Nevada Test Site
Transuranic (TRU) Project Difficulties, Issues, and Events

September 2009

Compilation of the difficulties, issues, and events during the preparation and implementation of the TRU Waste Project at the Nevada Test Site (NTS)

In June of 2006 National Security Technologies (NSTec) was awarded and assumed the responsibility as the management and operating contractor for the NTS. Included in the scope of that contract was the disposition of the remaining legacy TRU waste stored at the Area 5 Radioactive Waste Management Complex (RWMC). The most significant portion of this waste was 58 oversize boxes of legacy laboratory waste that would require sorting and size reduction to ensure compliant disposal. These boxes were each uniquely built and varied in size and shape to accommodate the waste. A site treatment plan regulatory milestone was associated with this effort.

In order to complete the sorting and size reduction that would be required, an existing Area 5 RWMC non-nuclear, radiological facility was identified as the best available location. A number of modifications to the building were identified as well as the need to analyze and properly reflect the operation in the Authorization Basis (AB). A Preliminary Documented Safety Analysis (PDSA) was developed, a design for the modifications completed and implemented, the Documented Safety Analysis (DSA) revised, an Operational Readiness Review (ORR) conducted and the waste processing successfully conducted. Operations were completed in 2009.

Included in this document are issues, events and process developments that occurred or were otherwise noteworthy during the project. These issues, events or process developments represent areas where the project had problems or were otherwise able to overcome some form of difficulty during the preparation and implementation of the project. These items were developed during many different phases of the project. The items have been sorted into functional areas for clarity, but several reflect on issues or programmatic gaps where interface relationships were not fully developed or understood.

For questions or clarification to these lessons learned.

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#	Functional Area	Discussion	Recommended Actions
	OPERATIONS		
OPS-1	Operations - Ventilation	A conservatively designed ventilation system provided an environment that promoted worker safety and provided the ability to complete the resizing and repackaging of the TRU waste with no personnel contamination or significant radiological incidents. Aspects of that design that were components to that success: • The system was designed with two times the air flow of what was operationally identified. The high contamination area was eventually measured to have approximately 45 air turnovers in an hour. • A filtered specialized point source ventilation capability was installed. This system included the use of two filtered and relocatable (PlymoVent ™) ventilation arms, each capable of 1,000 cubic feet/minute flow with a reach of 20 feet. The use of two vents enhanced the workers ability to control the spread of contamination when extremely high levels of contamination were encountered. The redundancy enhanced production by providing the ability to conduct more than one task at a time, thereby utilizing workers time more effectively when in the high contamination area (HCA), and effectively reducing the number of HCA entries required. • The PlymoVent arms were recognized as a best practice during a DOE VPP Star assessment • Due to space constraints of the existing structure and the size of the waste containers that required processing, the facility was designed without the benefit of an air lock for processing waste into and out of the contamination areas. Radiological control zones were implemented from areas of no contamination, to low contamination, to high contamination with the appropriate consideration of ventilation air flow. While this design was not optimum, it was effectively implemented without incident and minimal impact on the ability to effectively perform the operation. The wrapping and diapering	Overdesign for air flow including redundant point source ventilation. Design assuming B-box/airlock arrangements to account for material moving in and out of the processing areas, but design the ventilation flow requirements as if you don't have an airlock. Integration of the various discipline design requirement documents such as radiological control, nuclear safety, Industrial safety, and operations is imperative for optimization of the design. While outstanding as tool for these type processes, a better arrangement for the PlymoVent elbows would be up above and out of the work zone.

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		of the waste containers at various junctures of the operation were effective in minimizing the need for waste container decontamination as containers were removed from the facility. • For ventilation system designs for radiological contamination, strict application of American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) design recommendations may not be enough. If there had been an air lock, minimum required air flows would not have achieved the desired operational work environment. Additionally, some standard ventilation design aspects, e.g., slotted intakes, are not effective for the purpose of radiological particulate capture. The design eventually incorporated a floor mounted (sidedraft) filter housing instead of the initially identified slotted design called for by ASHRAE. • Chapter 2 of the DOE Nuclear Air Cleaning handbook, DOE-STD-1169 provides examples of requirements to be applied to ventilation system design. Based on the limitation associated with modifying an existing facility it was necessary that the Visual Examination and Repacking Building (VERB) design be a hybrid of these examples. Therefore the design ended up with a requirement to maintain a 0.3 negative D/P that would be expected of a glovebox (even though the area was to be occupied) and the face velocity requirements of a chemical fume hood because there was no airlock. The handbook allows adjustment of these values based on operating requirements and analysis, but coordination was not sufficient during the design between nuke safety and engineering to apply any adjustment. • ALARA reviews need to be more imposing with respect to the requirements to meet worker safety and radiological protection requirements to reduce the number of events resulting in loss of the Permacon. In the 6 months of operation the Permacon was lost 2 times. This was an extremely low number based on the contamination levels of up to 1 billion dpm per 100 cm squared which were encountered. • Radioactive Work Package (RWP) was well written such that it allowed us to enter required actions and recover quickly when suspension limits were exceeded. (10,000DAC.)	

