0001% of the NRC limit for uranium releases to unrestricted areas (10 CFR 20, Appendix B, Table II).

A second type of sampling will be employed to monitor the worker's breathing zone (BZA). This sampling will be extensive during the initial stages of the operation but may decreased if accumulated data and experience warrant. As a minimum, however, the breathing zone of representative workers will be monitored for the duration of the project to satisfty the Department's request.

The BZA filter sample will be analyzed the same day as the sampling occurs to obtain immediate data on worker exposures and potential environmental concerns. If a worker receives a dose greater than 4 MPC-HRS or 10 millirem, the particular task to which the exposure can be attributed will be terminated, reviewed and corrective actions implemented prior to restarting. In addition, if this exposure level is reached, the perimeter environmental samplers will be analyzed for total uranium to insure that the conditions which caused the release were localized.

If, at any time during the operation, an environmental sampler indicates a result in excess of 10% of the NRC limit for airborne uranium release to unrestricted areas, the operation will be terminated and an investigation will be conducted to determine the cause. Work will not resume until any necessary corrective actions are taken, and a written report is forwarded to DEQE which explains the results of the investgation and the corrective actions.

4. <u>Equipment Decontamination Prior To Release</u>

All equipment used in the basin area, as defined by the fence boundaries, will be surveyed by NMI's Compliance Department as required by our NRC license. The survey will consist of smear tests for the determination of removable contamination and a radiation measurement using a GM type (open window) hand held radiation detector. All surveys will be documented in accordance with our NRC license requirements. Any equipment that exceeds the limits listed below will be subject to decontamination.

Contamination Control Limits

alpha smear . . . . 220 DPM/100 sqcm
beta-gamma smear . . . . 2200 DPM/100 sqcm
contact radiation measurement . . . . 1.0 millirem/hour

Decontamination, if necessary, will be accomplished by steam cleaning or simple soap and water washing, as determined on a case by case basis. After decontamination takes place, resurveying will be performed to ensure efficacy of cleaning.

5. Protective Equipment

The special personal protective equipment that will be required, as a minimum, will include: radiation dosimeters, company controlled uniforms, company controlled safety shoes, shoe covers (rubbers), BZA's (when required), gloves (where appropriate) and other items as identified by pre-work discussions or daily audits.

We expect that the above information in conjunction with our previously submitted Health/Safety Plan, will enable DEQE to allow NMI to go forward with the next step in this important project. We hope to perform the extraction during the good weather months this summer starting site work some time during the end of July. Contractural matters should be in place by the end of June, therefore we would appreciate efforts the Department could take in providing approval by June 21st.

We will be happy to answer any additional questions you may have and look forward to your reply.

Sincerely,

Frank J. Vumbaco

Frank J. Vumbaco, Manager
Health and Radiation Safety

FJV:swf

Enclosure

RADIATION WORK PERMIT SUPPLEMENTAL INFORMATION

CONTROLLED AREA BOUNDARIES - The controlled area is defined as any area inside the inner fence which surrounds the Basin. Only those individuals who have undergone specific radiation training and understand the requirements of this RWP are allowed access to this area.

PROTECTIVE EQUIPMENT - For those individuals who will be or have the potential to be in direct contact with Basin materials (sludge) the following is required: 1) Company issued uniform. 2) Tyvek (or equivalent) outer coveralls with protective shoe coverings. 3) Rubber gloves (for sludge handling). 4) Safety glasses. 5) Any other equipment deemed necessary by Health Physics or Safety.

HEALTH PHYSICS MONITORING - All workers who will access the Basin controlled area for the purpose of sludge extraction will wear a whole body film badge on a continuous basis. In addition all workers who are in the localized area where there is coring activity will be wearing a Breathing Zone Air sampler (BZA) for the duration of the days activities in that area. Exiting of the controlled area will require a survey of that individuals outer garments (shoes after covers are removed, uniforms after Tyvek is removed, hands and/or any other area as deemed necessary by the on site Health Physics Technician. In addition, each worker involved with sludge extraction will be required to submit a urine sample prior to starting any work in the Basin area and one sample every Monday morning until the project is completed.

