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NGLW RCRA Storage Study

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DISCLAIMER

Executive Summary

The Idaho Nuclear Technology and Engineering Center (INTEC) at the Idaho National Engineering and Environmental Laboratory (INEEL), a Department of Energy (DOE) site, contains radioactive liquid waste in underground storage tanks at the INTEC Tank Farm Facility (TFF). The waste has resulted from many years of operations at the plant formerly known as the Idaho Chemical Processing Plant, and from continued operations at the same plant, now known as INTEC, in support of the DOE mission. INTEC is currently treating the waste by evaporation to reduce the liquid volume for continued storage, and by calcination to reduce and convert the liquid to a dry waste form for long-term storage in calcine bins. Both treatment methods and activities in support of those treatment operations result in Newly Generated Liquid Waste being sent to the TFF.

The storage tanks in the TFF are underground, contained in concrete vaults with instrumentation, piping, transfer jets, and managed sumps in case of any liquid accumulation in the vault. The configuration of these tanks is such that Resource Conservation and Recovery Act (RCRA) regulations apply. The TFF currently operates under interim status with a RCRA Part A permit for storage of hazardous wastes and a consent order, described herein. The TFF tanks were assessed several years ago with respect to the RCRA regulations and they were found to be deficient.

A Notice of Noncompliance / Consent Order (NON/CO) was issued. The NON contended that the eleven tanks in the INTEC TFF and much of their ancillary equipment did not comply with RCRA secondary containment requirements. The NON/CO established a compliance schedule for completion of several tasks which would result in ceasing use of five tanks by June, 2003 and ceasing use of the remaining six tanks by December, 2012.

Further direction from the DOE Idaho office calls for no Newly Generated Liquid Waste (NGLW) to be placed in the existing TFF tanks after 2005. Consequently, alternatives are required to provide RCRA-compliant storage for the NGLW.

This study addresses methods by which RCRA-compliant storage may be obtained. The first method considered is to use VES-WM-190 in its existing configuration. One method considered is to construct new tanks. Another method is to modify an existing tank (VES-WM-190) in either of two ways, to place a new tank within the existing tank or to place a second bottom inside the existing tank and upgrade the existing vault. A third method considered is to relocate four existing direct-buried tanks (VES-WM-103, -104, -105, and VES-WM-106) to a new vault system. In conjunction with all four methods, three other existing tanks (VES-WM-100, -101, and VES-WM-102) will provide an additional 54,000-gallons storage.

One stipulation of the NON/CO decree required the INEEL to provide thorough records pertinent to the configuration and integrity of the tanks and ancillary equipment, including history of operations and maintenance, and corrosion records. In response to the aforementioned NON/CO stipulation, an important report was compiled by W.B. Palmer. The content of the W.B. Palmer report was particularly useful in the development of this study. Since the specific information in the report emphasized the robust condition of the tanks, especially VES-WM-190, and the reliability of the ancillary equipment, this study was able to focus on the condition of the secondary containment of VES-WM-190 with respect to compliance with RCRA regulations.

This study considers the current tank(s) configuration and the RCRA deficiencies identified for each. The study proposes a means of correcting the deficiencies. The cost estimates included in the study account for construction cost; construction methods to minimize worker exposure to chemical hazards, radioactive contamination, and ionizing radiation hazards; project logistics; and project schedule. The study also estimates the tank volume benefit associated with each corrective action to support TFF liquid waste management planning.

The study has determined that the first recommended option is to use VES-WM-190 for NGLW Storage AS-IS under provisions of the Consent Order, since the least costly alternative is to use WM-190 without modifications. The Palmer report establishes a strong technical basis for allowing the continued use of WM-190, and there is a legal basis to support such use until 2012.

The study has found that the second most attractive method, i.e., to construct new tanks is advantageous. The proposed method would provide three (3) 100,000-gallon tanks in a RCRA-compliant installation adjacent to the existing TFF enclosure. That location is indicated due to the proximity of an interconnecting piping and instrumentation system. Although life-cycle costs are slightly more than the lowest cost option considered, the flexibility for future TFF management is pre-eminent.

Further, the study found in analyzing the fourth method, that VES-WM-103, -104, -105 and VES-WM-106, while in good condition, are in an existing direct-buried configuration. Construction of a new vault and relocation of the tanks would be too problematic due to difficult excavation, piping demolition, and relocation effort. Also, since the aggregate storage volume thus achieved would not meet the projected requirement, this method was considered no further.

The study turned to the third method, e.g., to modify existing tank VES-WM-190 in either of two ways: (1) to place a new tank within the existing tank or (2) to place a second bottom inside the existing tank and upgrade the existing vault for secondary containment. As with the fourth method, the current tank configuration and the existing RCRA deficiencies were considered. Either of the two ways would serve to correct the deficiencies. Placing a new tank within the existing tank proved to be too costly due to the necessary construction methods.

The study found that placing a second bottom inside the existing tank and upgrading the existing vault was attractive. The cost estimate indicated the lowest cost and a reasonable schedule, coupled with achieving as much as 250,000 gallons RCRA-compliant storage.

Considering potential difficulty with continued use of VES-WM-190 AS-IS, especially to meet storage needs beyond 2012, the flexibility associated with new tanks is very attractive. In summary, considering potential difficulty with continued use of VES-WM-190 AS-IS, especially to meet storage needs beyond 2012, the flexibility associated with new tanks is very attractive. The new tanks option, while slightly more expensive than the VES-WM-190 new, second-bottom option, should be given favorable consideration, because new tanks offer 300,000 gallons storage and flexibility in tank farm waste management planning. Construction would not adversely affect existing TFF operations. Once new tanks construction is complete, the next most attractive method would be to construct the new, second bottom in VES-WM-190.

The combination of (1) new tanks, (2) use of existing VES-WM-100, -101, and VES-WM-102, and (3) the modification to VES-WM-190 would result in a final aggregate RCRA-compliant volume of approximately 600,000 gallons.

Contents

NGLW RCRA Storage Study

1. INTRODUCTION

This engineering study provides an evaluation of various alternatives for RCRA-compliant storage of NGLW. It provides schedules and life cycle cost estimates for each alternative. Finally it provides analysis and recommendations for Management.

The INTEC Tank Farm currently operates under interim status with a RCRA Part A permit for storage of hazardous wastes and a consent order, which is described below. There are no plans to submit a Part B application because it appears as if the tank systems could not be feasibly upgraded to meet the required standards.