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OPS-2	Operations - HVAC	A key aspect of ventilation system design for air suit operations is the available air conditioning capacity (heating and cooling). This aspect, while not a safety structure, system, or component (SSC) for this effort, is critical to the production. Stay times in the air suits are directly related to the temperatures of the working environment. Additional cooling was installed that was considered over that needed or required and turned out to be just adequate for the desert conditions for the location of the facility.	The processing activity is hard, labor intensive work. Standard routine industrial ventilation designs can fall short. Ensure the design include worst case conditions with appropriate extra capacity.
OPS-3	Operations – Breathing Air/Vortex Cooling	Breathing air system air supply requirements were adequate for the operation based on the seasonal conditions (Fall and Winter). Cooling for the air going to the suits cannot be under estimated. For the air suit chosen, air supply requirements were in the range of 15 cubic feet per suit. The design of the Breathing air system and portable compressor to supply the air came with a standard cooling system. Due to the desert environment, this cooling capacity turned out to be less than adequate. Vortex cooling units were added to the individual air suit supply lines to add additional cooling. While the vortex cooling units were effective they require ~30 % more air to operate. Breathing air suit and associated air cooling requirements need to be closely evaluated to include excess capacity when sizing the breathing air system.	The processing activity is hard, labor intensive work. Ensure the breathing air design includes capacity for equipment and air suits that will be used in the operation. Installed cooling on the compressors will not provide enough cooling and will be required to be supplemented.
OPS-4	Operations – Use of RTR and ISOCS for planning	Each Parent container was individually mapped using an In Situ Object Counting System (ISOCS) (Gamma Spec) unit. Additionally, most of the waste containers had real time radiography (RTR) information that revealed some details on the objects that would be encountered during the repack. As experience was gained with the completion of each container the workers were able to predict with greater and greater accuracy the specific contents of each new container and the hazards presented. This information was then used by the repack team of ironworkers, laborers, waste handlers, and radiological control technicians (RCTs) to orchestrate their approach to each container. Higher hazard and radiological source areas were approached in the best manner possible to eliminate or reduce the hazard. When appropriate, waste components were surgically removed from the parent containers by cutting holes in the containers sides and extracting a waste item.	
OPS-5	Operations – Breathing Zone	Experience at NTS was limited in the use of air supplied breathing air suits. The approach to breathing zone monitoring and dose assignment required socialization with site organizations and the DOE and eventual revision to the respiratory protection	

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	Dose monitoring	program for implementation. While this approach had been or was in use at other locations in the DOE complex it was new for NTS. The approach employed included the use of air suits, breathing zone air (BZA) monitoring internal to the suits, and the establishment of RWP compensatory actions when external suit derived air concentration (DAC) levels reached the Protection Factor (PF) of the suit and suspension limits at DAC levels greater than 10 times the PF of the suit. Suspension limits for the RWP were reached on 3 occasions. There were no skin or personnel contaminations during the 4 month campaign.	
OPS-6	Operations – Mockup Training and Feedback Process	Experience with this type of radiological operation was limited at NTS. A Repack Team was assembled of Ironworkers, Laborers, RCTS and Waste Handlers. The team was chosen to include a few members who had had similar experience with high hazard waste repackaging and radiological operations. While few, these individuals provided the basis upon which to build the team. That start was enhanced by designing and building a mockup facility for the purpose of selecting an air suit, practicing in doffing the air suits and other high contamination area (HCA) operational activities. This mockup was critical for those personnel who had not had experience in air suit operations and the radiological hazards presented by the impending operations. Proper performance of even simple activities is paramount to the successful completion (without incident) to these high hazard operations. The smattering of experienced personnel, the mockups and associated hands on training to practice provided a basis for the successful completion of the repack campaign. The project completed a 4 month campaign, with two entries per day, 6 days per week, without a recordable injury and no personnel contamination incidents. Key to this learning process was the use of daily debrief meeting of the Repack team. This meeting proved effective for feedback as well as planning the next day's events. Worker involvement was the starting point and prompt action by support organizations and management made for an extremely effective feedback process. The process was used throughout the training and repack campaign. Management personnel with specific experience in repackaging operations and team building were brought in to ensure readiness preparation success as well as serve as senior supervisory watches for operations. Due to the short duration of preparation these personnel became a key element of the readiness review success. The importance	