CONTAMINATION CONTROL - During operations which require direct contact with Basin sludge the areas immediately around the access point will be covered by clean plastic. Initial entry into each hole shall be done in such a manner as to control the generation of dust from the underlying dried sludge. If necessary, this initial open area of sludge will be moistened under the direction of the overseeing Health Physics representative. Any contamination generated from work in a sample hole will be cleaned up immediately with damp rags and if necessary small hand tools. The clean up will be handled with extreme care in an effort to keep any migration of the contaminant to an absolute minimum. At the completion of work in any given hole and prior to any patching/covering a radiological wipe/smear survey will be performed to insure that clean up efforts were successful. Any smear result in excess of 22 DPM Alpha or 220 DPM Beta-Gamma will require the re-cleaning of the area and a second survey to insure that the smear limits are obtained prior to patching/sealing of any hole. All materials used in contamination control such as plastic coverings, rags, towels etc., will be discarded in a container marked for "CONTAMINATED ITEMS ONLY". The reuse of these types of articles shall be kept to a minimum. The Sludge sampling device will be covered in it's entirety when it is withdrawn from each hole this covering shall be suitable for the control of loose materials that may drop off or contamination that maybe dislodged during sampler movement.

REPORTING REQUIREMENTS - The following items will be reported to Health Physics if encountered at any time during the sampling project:

1. Contamination which is found or located outside the localized areas where the protective plastic surrounds the hole. (examples include but are not limited to: sludge spills from the moving sampler device, spills of sludge during any transfers, any noticeable airborne materials generated from the sampling activities, any contamination of workers beyond the protective clothing provided).

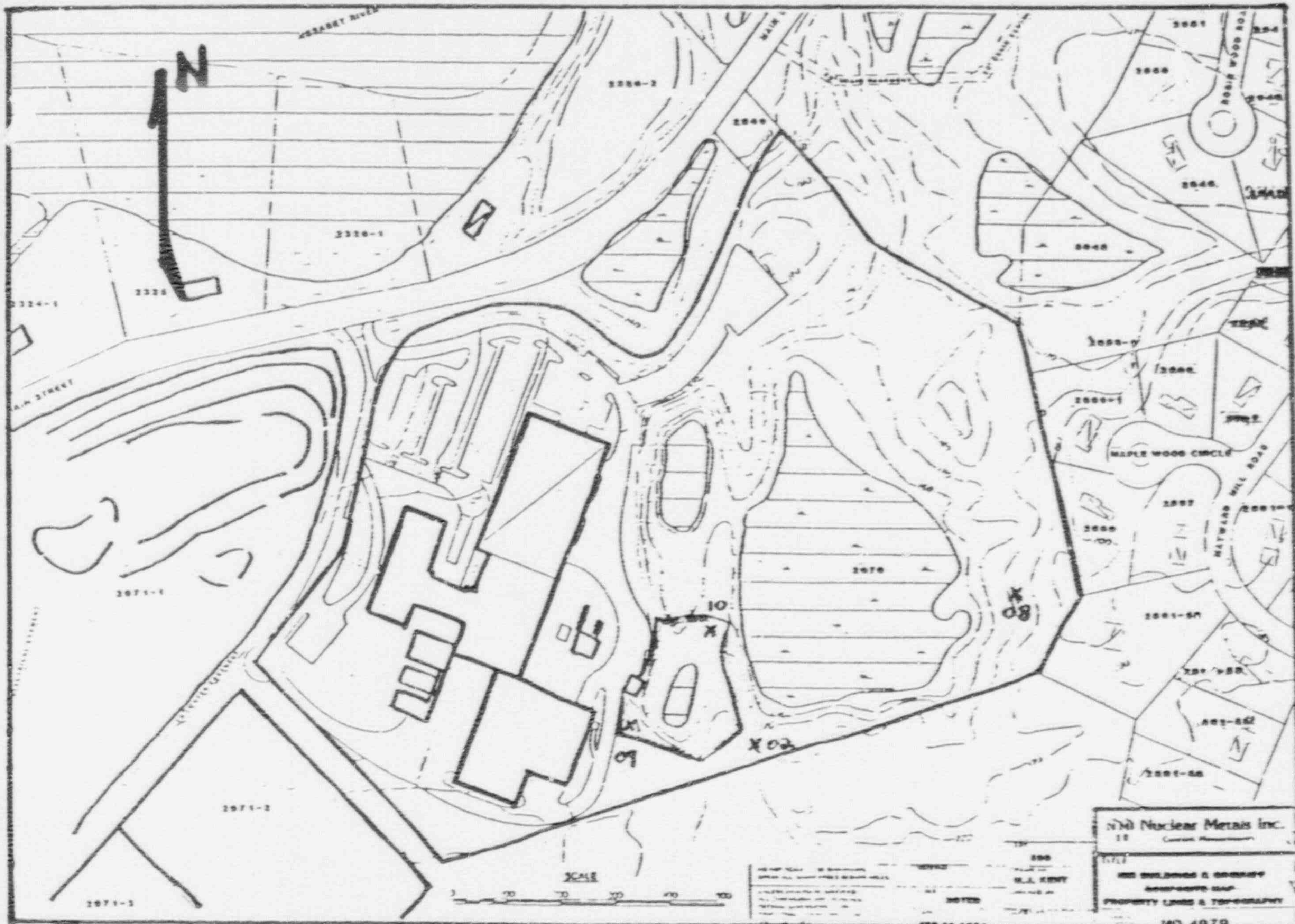
2. Any accident or incident which causes or could have caused injury to workers, damage to the Basin cover, releases of radioactive materials, exposures beyond those identified in this RWP, any loss of radiation monitoring devices (film badge), any air sampling device that may have been inadvertently exposed to radioactive materials through improper handling or accident.