The following information was compiled in the W.B. Palmer, et al, report entitled "Status and Estimated Life of the 300,000 Gallon INTEC Tanks":

> Due to aging of the tanks and support facilities and more stringent requirements in the areas of secondary containment and seismic stability, a project was initiated in 1989 to replace the INTEC Tank Farm. The Notice of Noncompliance (NON), issued by the EPA on January 28, 1990, supported the DOE decision to construct replacement tanks. The NON contended that the eleven tanks in the INTEC Tank Farm and much of their associated valves and piping were not in compliance with secondary containment requirements for acidic waste. According to the W.B. Palmer report, the concrete vaults for the tanks are unlined and, if a tank leaked, the acidic waste would attack the concrete and could eventually dissolve a hole through the vault wall or floor. The pillar and panel construction of some of the tank vaults is not as structurally robust as the monolithic designs and will not meet current (as explained later in the report) seismic design standards.

The Palmer report continued:

> The NON Consent Order (NONCO), signed April 3, 1992, outlined a compliance schedule for the completion of several tasks that would ultimately result in the required permanent cessation of use of the five pillar and panel tank vaults containing Tanks WM-182 through WM-186 on or before March 31, 2009. Cease use for the remaining six vaults containing Tanks WM-180, WM-181, and WM-187 through WM-190 would occur on or before June 30, 2015, among other provisions. The Idaho Settlement Agreement, signed October 17, 1995, requires all SBW to be calcined by December 31, 2012. The Second Modification to the NONCO, signed August 18, 1998, accelerated cease use of the pillar and panel vaulted tanks to June 30, 2003 and cease use of the remaining six tanks to December 31, 2012. The Third Modification to the NONCO, signed April 19, 1999, left existing Tank Farm milestones in place. (Status and Estimated Life of the 300,000-Gallon INTEC Tanks, W.B. Palmer, et al, INEEL/EXT-99-00743, July 1999.)

This study includes four storage options and four corresponding mechanical design scopes as follows:

1.1 Use WM-190 Without Modification

This alternative addresses WM-190, which would be used as-is, without modification. The Palmer report provided historic data for VES-WM-190:

> WM-190 was never put into service for HLW storage as designed, but was retained as the designated spare tank for use in emergencies. Over many years, approximately 7000 gallons of accumulated vault sump water and HLLW, which leaked through closed valves, collected in the tank. This waste was pumped from the tank in 1982. System modifications and repairs were made to correct the problems and no subsequent pumping of the tank has been required. The tank is currently estimated to contain only 500 gallons of solution. The tank is contained in a square reinforced concrete vault. Scoping studies have concluded the vault could be shown to meet the most severe INEEL seismic criteria, more stringent than the current seismic requirements for the vault. The tank is 50 feet in diameter, is constructed of 304L stainless steel, and has a side wall that is 21 feet high. The tank has a nominal volume of 300,000 gallons, but the operating volume is not allowed to exceed 285,000 gallons. The tank is equipped with cooling coils. This tank will be kept empty as long as possible to retain maximum use flexibility in future Tank Farm operations. If used, this tank will be emptied to heel level by December 31, 2012. It will be RCRA closed along with the other square-vaulted tanks after 2012.

The following is provided for VES-WM-185, for general information, from the Palmer report because it has been indicated as an alternate, or backup, vessel to VES-WM-190. Since this report is not intended to address specific information about WM-185, no further information will be presented in this report.

> WM-185 was put into service in 1959. It is contained in an octagonal, pillar-and-panel concrete vault that is not as structurally robust as a monolithic design. The tank is 50 feet in diameter, is constructed of 304L stainless steel, and has a side wall that is 21 feet high. The tank has a nominal volume of 300,000 gallons, but the operating volume is not allowed to exceed 285,000 gallons. The tank is equipped with cooling coils. The tank has been filled six times and has contained aluminum and zirconium fuel reprocessing raffinates as well as high fluoride decontamination waste and SBW. When empty, this tank may be used as the designated spare tank, as discussed in the Second Modification to the NONCO, if WM-190 is put into service. (Status and Estimated Life of the 300,000-Gallon INTEC Tanks, W.B. Palmer, et al, INEEL/EXT-99-00743, July 1999.)

1.2 Modification and RCRA Permitting of WM-190 and Associated Piping

WM-190 does not presently meet RCRA secondary containment requirements primarily due to the configuration of its concrete vault. This study presents two concepts to make WM-190 compatible with the acidic liquid waste. One would be to line the vault and put a false floor in the tank and the other is to install a second tank within the existing tank. Both concepts have many difficulties to overcome.

1.3 Re-Location and Re-Use of WM-103, -104, -105, and -106

These tanks are presently buried underground surrounded by redwood slats and directly buried in dirt. This report evaluates retrieving these tanks and re-using them with proper secondary containment. The tanks, themselves, are RCRA compliant. The non-compliant issue is the fact that they are direct buried and the installation does not meet RCRA requirements for secondary containment.

1.4 New Tank Or Tanks

This report presents a preliminary conceptual design for new tanks, their size, location, and estimated cost. These tanks will be designed and constructed to current RCRA requirements.

1.5 Modification and RCRA Permitting of WM-100, -101, and -102 and Associated Piping

These tanks will be used in any storage system option either for storage of dilute feeds to the evaporator systems and/or final concentrated NGLW. These tanks are RCRA compliant, currently permitted in Interim Status. Permitting action is underway to permit these and the PEWE system. This report describes the RCRA compliance status of these tanks and associated piping.

2. Mission and Justification

The Second Modification (dated July 31, 1998) and Third Modification (dated April 20, 1999) of the Consent Order to the Notice of Noncompliance with the Hazardous Waste Management Act issued January 29, 1990 changed plans for INTEC new calciner operations and Tank Farm usage. The latest modifications require that the calciner must cease operation by June 1, 2000 and cease use of the five Tank Farm pillar-and-panel tanks by June 2003.

Although not presently required by the Consent Order or its Modifications, DOE-ID has requested that LMITCO stop adding all newly generated liquid waste (NGLW) to the Tank Farm by September 30, 2005 (letter from Joel Case, DOE-ID HLW Program Director to Jim Valentine, LMITCO HLW Program Director, dated June 21, 1999). This will require that future NGLW generated at INTEC be collected and stored in RCRA-compliant tankage independently of the sodium-bearing waste (SBW) which is currently stored in the non-permittable 300,000-gallon Tank Farm tanks. (It should be noted that the "use as-is" option for WM-190 would mean meeting as many terms of compliance as is practicable, but not completing all steps associated with full RCRA compliance; other options presented herein are intended to meet full RCRA compliance.) The NGLW will then be co-processed with the SBW, as long as it remains chemically and physically similar to SBW after it is concentrated in the INTEC evaporator systems, when treatment systems are made available for that purpose. After the calciner operation is terminated by Consent Order, it will not be possible to treat the SBW and NGLW until much later than

2005, either by the MACT-modified calciner or by some new treatment process facility to be constructed and on-line by 2010 at the earliest.