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		of building an effective team should not be under estimated with mixed crews of labor and support personnel.	
OPS-7	DOE Project Support	DOE Project personnel supported the readiness effort by helping to schedule resources and helping with the removal of road blocks during the orchestration of the readiness activities. The DOE support personnel enhanced the ability to achieve readiness on time.	
OPS-8	Operations – Gas Generation Testing	Transuranic Package Transporter II Authorized Methods for Payload Control (TRAMPAC) test category waste was not identified until late in the project. Six drums of TRU waste inventory that had been thought to be shippable in the Transuranic Package Transporter (TRUPACT) II was later identified as requiring Gas Generation Testing (GGT). Special equipment is required to perform this test. No provisions had been identified for this testing and it had not been incorporated into the AB. The need to include the testing activity in previous DSA changes had been discussed but was left out as none of the waste inventory had been identified as requiring the tests. During the repack effort, one parent container contained a large quantity of machine oil which was absorbed and created an additional test category drum. These tests can run up to three weeks, depending on the waste type. Using the regional generation facilities DSA analysis as background, the existing DSA analysis and controls were determined to bind the GGT testing activity. GGT equipment was provided by the regional characterization facility. This equipment has been designed to interface with systems at the regional characterization facility. Equipment includes test canisters for the drums and analysis equipment Mass Spectrometer/Gas Chromatograph (MS/GC). Some issues were encountered as this was the first time the equipment had been sent to a processing facility for use. • The Test Canisters are designed to interface with a piping system that vents internal gases outside the facility. This system was not available locally. To make the canisters operate properly (provide a vent path and relief path) quick disconnects of the size and make of the tubing on the canisters had to be located and installed. These fittings and appropriate lengths of tygon tubing are required for a normal testing set up. • Each canister as well as the test cart containing the MS/GC requires significant 120 volt power requirements. This power was provided using a temporary	As a lessons learned, it would have been more appropriate to include the provision for GGT in the DSA supporting TRU waste processing and characterization for the original submittal.

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		modification to tap into the RTR building electrical distribution system at a point that had the capability of supplying 15 amps for each of the 7 canisters and separate 15 and 20 amp connections for the test cart. • The test cart requires calibration gases that were not supplied with the equipment. Due to quality requirements these gases have to be supplied through Central Characterization Project (CCP). • The CCP procedure that incorporates the testing and gas analysis was designed to conduct activity at the regional test facility. This procedure was revised by CCP so that it could be generically applied but the procedure still requires incorporation into the processing facility work processes.	
OPS-9	Team Building	The building of the team for operations, including craft, radiological support, subcontract personnel performing gamma spec, and senior supervisory personnel was a key element of the success. This process was facilitated by bringing in the team building support managers early in the readiness process and maintaining that support throughout operations. Senior Supervisory Watch personnel and mentors were a valuable asset to the site operations and team functionality. Cabrera provided the gamma spec support and indicated that it was the best support they had ever encountered at any of the DOE sites they had performed operations. They indicated they were never told "no" when asked to move waste containers or their equipment. They were an integrated part of the team throughout the project.	
OPS-10	ISOCS and Waste Processing	Waste characterization was supported by real time gamma spec nondestructive assay (NDA) using ISOCS. This allowed the workers to sort the TRU waste from Low-Level Waste (LLW) and thus reduce the waste produced and assure that only TRU waste was being made available for shipment to the regional characterization facility. Originally, real time characterization of the LLW waste was to be completed using Surface Contaminated Object (SCO) methods. ISOCS was determined to be more effective. Specific aspects of using the real time gamma spec NDA of the waste and waste packages increased efficiency and production: • Two ISOCS units were used throughout the project: One in the building to sort wastes and the second outside the building for final waste container assay. • A backup system was also available and was used near the end of the project	

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		when one of the primary units needed repair. When the Cabrera unit went down, the backup unit was used to get back up and running within a matter of hours. • The project used two Cabrera support personnel: 1 subject matter expert (SME) and 1 ISOCS operator. This was the correct resource requirements for the project. When activities slowed near the end of the project a single Operator/SME was sufficient. • An SME on site full time was needed to validate and perform the expert review of the NDA data. This allowed very timely processing and validation of the ISOCS data. • The Permacon arrangement allowed the ability to negotiate/communicate with the radiological control personnel for the positioning of the equipment and waste. This capability is required to make the real time categorization of the waste effective. Depending on the background in the Permacon, the ability to classify the waste was sometimes difficult if not impossible to do. A better design would include a designated area for assaying of the waste that was shielded from the waste processing activities as these activities adversely affect the background and the ability to use the ISOCS. A properly designed arrangement, including shielding would reduce count times, provide for better detection limits, and provide more effective classification of the waste as TRU or LLW. The ISOCS in the Permacon was used in a Contamination Area (CA) and was removed on two occasions. This was facilitated by keeping the CA relatively clean and wrapping the unit. Unrestricted release was achieved at the end of the project, but precautions need to be implemented to ensure this can occur. • Due to work authorization restrictions, craft were used to maintain nitrogen in the gamma spec detector. This aspect of maintaining the vendor equipment has to be considered when establishing working relationships. • Due to the space constraints of the VERB, the waste containers were brought in and out the same door. The ISOCS was moved for each evolution which necessitated realignment after each container movement. As space permits, allow for a fixed ISOCS location or consider a second transfer door. • Integration of ISOCS assay activity with real time support from the NSTec waste	