3. Removal of any tools, equipment and/or articles that once in the controlled area require removal to an area outside the controlled area.

4. Any changes in the procedures and requirements herein to handle, extract, move or control the sludge and/or contamination generated from the sludge or any changes in the requirements herein to protect workers from exposures to sludge or contamination generated from the sludge.

5. Changes and/or additions in personnel from those who initially signed this RWP and undergone NMI training in radiation safety.

FIGURE 13



Holding Basin
BASIN Boundaries

FIGURE 14

DOSIMETRY SUMMARY

THIS SUMMARY IS FOR CONTRACTORS WORKING ON THE BASIN SLUDGE SAMPLING PROJECT WHICH TOOK PLACE FROM 16 OCTOBER 1989 TO 15 DECEMBER 1989.

Contractor	External Dose	Internal Dose	TOTAL(mRem)
R. R.	15	20.9	35.9
D. S.	10	0.1	10.1
D. V.	10	ND	10.0
C. N.	10	5.6	15.[illegible]
D. B.	10	ND	10.0
J. M.	15	1.4	16.4
J. A.	15	ND	15.0
L. B.	10	ND	10.0
K. C.	10	ND	10.0
J. M.	15	ND	15.0
F. L.	10	ND	10.0

ND - Denotes none detected.

FIGURE 15

WILLIAM LORENZEN, R.H.P.

HOLDING BASIN

INTAKE EVALUATION FOR WORST CASE URINE RESULTS

******************************* RADIONUCLIDE *******************************

URANIUM-238
PHYSICAL HALF-LIFE = 1.632E+012 DAYS

************ RESPIRATORY AND GI TRACT INPUT - DOSIMETRY INPUT ************

CHRONIC INHALATION INTAKE OF 1.00 MICRON AMAD AEROSOL
CHRONIC INTAKE INTERVAL = 3.000E+001 DAYS

FRACTION OF INTAKE DEPOSITED IN LUNGS = 0.630
DNP = 0.300 DTB = 0.080 DP = 0.250
STANDARD ICRP 30 RESPIRATORY TRACT AND GI TRACT MODELS USED

56.0% CLASS D WITH FRACTIONAL UPTAKE FROM GI TRACT (F1) = 5.000E-002
MPC (AIR) = 2.778E-004 uGm/mL
44.0% CLASS Y WITH FRACTIONAL UPTAKE FROM GI TRACT (F1) = 2.000E-003
MPC (AIR) = 2.778E-004 uGm/mL

*************************** SYSTEMIC EXCRETION ***************************

FRACTION OF SYSTEMIC EXCRETION THROUGH URINE = 1.00

VOLUME OF URINE EXCRETED PER DAY = 1.4 LITERS

********************* PARAMETERS FOR SYSTEMIC MODEL *********************

COMPARTMENT	COEFFICIENT	BIOLOGICAL HALF-LIFE (DAYS)
1	5.360E-001	2.500E-001
2	2.400E-001	6.000E+000
3	2.000E-001	2.000E+001
4	1.040E-003	1.500E+003
5	2.296E-002	5.000E+003

***************************** INTAKE ESTIMATE *****************************

INTAKE ESTIMATED FROM URINE CONCENTRATION DATA
ESTIMATE OF INTAKE FROM UNWEIGHTED FIT OF DATA = 6.246E+002 uGm
EXPERIMENTAL ERROR IN INTAKE ESTIMATE = 1.936E+002 uGm

**************************** DOSIMETRY RESULTS ****************************

NUMBER OF MPC-HRS = 1.799E+000 = 4.5 Mill. Rem TOTAL

WILLIAM LORENZEN, R.H.P.