A joint LMITCO – DOE-ID Value Engineering session was held at INTEC on December 10, 1998 wherein the following conclusions were noted. (Direct quotes from reference letter "Newly Generated Liquid Waste Meeting Minutes of December 10, 1998", letter number LCS-01-99 by L. C. Seward, dated January 7, 1999.)

- After 2005 all newly generated liquid waste (NGLW) streams (except calciner operations and Tank Farm vessel and heel flushes) will be considered for the RCRA-compliant tank storage project.

- This is new direction from DOE-ID or at least correction of a misunderstanding that only Type 2 NGLW required segregation starting in 2005.

- There is no requirement to segregate Type 1 and Type 2 wastes in separate RCRA-compliant tank systems; in fact this is not desirable for various reasons.

- There is no requirement to treat the NGLW independent of whichever treatment process is used for SBW; in fact this is not desirable for various reasons.

- Even though at this time it is believed that collective NGLW will be above the WIPP TRU minimum as is SBW, NGLW cannot be independently processed without the possibility of creating an orphan waste. As such, it will be treated with the SBW by blending through the same process, to the same waste form, to the same disposal site.

The INEEL Liquid Waste Management Plan, PLN-439, by Julie Tripp, et al, Revision 0 dated 9/30/98, discusses waste generation projections and plans to minimize the on-going production of liquid waste. In PLN-439 the NGLW is separated into two main types, Type 1 and Type 2. Type 1 waste is generated from calciner and Tank Farm operations (SBW) and filter leach operations (filters from spent fuel reprocessing and HLW and SBW calcination). Once Type 1 waste is concentrated in the evaporator systems it has essentially the same radiological and chemical characteristics as SBW. Type 2 wastes are all other liquid wastes that are produced or received at INTEC. It has been recently determined, and consensus was obtained at the December 10, 1998 meeting, that it is highly likely that the Type 2 NGLW, once concentrated in the INTEC evaporator systems, will also have a radiological and chemical composition similar to SBW, at least, and most importantly, in transuranic composition which makes disposal of this material as low level waste quite problematic.

This study includes the segregation and RCRA-compliant storage of collective NGLW streams -- all of them, captured and blended as a whole as recommended in the FY-98 PLN-439 and the December 10, 1998 VE session. INTEC Operations personnel may want to segregate some Type 1 and Type 2 waste (or any stream combination) for various reasons related to chemical/radiological composition and the need for staged processing through treatment systems. However, this is not required and collective storage is allowed. Also, the Type 1 and Type 2 definitions and tracking will generally be maintained at least for dilute feeds because of the Waste Minimization Program and its goals and incentives. Staging of transfers may be used to maintain segregation of Type 1 or Type 2 liquid wastes. For operational flexibility, HLW Tank Farm Operations has indicated that, if new tanks are constructed, three separate tanks in addition to WM-100, WM-101, and WM-102 are desired to provide isolated storage if needed.

If WM-190 is selected as the storage alternative, HWL Tank Farm Operations will work within the constraints of a single tank.

PLN-439 refers to wastes from other facilities such as TRA and PBF. This study accommodates the volumes of these wastes as well as those from waste systems at INTEC. However, various projects or system modifications at those other facilities required to get this waste to INTEC have been assigned to and will be handled by personnel at those facilities and is not otherwise covered in this report.

2.1 Use WM-190 Without Modification

The Palmer report provides the following description:

> The four newest tanks, WM-187 through -190, are contained in a four-sectioned, rectangular, monolithic, reinforced concrete vault. The design of the vaults is important because the pillar and panel construction does not meet current seismic requirements and the unlined concrete in all of the vaults does not meet RCRA secondary containment requirements since the acidic waste, if leaked to the vault, would attack the concrete. Although leaks have occasionally occurred in associated valves and piping, the waste tanks have never leaked.
>
> Another suggestion for a way to utilize WM-190 has recently been evaluated: since the unlined concrete is unsuitable as secondary containment for acidic waste, it was proposed, as part of a waste segregation concept, that if wastes were neutralized to a pH greater than 2 (in order to fall within the RCRA definition of non-corrosive), they could potentially be stored in WM-190. (In other words, instead of modifying the tank and vault system to make it compatible with the wastes, do the opposite – alter the chemistry of the wastes to make them compatible with the tank and vault.) Results indicate that this neutralization concept is not a workable one since the waste would need to be neutralized well beyond pH 2 for materials compatibility (INTEC materials engineers recommend neutralization to a minimum pH of 6.5 to be compatible with the vault concrete). If this were done, waste volume would be increased substantially by the neutralizing reagent and a significant amount of sludge-like solids would also be precipitated.
>
> INTEC Technical Development engineers completed a series of tests to bring closure to this concept. Tests were conducted to determine the reaction of NGLW to pH adjustments with either a 20 wt% NaOH or a 10 wt% $Ca(OH)_2$ slurry. Because the calcium hydroxide slurry is more dilute, the precipitate sludge is not as thick as when sodium hydroxide is used. The volume increase, however, is more significant. Adjustment of the pH to 5.5 with sodium hydroxide produced a mud-like mass. It seems highly unlikely that the NGLW can be neutralized to a pH range of 6.5-8, for compatibility with WM-190, without significant dilution to maintain a pumpable and retrievable sludge. (D.W. Marshall letter DWM-02-99, to J.H. Valentine and N.C. Olson)
>
> Another possible way to prove RCRA compliance for WM-190 would be to demonstrate that it is leak tight and safe to use for acidic waste. This approach should be reasonable since the tank has not been used for waste storage and is in essentially new condition. The other ten 300,000-gallon tanks have reliably stored acidic waste for decades and no tank leaks have occurred. This approach is described in 40 CFR 265.191 (a section of the Resource Conservation and Recovery Act, RCRA) which says in part:

(a) For each existing tank system that does not have secondary containment meeting the requirements of § 265.193, the owner or operator must determine that the tank system is not leaking or is unfit for use...