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		generating services (waste characterization and certification function) streamlined the waste processing and disposal processes for LLW. No formal tracking mechanism was initially established to track the daughter waste containers and individual container status. As a lesson learned a visual system of labels or flagged would be appropriate for identifying aspect of the characterization process including the need for an assay or otherwise demonstrate the processing status of an individual package.	
OPS-11	IH BE sampling	The capability to perform real time beryllium samples was provided by the Industrial Hygiene (IH) group. This equipment was located locally and was used to perform an initial screen for onsite movement of containers. As the system was not certified, samples had to be sent off site for certified analysis for final container disposition. The beryllium screening methods can be qualified or accredited for local certification, rather than sending the samples offsite to an accredited lab for final analysis. Due to the small number of samples taken, the cost did not justify the expense in this case. The DOE ORR identified the real time screening as a noteworthy practice. • IH and radiological impacts for shipping samples and associated procedures should be planned in advance. • As with the ISOCS there was an identified need for a sample and container management process for tracking status related to beryllium samples	
OPS-12	Personnel transportation	A primary safety concern for the operation was the fact that the NTS is remotely located from the workers homes. Due to the high work tempo for the activity and long work hours, the safety of personnel driving to and from the site needed to be assured. The drives were typically in the dark and at highway speeds. Operations personnel strived to ensure that there were at least two people in any vehicle traveling to and from the site. Vanpools were provided and were extremely valuable. Vans provided operational flexibility that a bus would not provide. It was the exception that anyone drove by themselves.	
OPS-13	VERB design enhancements	During the waste processing it became evident that certain features in the processing facility could enhance operations and make it more efficient: • A standard waste box (SWB) port location was designed into the tent structure separating the CA and HCA. This port location for the bagout SWB was not user friendly which resulted in more direct loaded SWBs. The opening was too high	

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		off the floor and at an angle. An ideal arrangement would consider a number SWB loading options and should consider the following options: o Level with the floor so that waste material could be lowered into the box. o One that could be accessed with an A frame crane o One positioned for direct loading without climbing up a stairs or ladder • The efficiency of operations could be enhanced with an airlock between the CA and HCA • All equipment must be elevated off the floor or on wheels to simplify decon. Overhead track system (monorail) with hoist for handling containers in and out, and lifting items from boxes would have been a great improvement. There would be no wrinkling of the floor cover and eliminate the possibility of running over air supply hoses. • Doors were not big enough for the largest boxes, sometimes there were only a quarter inch on each side. This was known during the design, but was all the space we had. • The VERB spill protection berm made material handling with manual dollies difficult. Longer ramps to these berms would be an improvement. • Consideration should be given to the handling of air hoses, including the capability of suspension from the ceiling or retractable. • It would be optimum if the Waste Examination Expert (WEE) had direct visual contact with the repack processing area.	
OPS-14	Operations – Worker enhancements	Several enhancements and improvements were developed by the craft and support personnel as we processed the waste: • Because of the need to move target SWBs into and out of the HCAs, the craft develop a standard plastic cutout for diapering of waste containers. This facilitated protection in the HCA and ease of decontamination when bringing the SWBs out. • Operations were scheduled using dedicated teams. This provided enhanced personnel comfort level, eased communications and enhanced the personnel's ability to anticipate operational requirements.	

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		• Mock-ups and dry-runs were essential to the success of this project. The mockups were focused to a purpose which made them more effective, e.g., tool use was first practiced and techniques developed without encumbering Radiological personal protective equipment (PPE) until personnel had that aspect perfected and then radiological PPE was added. As experience was gained and methods determined, work factors were combined until full scale mockups could be conducted. As the use of breathing air was a new experience for several of the crew, the goal was for them to perform full dress PPE activities at least 10 times before going hot. These sequential mock-ups with increasing layers of PPE and complexity made the mock-ups more effective. • While not used for the NSTec TRU project, the craft identified the need to include WIPP packaging requirements in mockup and other training for the operators. • Housekeeping and standard tool and equipment storage enhances the crafts ability to work, especially when multiple crews are using the same tools. • The more time available for the craft to work with the tools before actual use, the better. • Waste Handling of the large containers in and out of the VERB was a challenge. Larger capacity motorized power pallet jacks would have provided some improvement.	
OPS-15	Radiological Control Considerations and lessons learned	The follow is a list of enhancements and lesson learned related to radiological control • Cerium nitrate was not used because of restrictive DSA controls, works well only on stainless steel, and application and removal is not very efficient. Its use requires a considerable number of fire control measures. • Simple Green™ and Radiacwash™ were effective for use on decontamination of glove box parts and tack cloth worked well on LLW.	
OPS-16	Communication in Breathing Air suits	Several attempts were made to make communications clear, comfortable, reliable and easy to use while in the air suits. While communications were effective and the teams adapted to the systems provided, this was an area identified by the workers where improvements could be achieved. The short term nature of the project and the lead times time associated with specialized communication equipment did not make this	Communications are a key element of effective processing. Early consideration and application of equipment to the mockup processes is required to