HOLDING BASIN

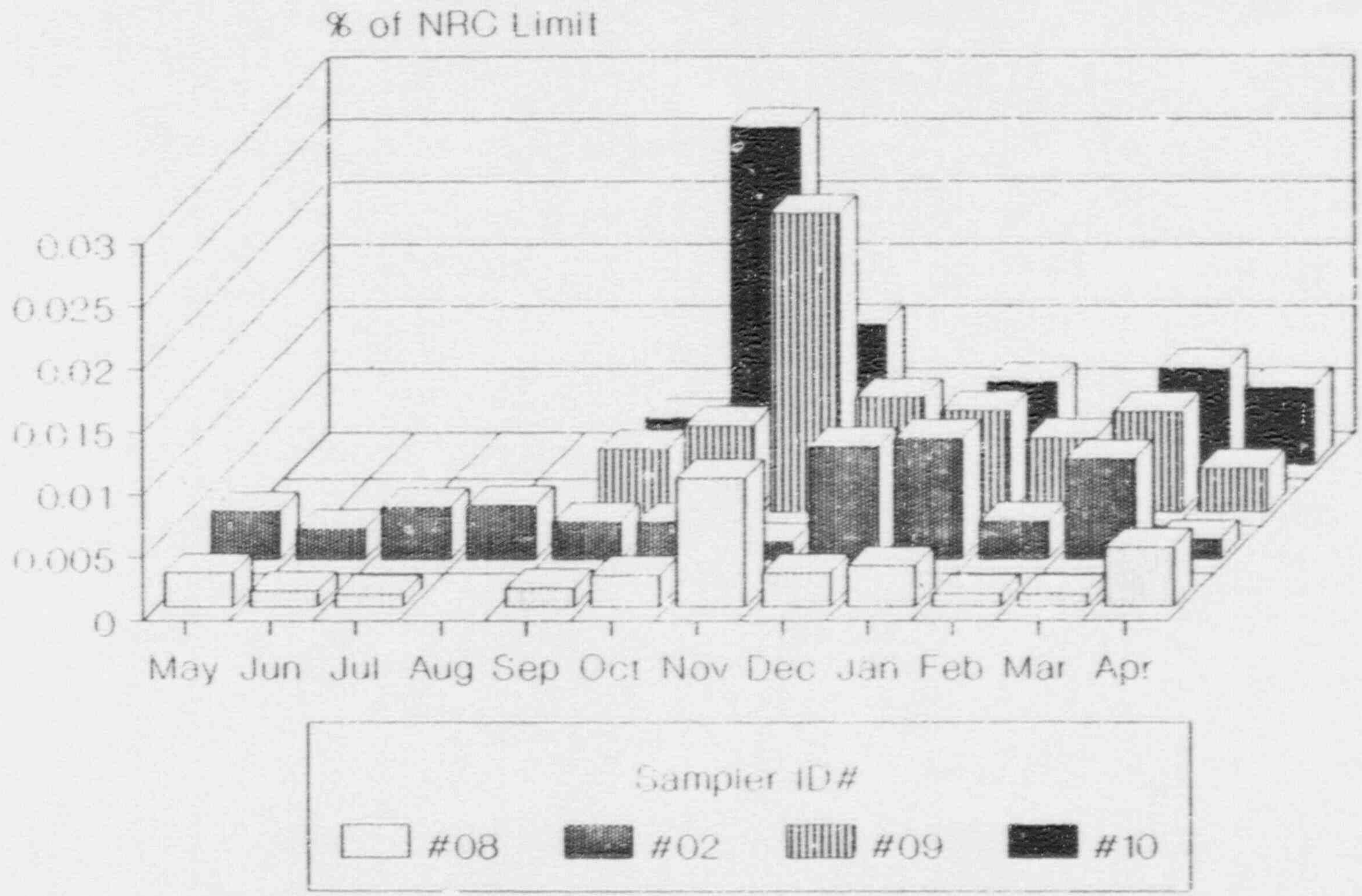
INTAKE ESTIMATED FROM STATISTICAL EVALUATION OF
URANIUM-238 URINE CONCENTRATION MEASUREMENTS

TIME POST INTAKE (DAYS)	BIOASSAY MEASUREMENT (uGm/L)	ERROR MEASUREMENT (uGm/L)	RETENTION FRACTION (1/L)	UNWEIGHTED-FIT EXPECTATION MEASUREMENT (uGm/L)
1.00	1.000E+000	1.000E+000	7.855E-002	1.635E+000
9.00	1.000E+000	1.000E+000	1.598E-002	2.994E+000
21.00	1.000E+000	1.000E+000	7.947E-003	3.474E+000
22.00	2.000E+000	1.414E+000	7.637E-003	3.498E+000
28.00	7.000E+000	2.646E+000	6.195E-003	3.611E+000
29.00	6.000E+000	2.449E+000	6.007E-003	3.627E+000

FIGURE 16

HOLDING BASIN AIR SAMPLERS

May 89 - Apr 90



Samplers #09 & #10 installed Sep. 89