(b) This assessment must determine that the tank system is adequately designed and has sufficient structural strength and compatibility with the waste(s) to be stored or treated to ensure that it will not collapse, rupture, or fail. At a minimum, this assessment must consider the following:

(1) Design standard(s), if available, according to which the tank and ancillary equipment were constructed;
(2) Hazardous characteristics of the waste(s) that have been or will be handled;
(3) Existing corrosion protection measures;
(4) Documented age of the tank system, if available (otherwise, an estimate of the age); and
(5) Results of a leak test, internal inspection, or other tank integrity examination...

This approach was pursued for the Tank Farm in 1990, when International Technology Corporation (ITC) was contracted to do an assessment per 40 CFR 265.191. Their study required several months, and resulted in a 400-page report ("Interim Tank Assessment Radioactive Waste Tanks with RCRA Requirements of 40 CFR 265.191 and 40 CFR 270.11, Engineers Report," December 1990, by International Technology Corporation).

The report assessed the fitness for use of the eleven stainless-steel tanks in accordance with the minimum criteria of 40 CFR 265.191. This tank assessment specifically excluded other tank systems and ancillary equipment facilities at the INTEC. These minimum criteria include (1) design standards used for tank construction; (2) hazardous characteristics of the waste stored or handled; (3) corrosion protection; (4) tank age; and (5) for non-enterable tanks, the results of a leak test accounting for temperature, tank deflection, vapor pockets, and a high groundwater table. The ITC findings, taken from the report, are summarized below.

2.1.1 Design Standards Used for Tank Construction

There is adequate documentation for the design and construction of Tanks WM-182 through WM-190 for compliance to the minimum requirements. The current documentation for WM-180 and WM-181, which are the oldest tanks, is inadequate in establishing the design standards to which these tanks were constructed.

2.1.2 Hazardous Waste Characteristics

The chemical and radiochemical composition of the wastes is derived from nuclear fuel dissolution processes at the ICPP. The dominant components of the non-fluoride waste types are aluminum and nitrate, and the dominant components of the fluoride waste types are aluminum, zirconium, fluoride and nitrate. All of the first-cycle raffinates are acidic with hydrogen ion concentrations usually ranging from 1 to 3 molar and with radioactivity levels historically varying from 5 to 40 Ci/gal for the Cs-137, Cs-134, Ce-144, and Sr-90 radionuclides. The wastes are classified as "hazardous" as defined by RCRA for two reasons. First is the presence of cadmium, lead, chromium, and mercury, which are included in the list of toxic constituents under the toxicity characteristic rule. The second is due to corrosivity (low pH).

2.1.3 Corrosion Protection

The corrosion control for the tanks is provided by the appropriate construction materials, and confirmed by a corrosion-coupon evaluation program. No active protection mechanism such as cathodic protection is provided. [No cathodic protection is needed for WM-190, or WM-185, since the tanks are not in contact with the soil.] The materials used in the Tank Farm and the liquid transfer system are 304L, 316L, and 347 stainless steels. The general corrosion metal loss, as evidenced by the low corrosion rates on corrosion coupons recovered above the solids layer in the tanks, is well within the design limits of the tanks. (W.B. Palmer letter to J.H. Valentine, New Tank Volume at INTEC - WBP-02-99)

An active program to monitor the materials performance of the tanks has been in place since Tank Farm operations began. The program originally consisted of (1) laboratory studies to evaluate and confirm the corrosion acceptability of the fabrication materials and methods with stored liquid wastes, (2) routine visual and instrumental inspections, and (3) the use of corrosion coupons exposed to the actual liquid wastes stored in the tanks. The most authoritative data pertaining to the materials performance of the tanks are obtained from the corrosion coupons. Sets of as-welded corrosion coupons of all tank construction materials (plus some others to provide additional information) have been placed in all waste tanks suspended at various levels to be covered by the liquid contents of the tank after they were in service.

During the four decades of operation, a wide variety of types of nuclear fuels have been received and processed at the INTEC. Each type of fuel reprocessed has required its own unique chemical dissolution and separations flowsheet and operating conditions for effective chemical separation of the uranium from the waste products. Extensive chemical research preceded the adoption of each major chemical process before it was used in the plant. The chemical reprocessing of each type of fuel required: (1) dissolving the fuel and its components, (2) separating the uranium from other actinides, fission products, and other dissolved fuel materials, (3) calcining the waste products, and (4) using only chemicals that were acceptably non-corrosive to the available facilities at every step.

Whenever a new process was developed, laboratory tests were conducted in advance to confirm the corrosion acceptability of the anticipated new waste solutions. Additional laboratory tests were conducted to obtain the same materials performance information for chemical solutions that were to be used later to decontaminate various facilities. During the actual fuel processing campaigns, the chemical compositions of the waste solutions were monitored to maintain process control. When necessary, the compositions were chemically adjusted to assure that they met the appropriate specifications before wastes were transferred to the Tank Farm. Considerable attention also was given to making certain that incompatible chemical wastes were not mixed or combined in the same storage tanks.

General corrosion rates are determined from the coupons' weight losses. Types of corrosion are characterized by the appearances of the metal surfaces in microscopic examination and from various techniques of metallographic analysis. General corrosion rates are useful to provide general estimates of tank wall thinning. Localized corrosion, such as pitting, stress corrosion cracking, crevice corrosion and preferential weld attack, is especially important. Analogous to the weakest link in a chain, any localized corrosion or defect that causes any leak at all, compromises the integrity of the entire tank. Therefore, it is essential for corrosion monitoring coupons to be fabricated from materials that are identical to those in the tanks and welded to exactly the same standards as applied to the tank.

A program to monitor corrosion in the waste tanks was initiated in 1953 when the first tank was placed in service. This program, using austenitic stainless steel corrosion coupons representative of the

materials of construction of the tanks, is continuing. The initial corrosion monitoring plans for the tanks were to retrieve a set of coupons approximately once every five to ten years in order to monitor their corrosion behavior in the actual waste storage environment. Corrosion coupons have been retrieved from the tanks and analyzed four times, in 1962, 1976, 1983, and 1988. The next retrieval is planned for 1999. The coupons removed from the tanks are carefully decontaminated in a manner that will not significantly affect the coupon surfaces with respect to their appearances or amounts of surface material that might have corroded away. Blank or control coupons accompany actual tank coupons through the decontamination process, so any corrosive effects from the decontamination can be recognized and given appropriate consideration in the interpretation of the results. The coupons are weighed in order to determine weight losses from which the rates of general corrosion attack can be determined. The coupons are also examined microscopically for indications of localized corrosion, such as cracking, pitting, preferential weld attack, or weld heat affected zone attack. The corrosion data are then evaluated and the results reported. These data provide the technical bases from which tank lives can be estimated. (Status and Estimated Life of the 300,000-Gallon INTEC Tanks, W.B. Palmer, et al, INEEL/EXT-99-00743, July 1999.)