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		feasible for the VERB operations. The transfer of containers between the radiological control zones were particularly troublesome as some workers were in air purifying respirators and others with radios were in air suits. For these instances air purifying respirators (APRs) with devices to assist communications would have enhanced the operation.	develop the processes and determine which equipment will meet the needs of the workers and determine the equipment which will not work. A one size fits all equipment selection may not be effective.
OPS-17	Tools and equipment	Power tools, waste process and PPE selection by the workers was actively supported: • Saw blades were selected and procured for different metal cutting abilities and resulted in a dynamic increase in efficiency. • A hydraulic spreader/cutter and electric chisel were extremely effective tools and reduced the physical work load of the workers. • Safety blades (J-knives) were used exclusively for cutting plastic. • A sturdy sorting table of the proper height is needed for effective and efficient identification of waste items to meet Waste Isolation Pilot Plant (WIPP) criteria. • Personnel used fire blankets to drape over the sharp edges of waste containers to protect their PPE. • Arm sleeves were required after one worker cut their suit on the edge of an SWB. These were especially cumbersome and had to be modified by one of the workers to properly fit over the suits. (Two protectors were sewn together to make one.) Consideration should be given to enhancing that area of the air suits to provide more robust cut protection as some PPE makers will consider reinforcing problem areas. • The outside of the parent waste containers were marked for re-assembly as they were dissembled for access to the interior TRU items. These containers were filled with LLW, reassembled using metal plates, screws, and cargo tape, and then removed from the HCA into the CA. In the CA they were wrapped with plastic and radiologically cleared for a short movement (50 feet) to a LLW disposal container (Cargo). • Fire retardant Anti-Cs and booties were worn by the Ironworkers when it was expected they would perform hot work.	

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		• Care was required throughout the project to police hoses that were on the floor. While not employed for the VERB project, workers recommended that consideration should have been given to overhead reels for as many of these items as possible. • All personnel actively participated in the post evolution briefings daily which made processing feedback for all the work crews happen in real time.	
	Construction		
C-1	Construction Work Control, Configuration Management	Timely closeout of construction work packages was not pursued initially; no priority was given to closeout of packages as work was completed. There was poor visibility of the construction paperwork completion until it became time critical at the end of construction. A TRU Project quality review was established based on the lessons learned from other nuclear projects. Construction Work Package completion and closeout was effected by a number of issues: • A key element of work package closeout was related to configuration management of the work completed, including capturing the design change paper. • The construction completion/engineering process causes a bow wave due the processing of the information by entire design change package (DCP) rather than drawing by drawing. The process needs latitude and coordination to process the work completed drawing by drawing or system by system to support downstream testing and acceptance. • There was a need for technical coordination and scoping of the package development and completion effort by construction; the process needs a technically competent person assigned to track, drive, and coordinate. For a nuclear facility it is the basis around which the test program and system configuration management are built. Timely closure of work packages was not fostered under the work control process. The process allowed packages to remain open and useable for long periods of time even though the initially identified work was completed. Originally 16 work packages were anticipated for the entire construction. This number escalated to 55 as construction	The time and resources necessary to closeout the work packages was underestimated. This critical path activity caused a one week delay to the start of readiness reviews. The implementation of basic quality documentation requirements for construction management and supervision needs to be reinforced. Management of the process is a matter of training and experience, and needs to be enhanced. Construction staffing has to consider the effort that is required to track and monitor interfaces with work control, engineering, and procurement.

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		schedule extended due to procurement of materials and design delays. Construction Management felt that 55 work packages caused major issues scheduling work and confusion by craft while performing work since many work packages (WPs) 'overlap' and finally WP closeout. The turnover of systems to Start-up for the Safety Significant SSC and to the Facility Manager for General Service SSC was hampered by work package closeout. The management of the work package closure activities hampered the ability to turnover the equipment which impacted the ability to complete startup testing as scheduled.	The appropriate technical and quality expertise have to be available to construction management. The division of the work effort must consider how the construction work is accomplished, including the craft support as well as work sequences and craft interferes that may be involved. This effort needs to enhance an overall project schedule, including turnover of the equipment and systems, and testing. The turnover over and testing processes have latitude that allows for system and equipment turnover, but to effectively turnover equipment and systems, the construction work effort and sequence has to be identified that supports the appropriate equipment turnover and testing.
C-2	Turnover	Construction personnel had difficulty identifying the requirements and format for turnover of the systems to the Startup organization and determining what information was needed by engineering to close the DCP. This process was hampered by the ability to close work packages. The turnover of systems to Start-up for the Safety Significant SSC and to the Facility Manager for General Service SSC was hampered by work package closeout.	

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C-3	Construction Project Management - Staffing	Construction was not adequately staffed or experienced to perform the required tracking and management of engineering issues and subsequent required documentation. The amount of effort and therefore the need for someone to perform these functions was not recognized in our planning related to construction staffing. Construction needed an assigned, full-time Quality Assurance (QA) personnel to administer NCRs. There was a need for a technically competent person to manage the routing and status of the nonconformance reports (NCRs), as well as other engineering paper including design change forms (DCFs) and requests for information (RFIs). The TRU Project provided key support roles in a number of areas including, QA, Material control, and NCRs that should have been the responsibility of a trained, experienced construction representative. This is more than a clerical function and requires some technical understanding of the processes involved.	
	ENGINEERING		
E-1	Design Basis Standards and Specifications	Identification of design and construction specifications were troublesome throughout the Project. Construction specifications were available as part of the DCP but were non-specific to the application of the multitude of identified requirements and were not directly related to the design drawings. Engineering design requirements did not identify the specific aspects of these global specifications for application during construction. The design basis with respect to specifications and standards was not well integrated with the PDSA development, engineering, construction, or operations. This was made worst by the fact that we were dealing with an existing facility that we were upgrading. The Nuclear Air Cleaning Handbook, DOE-STD-1169-2000 provides a good example. This standard provides specific guidance for the design and function of air handling systems in DOE facilities. The standard was designed to be used as guidance for the design and construction of DOE facilities used for handling radioactive material. Quality Inspection Plan (QIP) development was problematic for the VERB DCP. The quality inspection plans should include specific reference to the requirements.	Interface with engineering during the development of PDSA is now addressed and required by DOE-STD-1189. Engineering desires a final answer before they start, but it does not work that way. This effort is a reiterative process.
E-2	Engineering Process	The broad assignment of a Safety Significant (SS) level of functional classification to systems resulted in the assignment of the SS classification to non-critical components. This in turn complicated the procurement process and created additional work to qualify these components.	Use component level classification instead of system classification.

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	Integration		
I-1	Commercial Grade Dedication – (CGD)	Commercial Grade Dedication suffered from lack of definition as a program or process. • There was a lack of an integrated process incorporating responsibilities and actions for engineering, procurement, material control, Tech Services, and construction. • The process did not address or provide the necessary interfaces and details needed to properly control and track the QG3/legacy items put up for CGD • A workable method within the process for items that have post-installation testing to complete CGD. The Compensatory Measure for CGD that was put in place addressed the issue at a high level and was primarily QA driven and provided limited process related to QG3 dedication. Additional actions were required to fully implement the compensatory measure in the field	The integrated process implementation aspects of the CGD process needs to be developed. The process needs to consider aspects of Engineering, Quality, Procurement, and Construction. The process needs to fully recognize and integrate the revised quality program requirements and component functional classification aspects of revised engineering processes.
I-2	Procurement – QA reviews	Project management does not have dedicated QA procedural support. Engineering developed and submitted procurement specifications internally without project QA review. A project specific direct QA review of the specification would be appropriate on the engineering generated specifications. There is no programmatic requirement or process in the procurement process for a "project" QA review. The procurement processes assumes that the procurement QA representative assigned to do all procurement reviews knows everything about what each project needs and that the normal process review will capture all the quality requirements that are required. Therefore, with respect to the needs to the project, the generic QA review of procurement documents may not capture the needs of the project. This issue identifies the need for project directed QA support to engineering.	
I-3	Design Changes	The number of design changes adversely affected construction's ability to complete the VERB DCP on schedule. The existing design change process is restrictive and inefficient.	

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		RFIs create a level of formality and create redundant work. Engineering will visit each issue twice, once for the RFI and once for the design paper that will come out of the disposition of the RFI. Not all RFIs will lead to design changes, but for the VERB at least ½ did. Many of these issues can be solved by a phone call and/or a walkdown. The RFI process was required by engineering. The ability to incorporate field engineering into the work process was not available for the VERB. This is a critical element of design and construction that we do not have in our tool box. Field engineering has to be a part of our design and build processes. The limits of use and a process for use need to be established and incorporated into the design processes.	
I-4	Design Change Package	One large DCP was used to transmit the design for review, approval, and construction. While convenient for engineering, the ability to construct, manage, and closeout was made more difficult. The scope of various design elements of the DCP or the use of separate DCPs needs to be developed, integrated, and approved for the benefit of the entire project, including construction, testing, and turnover. A system by system approach to the design output is required that would allow processing of the design effort in smaller well defined parts. This would support a natural division to construction and startup testing management, including the leveling of the design review and approval effort, the procurement effort, the construction effort, the testing effort, and the turnover effort.	
	Maintenance		
M-1	Preventive Maintenance (PM) and MAXIMO	The ability to identify and incorporate preventive maintenance into existing processes was cumbersome. The process that was orchestrated by the Facility and Maintenance had difficultly delivering the product desired by the Project. • Summary data output was not readily available to demonstrate the required PMs and justification for the PMs that were selected. There appeared to be no standard approach or periodicity established to keep the Preventive Maintenance list current and the facility updated. This is a facet of configuration management that is required of the cognizant system engineer (CSE) and facility manager (FM) of the facility. While there is a need for a computerized	