There is no known corrosion coupon data from WM-190, WM-103, -104, -105, or –106, since no waste was in the tanks when the corrosion coupon monitoring was initiated. No process waste has been held by the tanks that would have produced measurable corrosion.

The Palmer report continued:

> There is evidence of solid particulates at the bottom of the storage tanks other than WM-190, WM-103, WM-104, WM-105, and WM-106. Is should be noted that if these tanks were to receive NGLW, solids would eventually appear in the bottom of these tanks, as well. The solids have been found by video inspection and consist of a finely graded, easily re-suspended material. Over time, these solids settle to the bottom of the tank. There is also a possibility that solids exist in the waste transfer system. No information is currently available on the size, shape, chemical composition, grit size, specific gravity nor radioactive levels of the solids layer. Since the coupons have not been in the solids layer until recently, no information is available on the effect of these solids on corrosion rates. Additional testing and monitoring will be required to determine the significance of the solids on short- or long-term corrosion rates in the Tank Farm tanks and transfer piping system.
>
> As discussed by Zimmerman, the observed general corrosion-rate data and physical examinations do not eliminate the possibility of localized attack in the tanks. Localized corrosion includes pitting, stress corrosion cracking (SCC), and embrittlement. No direct evidence of intergranular corrosion attack has been noted in corrosion coupons recovered above the solids layer from the tanks. Nevertheless, combinations of low temperature, altered solution chemistries in the solids layer, and notably extended periods of time will result in the progressive evolution of staining, pitting, and cracking. In addition, possible staining in WM-187 was observed during the tank washings as brownish stains on the plate portions of the tanks, away from the welds, which could not be removed by repeated attempts of the pressure hose. An evaluation was made based upon available information to determine if the passivation layer was sufficient to protect the tanks from localized corrosion. While the major problem is associated with the unknown effects of the solids layer, current indications are that some localized corrosion may exist. Consequently, it was concluded that the existing corrosion protection does not meet the requirements of 40 CFR 265.191.

The tank vaults were not assessed in the ITC study, since they concentrated on the vessel integrity. It should be noted that construction drawings do not indicate a water stop at the cold concrete joint where

the vault sidewalls meet the vault floor. Testing may be required to demonstrate the ability of the vault to meet permeability and leak resistance for a postulated leak.

The Palmer report continued with information pertinent to RCRA permitting.

Tank Age

The ages of the tanks are known and well documented.

Leak Tightness

Because of the radioactive nature of the waste stored in the tanks, it is impractical to perform a mechanical leak test of the tanks using conventional methods of pressurization. Visual inspection is also impossible. Therefore, the leak tightness requirements of the regulation had to be inferred based on available liquid-level instrumentation data combined with an analysis of the sensitivity and potential errors associated with instrumentation. The major sources of error include fluctuations in temperature while the effects of tank-end deflection and evaporation losses were found to be insignificant. The depth to the groundwater at the INTEC is at least 400 feet, and water table effects in masking leakage rates are nonexistent. The leak tightness in each of the eleven tanks is continuously monitored by a series of precision, stainless steel radio frequency probes. The probes are capable of measuring fluid level changes within the tank to a resolution of .05 inch over probe lengths of from 40 to 50 feet.

Analyses of the probe data have been performed. They suggest that the fluctuations in tank volumes are due to thermal effects, and not due to tank leakage. Within the accuracy of instrumentation, the evaluations of current fluid levels for tanks WM-180 through WM-189 indicate that leakage rates do not exceed 0.1 gallons per hour, and that the tanks are performing well which is in accord with their operational histories. There is no current or previous indication of unexplained loss of fluid from these tanks. Radiation monitoring has been performed in shallow wells around the tank farm. However, in view of sampling problems, the degree to which the radiation monitoring near the base of the tank is representative is not known.

Leak Integrity of the tanks has been evaluated based on the current waste volumes and conditions. The tanks have leak integrity for the present storage of the high-level radioactive wastes provided that additional sampling of the thermal expansion properties of the fluids is made. Routine monitoring of the soon-to-be-implemented pressure transducer system will provide additional information. It is important to note that the leak integrity examination did not consider filling the tanks to capacity although several of the tanks were nearly full. For those tanks at less than full capacity, it is especially important to monitor performance if fluid levels are raised causing an increase in bottom pressures to occur.

These results are summarized in the table below:

Summary of Tank Assessment
Compliance with Minimum Requirements

	Tanks WM-180-181	Tanks WM-182-190	Ancilliary Equipment
Design Standards	No	Yes	No*
Hazardous Waste Characterization	Yes	Yes	Yes
Existing Corrosion Protection			
General	Yes	Yes	Yes
Localized	No*	No	No*
Solids Layer	No	No	No
Age	Yes	Yes	Yes
Leak Test	No*	Yes	No

*Not determined on the basis of not meeting other criteria.

In summary, ITC did not certify the tanks for use. However, their concerns for Tanks WM-182 through WM-190 were only on localized corrosion and corrosion in the solids layer on the bottom of the tanks. The localized corrosion concern was due to a stain observed on the wall of Tank WM-187 (in a video recording) that they felt could be a precursor to corrosion. The concern on corrosion in the solids layer was simply because no data were available at that time from corrosion coupons which had exposure in the solids layer. At the time, we were only concerned with certifying all of the tanks and so this approach was not pursued further. At the present time, the situation is somewhat different. We have specific dates to cease use of the tanks to prevent leakage from the aging tanks. However, since WM-190 has never been used, it should have decades of reliable service available if certified per 40 CFR 265.191. Certification should be straightforward. The data assembled by ITC for design standards, general corrosion, and tank age are provided in their report and will not need to be redone. Since the waste that will be proposed for storage may be somewhat different than ITC used, the Hazardous Waste Characteristics section will need to be updated. The localized and solids layer corrosion concerns do not apply to this tank since it has no stains or solids. A leak test will be required, probably by filling with water or existing waste. (W.B. Palmer letter to J.H. Valentine, New Tank Volume at INTEC- WBP-02-99.)

2.1.4 Additional Work

This study presents the results of additional work performed to determine the RCRA-compliance posture of ancillary equipment, specifically piping. The results are found in Appendix A. In general piping systems are found to be compliant, except for those noted in the Tables.