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		maintenance management system (CMMS), a one size (huge) does not fit all. It requires the assignment of personnel to the effort in excess of the function and usefulness it provides.	
	Nuclear Operations		
NO-1	CSE/System Engineering process	The division of ownership of the VERB and associated systems during construction activities for the DCP was not well understood by the CSE or the readiness manager. The fact that the facility was being upgraded from a radiological facility to a Category 3 nuclear facility required the existing structure to meet nuclear facility requirements not just the systems being modified. The CSE and readiness manager incorrectly believed that the whole facility was under modification, while construction and engineering only considered those portions affected by the DCP as their responsibility. The CSE did not understand that the parts of the facility that were not under modification were his responsibility and those physical aspects of the facility needed for readiness rested with him. This is an aspect of the modifications to an existing facility and represents a difference from a "green field approach". It was not recognized by the CSE until readiness preparations were underway that all the systems or parts of the systems not affected by the DCP are his responsibility for ensuring correctness of as-built drawings as well as other configuration management and maintenance requirements. • The site reliance on the "green field" processes for construction activities did not promote the identification of this issue until construction and startup were done.	
NO-2	Maintenance – Readiness and Process	Several maintenance issues were identified in the readiness processes of the management self assessment (MSA), contractor operational readiness review (CORR), and DOE operational readiness review (DORR). These issues related to the readiness of maintenance personnel, work package instructions (WPIs), preventive maintenance systems (PMs), and Surveillance Requirements (SR). The maintenance processes were not as robust as those used to prepare the operational activities. The maintenance support function did not receive the oversight in the preparation process that other areas received. This recommendation extends to the associated maintenance training records as well.	
	Procurement		

#	Functional Area	Discussion	Recommended Actions
P-1	Procurement Management	The issue at hand was to come up with a path-forward on procuring the IONEX Filter Systems. We had received multiple bids and the only qualified supplier on our QSL was not the low bidder. It was argued, and accepted, that there was more to consider than just the low bid on this requisition. From a cost perspective, there are additional costs that would be incurred by NNSA/NSO if awarded to a supplier other than the one on our QSL. In order to award to a supplier that is not on our QSL, either a quality audit of the supplier or a commercial grad dedication would have been required. These activities represented additional cost in money and time. In addition, based on past experience, the ability to generate a CGD for a system instead of a component was suspect. There were many risk factors associated with trying to qualify and use the lowest bidder in this case. Specifically: • The low bidder was untested – their ability to pass an audit was not known and they had not previously been qualified by anyone in the complex. • There would be a considerable time delay in doing an audit and just determining if the low bidder could be qualified. Therefore, for a long-lead-time procurement, this had the potential of putting the project schedule at risk. • The IONEX product was a known quality and based on past DOE complex experience they were expected to provide a good product. And they did. • The quality of the low bidder's product was not known. The procurement process needs to be evaluated to determine how to best factor in risk parameters so that correct and proper procurement awards can be efficiently made to the best benefit of the government. The procurement process and the need to qualify QG-1 or 2 vendors is a chicken or egg scenario. We need to use a QSL vendor, but we don't know who that is until we go through the procurement process to the point of award, then we may have to quality a vendor with a potential that the they will not be qualifiable. If a vendor cannot be qualified, then the procurement must be re-awarded and the attempt made to qualify another vendor. Existing qualifications needs to be given an advantage consistent with the fully loaded cost of qualification and potential adverse effect on the overall project schedule and associated cost of delays.	Total procurement lifecycle costs need to be considered when awarding a contract to include nuclear vendor qualification and commercial grade dedication activities.
P-2	Procurement	The development of procurement documentation was time consuming and inefficient. • Procurement documents were developed using proper names rather than	

#	Functional Area	Discussion	Recommended Actions
	Management	referring to a process or organizational function, e.g., requisition worksheets (RWs) were issued with specific names in the directions to buyers and not by position. At the least, there is indication that process was not well understood. • Calling out overly prescriptive requirements caused vendors to supply materials that did not meet the requirements and resulted in subsequent non-conformance reports, yet the parts met the project needs. • Calling out overly prescriptive requirements causes vendors to meet the exact requirements of a requisition without regard to desired function. Delays were experienced as vendors had to special order or build the equipment, when off the self equipment would have been satisfactory. • Significant design modifications, after the initial issue for construction package was completed, impacted procurements. • System versus a component level functional classification required some system sub-components to be procured at a higher quality level than would be required had there been a true functional analysis. This increases cost as the vendors must be qualified or the item commercially dedicated. The level of effort required to process the requisition paper, to develop CGD plans, to perform QA and QC inspections, and to conduct material tracking was increased. The fact that "legacy" CGDs were adequate for all of the items that were dedicated for the VERB indicates that our functional classification for items needs to be enhanced. In all cases of CGD, commercial off the self items met the technical requirements.	
	Project Management		
PM-1	Engineering and Construction approach to Modifications to Existing Nuclear Facilities	The fact that the VERB was not a green field project was a point made with engineering and construction from the very beginning. While that point was recognized by engineering and construction, what it truly meant in terms of process or requirements was not fully understood. The issue was that the engineering and construction processes primarily support a green field project, so they approach all their work in that manner. When it is not a green field project they are forced to interface with the facility and that is not well orchestrated in the existing processes. Construction personnel had	

#	Functional Area	Discussion	Recommended Actions
		little experience with a modification to an existing "nuclear facility". The lack of quality documentation output without the outside influence applied by TRU Project personnel indicates that the construction processes would not be effective at nuclear green field projects. This issue is related to a number of process issues as well, including turnover, design package configuration and format, and work package development.	
	Waste		
W-1	Waste Packaging	Implementation of a DOE prescribed waste packaging instruction mid-way through processing oversize boxes caused waste rejects and resulted in unnecessary rework. NTS was the pilot program for use of "Contact Handled Transuranic Waste Packaging Instructions" issued 10/9/08. First-time procedure use historically requires some revision or clarification which was not done. Furthermore, timely and consistent guidance was difficult to get from WIPP. Training of the Waste Examination Experts is fundamental to the entire waste packaging process.	Send CCP qualified Visual Examination (VE) Expert to support packaging at the outset Send site representatives to an operating site for initial training Explore WIPP administered training and qualification
W-2	Waste Non-Conformances	There is not a formal nonconformance process (NCR) for waste generation and characterization conducted under the new TRU Waste Packaging Instruction. The guidance received from Carlsbad Field office (CBFO) upon identification of a nonconformance by remotely located waste certification officials (WCO) was that the entire container was to be repackaged. Without an NCR process to identify and disposition nonconformances, the exact problem and remedy is not agreed upon prior to rework which can result in additional rework, worker exposure, and expense.	Implement an NCR process for use with the TRU Waste Packaging Instruction and provide specific rework requirements.
W-3	Processing Sources and "source like" High Rad Material	The WIPP definition of sources is not clear and not linked to waste criteria. Waste forms that challenge the ability to assay the waste becomes prohibited or orphaned due to the inability to impose WIPP certification requirements at the regional facilities. Highly radioactive material that does not meet any definition of "source", such as Cm244 and U232/U233 became problematic due to calibration limits of regional characterization facility NDA equipment. These restrictions are not identified in the packaging instructions. As a processing facility, we felt we handled the sources more than should have been required. A complete list of requirements was not established prior to accessing the	It would be beneficial if additional guidance were issued by WIPP regarding acceptable NDA protocols and methods so that generators could tailor their programs appropriately.

#	Functional Area	Discussion	Recommended Actions
		sources which resulted in multiple handling. The processing facility can never get enough information on sources or highly radioactive source like material to provide to the characterization and shipping entities. The ultimate disposition of this material will require every bit of info that can be provided, including any registry numbers, isotopic break downs, physical construction or makeup, pictures, weights, dimensions, and etc. This became a challenge to ALARA as the request for more and more data necessitated repeated handling.	
W-4	WIPP/CCP Communication	WIPP packaging requirements, special material approval processes, and data requirements often work contrary to worker safety and ALARA principles. • The WIPP packaging instruction requires the use of video and a waste examiner, instead of real time visual examination expert. This process tripled the amount of time required to generate waste containers which is an unfavorable tradeoff for ALARA and worker safety in an extremely hazardous environment. • There was no real time formal communication process between the generator and WIPP. NSTec could not talk to CCP directly. • The WIPP packaging instruction requires written approval to package sources and organics. When these items are identified, a more expedient resolution is required.	
W-5	Waste processing – documentation	The documentation requirements are very onerous. A checklist was necessary in order to meet data packaging requirements and 3 reviewers were used to ensure the quality requirements.	
W-6	Waste Processing – Visual examination equipment	Included with the modification of the VERB was recording equipment for the purpose recording the visual examination of all TRU waste. • The equipment proved unreliable and failed during visual examination activities. Failures of recordings results in rework. Only industrial grade equipment with numerous levels of redundancy should be installed for these applications. • There were blind spots in the waste processing high contamination area. The original waste processing flow was modified as experience was gained which would have benefited from additional cameras. When installing the video system, err on the side of extra coverage and redundancy.	

#	Functional Area	Discussion	Recommended Actions
		• The waste packaging instruction need to be improved with respect to the identification of requirements and recommendations	