After 10/1/2005 NGLW must be managed in a fully RCRA-compliant manner. This means that all tanks, pipes and valves and components that are contacted by the RCRA-controlled fluid must meet RCRA requirements for containment, detection of leaks and mitigation of possible leaks. Although existing tank farm tanks are not RCRA-compliant, principally due to un-lined secondary vault installations, most of the transfer piping system between the tanks is compliant. Modifications to Diversion Valve Boxes are underway to correct certain deficiencies in secondary containment. Upon

completion, the transfer lines required to move NGLW, as well as existing SBW or HLW, will meet RCRA requirements.

One deficiency in the tank farm has been noted for which no corrective action is planned (Status and Estimated Life of the 300,000-Gallon INTEC Tanks, INEEL/EXT-99-00743, Brent Palmer, et al, July1999). Years ago, during fuel reprocessing the tank farm vessel offgas system used a condenser to cool offgas from the storage tanks. The condensate from the condenser was routed back into a storage tank. The pipe used to convey the condensate passed through soil in an area protected by the cathodic protection system. It was not, however, constructed with a secondary containment. The configuration has been reviewed, and the findings are that excavating to expose the line and correct the situation would likely result in high risk for worker radiation exposures and possible structural damage to adjacent valve boxes and buildings.

2.2 Design Basis and Assumptions

Design Life of the NGLW tankage must be forty (40) years to provide storage until 2035. Records of tank farm tanks of the same construction and configuration as WM-190 show no leaks, no significant corrosion, regardless of usage. Since WM-190 has been essentially empty for approximately forty (40) years, operational evidence supports claims that successful operation of WM-190 could continue for yet another forty (40) years. WM-103, -104, -105, and –106, however, have been used for a few years to store 1st cycle raffinates from fuel reprocessing. They have since been drained and flushed, and the only reported waste to have entered these tanks has been condensate due to a steam control valve leak. This has also been removed.

2.2.1 Volume Requirements

Based on projections for NGLW flows from current operations until the eventual major treatment facility is in operation to receive and process the stored NGLW and SBW, this study is assuming that the NGLW storage volume requirement as three-hundred-thousand (300,000) gallons. The storage volume available from vessels VES-WM-100, -101, and -102 is 18,000 gallons, each, totaling 54,000 gallons. Regardless of the storage alternative taken by Management, the 54,000 gallons capacity will account for over one-sixth of the eventual capacity requirement. WM-190 in its present configuration (if used as is) is a 300,000-gallon tank, capable of storing 285,000 gallons. WM-185, the proposed standby alternate tank to WM-190, is the same size.

WM-190, if modified by one of the retrofit alternatives described herein, could store, depending on the option selected, either 200,000 gallons or 250,000 gallons. In any case, the storage volume available from using WM-190 is adequate for projected storage requirements.

If WM-103, -104, -105, and -106 are selected by Management for re-use in a RCRA compliant configuration, they would provide approximately 30,000 gallons, each, for a total of 120,000 gallons. Coupled with WM-100, -101, and -102, they will account for 174,000 gallons. For this alternative to be selected, Operations would have to project significantly lower volume storage requirements than those modeled under the current operating scenarios.

2.3 Process Description

The operating conditions and performance of the INTEC waste tanks have been continuously monitored on a daily basis since their installation. The liquid levels inside the tanks are continuously monitored to assure any potential leak is rapidly detected. The tank vault sumps are also continuously monitored for liquid buildup.

Historical and current operating data from the Palmer report provides the following:

> Typical chemical composition for the high level liquid waste (HLLW) and SBW that has been stored in the Tank Farm includes aluminum, zirconium, boron, cadmium, sodium, potassium, chromium, iron, tin, mercury, fluoride, chloride, nitrate, sulfate, and uranium. The zirconium, Fluorinel, and aluminum reprocessing wastes were readily calcined due to their high concentration of dissolved metals such as aluminum and zirconium. SBW, which is nearly 100 times higher in sodium and potassium content, cannot be calcined directly because the sodium and potassium form compounds that melt at calcination and bin storage temperatures. Melting of the calcine causes the calcine to agglomerate in the fluidized bed and storage bins; this would shut down the calcination process and possibly prevent retrieval from the storage bins and further processing to a final waste form. In the past, the Calciner has processed SBW by blending it with fuel reprocessing wastes (approximately three volumes of reprocessing waste to each volume of SBW).
>
> The blending diluted the sodium and potassium, thus permitting successful Calciner operation. Since the INTEC is no longer reprocessing spent fuel, no more reprocessing waste will be generated. Tank WM-188 contained the last of the reprocessing waste and when it was emptied, efficient blending to dilute sodium and potassium in the Calciner feed was not possible.
>
> Calcination of the remaining Tank Farm wastes will proceed more slowly than in the past because the SBW will have to be blended with non-radioactive materials, such as aluminum nitrate, for successful calcination.
>
> The current estimated chemical and radionuclide compositions of the Tank Farm wastes, based on historical processing and some sample analyses, are documented. The liquid waste stored in the Tank Farm has been maintained in the acidic (WM-180 was 0.08 N base for the initial tank filling) condition and, because of this, gross solids precipitation, as occurs in HLLW tanks at other DOE sites, has not happened at INTEC and the waste is a clear (although colored) liquid. A small amount (perhaps one-inch) of solids is expected to be accumulated on the bottom of each tank due to undissolved process solids, a small amount of accumulated dirt, and minor solids precipitation. These liquid wastes have been routinely transferred from tanks to the calcining facility with no significant problems; this same success in transferring liquid wastes is expected for processing the remaining Tank Farm wastes. Since the liquid wastes are chemically stable and contain very few precipitated solids, sampling and analysis of the liquid are relatively easy when compared to sampling mixtures of solids, sludge, and liquid which commonly exist in waste tanks at the other DOE sites; however, the sampling and analyses are still time consuming and expensive. All of the liquid wastes have been sampled and the general chemical and radionuclide compositions have been determined. Obtaining the detailed chemical characterizations that are required by the Resource Conservation and Recovery Act (RCRA) is in progress and will take several years to complete. Ultimately, the Tank Farm wastes and calcine must be removed from their storage locations and converted to forms suitable for permanent

disposal. The process to convert the waste to those forms has not yet been determined. An Environmental Impact Statement (EIS) and Record of Decision (ROD) will be issued in FY-2000, which will select the final waste treatment method. (Status and Estimated Life of the 300,000-Gallon INTEC Tanks, W.B. Palmer, et al, INEEL/EXT-99-00743, July 1999.)

INEEL Environmental Affairs has drafted a permitting plan for the High Level Waste Program for INTEC, entitled INTEC High Level Waste Facilities Permitting Plan. The plan and the associated schedule focuses primarily upon existing INTEC HLW hazardous waste management units, reflecting current planning in the HLW Programs and the alternatives presented in the draft INEEL HLW and FD EIS.

The permitting plan states that it in order for the HLW Program baseline assumptions regarding NGLW to succeed, certain tank systems must be permittable. The proposed interim status tank VES-WL-111, the Westside Holdup tanks VES-WL-103, VES-WL-104, VES-WL-105, CPP-603 (VES-SFE-106) and WM-100, -101, -102 tanks should be permitted as part of the PEWE facility in order to maintain administrative continuity of operationally related systems. VES-WL-111, and the WM-100, -101, and –102 tanks will receive Facility Assessment scrutiny following the 8/30/99 deliverable of the baseline PEWE FA to DEQ HWPB. WM-100, -101- and –102 are essentially RCRA-compliant. Identified deficiencies such as in secondary containment may be remedied during permitting via permit conditions, (INTEC High Level Waste Facilities Permitting Plan, DRAFT, LMITCO Environmental Affairs, Paul Smith, et al, July 1999.)

2.4 Utilization of the Wm-190 Tank

2.4.1 Physical Description

WM-190 is one of the eleven 300,000-gallon Tank Farm tanks. It has served as a spare tank over the years. WM-190 is currently located adjacent to tank WM-187 on the east end of the Tank Farm Facility (TFF). WM-190 is an umbrella-roofed, stainless steel tank, 50 foot in diameter and approximately 32 feet high from the base to the rooftop. The base of the tank and the lowest 8 feet of the cylindrical portion of the tank have a thickness of 5/16 inches. The remainder of the tank cylinder is 1/4-inch thick. The tank rooftop is 3/16-inches thick. The tank is estimated to weigh approximately 92,000 pounds and is not outfitted with lifting eyes.

The stainless steel tank is situated in a concrete vault where it rests freely on a 6-inch layer of sand. An octagonal shape concrete curb with a 3-inch wide drainage trench surrounds the WM-190 tank. There are two hot sumps located on the northeast and southwest sections of the concrete curb. Both hot sumps measure 1-ft square by 3-ft deep (~22 gallons) and are covered with a stainless steel wire mesh. Additionally, there is a cold sump located on the northwest corner of the tank vault. The cold sump, used to collect rainwater, measures 5-ft by 3-ft by 9-ft deep (~1,000 gallons). The vault floors are cast-in-place concrete, rests directly on bedrock and is approximately 56 ft. by 56 ft. by 2'-6" thick. The vault floor is a continuous pour. The vault floor has a 6" slope beginning at the center of the floor and tapers to the slab edge. The vault walls are 3'-6" thick cast-in-place concrete with a continuous pour up to a height of 16'-0". Drawing 117982 details the sequence of concrete pours for the vault walls. Each wall measures 32'-7" high and form key joints with the concrete floor. The construction drawings do not show any indication of water stops or waterproofing at the construction/key joints. The exterior walls are waterproofed with an asphalt seal coating. The vault roof is a cast-in-place roofing system that consists of pre-cast concrete roof beams and cast-in-place concrete slabs. The top of the vault roof is buried 9-ft

below grade. The roof beams extend 60-ft in the east–west direction and consist of a 2'-9" long by 4'-6" wide web and a 3'-9" long by 7" thick concrete flange. The beams are spaced approximately 7'-9" on centers. A 4'-6" long by 6" thick cast-in-place slab rests on the concrete beam flanges. The roof members are layered with a 3 ply built up roofing system and asphalt hot mopped on the exterior surface. Generalized information and tank dimensions are found in table 1.2

Existing ancillary equipment consists of waste transfer jets and piping, cooling, decontamination, instrumentation, and vessel off-gas pipelines.

Access to the tanks is provided through several risers. The WM-190 tank has four 12-in diameter tank risers, two 18-in diameter tank risers, and two 12-in diameter sump risers that extend to grade. Most risers are equipped with radio frequency probes for level measurements, corrosion coupons, or waste transfer equipment such as steam jets and airlifts. In addition to the sump and tank riser access, a manway opening, measuring 4'-6" by 4'-6" is located below grade near the center of the tank vault roof.

The WM-190 tank has one steam jet and one air lift pump. The steam jet can transfer waste out of the tank at approximately 50 gallons per minute (gpm) and the airlift can transfer waste out at approximately 35 gpm.

Although the WM-190 tank was never purposely used to hold waste, it did eventually collect about 7000 gallons of waste over the years due to inputs caused by jogging of valves to confirm their closure and when the tank vault hot sump was directly jetted to the tank. The tank was pumped down in February 1982 to about 1/2-inch by use of a mechanical pump that was temporarily lowered into the tank and it now contains approximately 500-gallons of contaminated water. The above information is based on detailed production logs presented to Cliff Olsen via phone conversation with Dan Staiger on 09/13/99.

2.4.2 Soils

The soil surrounding tank WM-190 is deemed an environmental controlled area (ECA 26) at this time. See sheet C-11 for location of ECA. In May 1964, a hose coupling leak was detected during a steam flushing operation designed to remove radioactive contamination from existing pipelines. The contaminated fluid was dispersed over a 3 to 4 acre area inside the INTEC fence line; however, contamination above background was detected outside the fence ($\approx$ 10 acres). The radioactive fluid was composed of Sr-90, Ru-106, Ce-144, and Cs-137. The contaminated soil material was removed. A soil characterization and waste management plan will need to be developed for the disposal of soil removed. For the purpose of this study, radiation control engineering developed a radiation model to access the radiation fields associated with construction work for tank modifications. The cost estimate accounts for the construction work in these radiation fields. See appendix D for radiation fields and appendix C for construction cost estimate.

2.4.3 Status of Tank Documentation

Adequate documentation for the design and construction of tank WM-190 exists to support a RCRA Part B permit application.

Two options are evaluated herein to obtain a RCRA compliant tank system. Option 1 would install a new 200,000-gallon tank inside of WM-190 and use the existing tank as secondary containment. Option 2 would install a new tank bottom inside WM-190 and line the tank vault with an epoxy liner. The epoxy liner would provide a secondary containment for the WM-190 vault.

2.5 OPTION 1 - Tank within a Tank

Option 1 would install a tank inside the existing WM-190 vessel (Ref. Sheet S-2). The entire vault roof would need to be exposed and removed. A prefabricated 200,000-gallon tank would be designed and placed inside of WM-190. Thus, WM-190 will be used as a secondary containment in the event of a catastrophic failure of the smaller tank.

2.5.1 Excavation

The tank roof lies approximately 9 feet below ground surface. A sloping plan has been laid-out on sheet C-13. A standard 1-1/2 to 1 slope was used with a 60 foot working area around the tanks. The total projected area of sloping covers 86 feet by 86 feet. It is estimated that approximately 2000 cubic yards of soil would need to be removed for this method.

Because of the proximity of other structures (features), shoring may be required to prevent undermining of existing foundations.

2.5.2 Excavation Difficulties and Costs

- Extensive subsurface investigation required.
- Approximately 40 pipes will require support at a minimum spacing of 7-ft on center and will require 250 to 300 supports. With all the congestion, a fair amount of hand excavation will be necessary.
- Extensive outages would be required.
- References Appendix C for cost.

2.5.3 RCRA Requirements

- Option 1 design and installation will conform to CFR 264, 265, subpart J.

2.5.4 Tank Vault Access

Several tasks will be necessary prior to accessing the WM-190 tank vault. The existing soil around the tank would require testing for radiological contaminants and soil properties. A soil characterization and management plan will be required. The soil characterization and management plan shall address the procedure for boxing and shipping of the soil to an approved storage and/or landfill Facility.

As detail on Sheet C-13, the total area necessary for access to the WM-190 tank is approximately 7,400 sq. ft. Several structures, such as the CPP 636 building, tank and sump risers, support pillars, concrete pipe encasements, concrete pads, and access hatches shall be removed, and replacements shall be designed to RCRA standards. An engineering evaluation and procedure for the removal of the vault roof beams and slabs shall be required. It is assumed that the tank vault roof will have to be redesigned due the possibility of corrosion, contamination and cracking during the removal process. The excavation process will require the use of a containment dome (sprung structures) that covers the entire construction area. This structure is currently in design in conjunction with the Tank Farm soils characterization (WAG 3). In addition, industrial size overhead cranes shall be designed and utilized to move all items scheduled for demolition. A large-scale packaging and bag out system shall be incorporated for all structures being removed from the construction site and exposed to the atmosphere. The containment dome will require a ventilation system (HEPA filters). The ventilation system shall have a continuous air sampling system in addition to obtaining air permitting. Furthermore, the filtered air will have to be routed to a stack for processing. This process will require the use of a stack monitor.

2.5.5 Tank within a Tank Design

Currently, the existing WM-190 tank holds about 500-gallons of contaminated water and the cooling coils are filled with a corrosion protection chemical (potassium dichromate solution) a known carcinogen. A remote system must be designed to decontaminate the underside of the tank roof and tank walls. Furthermore, the cooling coils will have to be flushed with decontamination solution, grouted and capped. A management plan is required for the generated waste. The water source used in the decontamination solution for the WM-190 tank will require evaluation.

An engineering analysis and procedure write up shall be performed for the hoisting and rigging of the tank roof. As stated in the vault access section, a packaging and bag out system must be used for disposal of the tank roof. A new roofing system shall be designed to accommodate the new tank installation.

The new tank shall have the following requirements in order to meet RCRA compliance:

- The new tank would be designed to hold 200,000-gallon.
- Design the 200,000-gallon tank as a pre-fabricated shell. The new tank shall measure 45-ft in diameter and rise approximately 16-ft in height.
- Engineering design of support system for new tank consisting of a concrete base inside of the existing tank. The concrete will also provide radiological shielding to protect workers during construction. This design shall include a seismic evaluation of the new and the existing tank.
- Design new base to support the weight of new tank and liquid. The new base shall be designed with a drainage system that allows liquid to flow to the existing sumps in the event of a catastrophic failure.
- Redesign existing 300,000-gallon tank roof to accommodate the installation of additional ancillary equipment and provide a means to collect and direct any leak to existing vault sumps.
- Prior to activation of the new tank system, an independent, qualified installation inspector or an independent qualified Professional Engineer, either of whom is trained and experienced in the proper installation of tank systems or components, shall inspect the system for the presence of any of the following items:
    - Weld breaks
    - Punctures
    - Scrapes of protective coatings
    - Cracks
    - Corrosion
    - Other structural damage or inadequate construction/installation
    - An independent qualified Professional Engineer would be required to certify that the design and installation of option 1 complies with RCRA requirements.

2.5.6 Leak Testing

One proposal for leak testing of the new tank and its secondary containment after modification is to fill the tank to incremental levels by steps, and holding that level to monitor by existing (restored) level instrumentation. After confirming there are no leaks at each level, continue to fill and monitor until the new tank capacity of 200,000-gallons is reached. This procedure would complete the internal tank leak test.

The next procedure would test the secondary containment for leaks. Drain the new internal tank to a level equal to that, which would be present in the case of a leak on the internal tank; this corresponds with the equlibrium height of 200,000-gallons between the internal and secondary containment tank. The drained water would be transferred for processing to one of the evaporators (PEW or HLLWE). Then introduce water into the existing outer tank while the new tank contains fluid. Provide level instrumentation to monitor tank fluid level. Hold and monitor for a prescribed time period. After confirming no leaks, transfer the fluids to the evaporators.

The test volume would result in approximately 200,000-gallons of liquid waste. At 8000-gal/day PEW capacity, it would take ~ 28 days to process the waste. At a 2000:1 reduction ratio, there would be a net 115-gallon increase to the tank farm.

2.5.7 Construction Requirements/Limitations

The following items would be required prior to and during construction of Option 1.

The instrumentation lines, waste transfer lines, sump riser piping, tank vent and sparging supply lines would need to be cut, deconned, capped and/or removed. Construction personnel would be required to work in appropriate personnel protective equipment and would have to comply with requirements for confined space and hazardous waste operations.

WM-190 and its surrounding vault was constructed in place prior to construction of adjacent buildings and valve boxes. Any modifications to WM-190 would require lifting by crane. Because new buildings have been constructed in surrounding areas, hoists will have to be designed to accommodate movement and storage of removed items. Furthermore, wheel restrictions are applied due to potential damage to the concrete vaults and duct banks. Cranes, back-holes, and other necessary heavy equipment would have to be large enough to reach inside the tank farm without exceeding the maximum load requirements.

2.5.8 Design and Construction Schedule

Incorporating modifications as detailed in Option 1:

JAN 2001 Conceptual Design and Funding Approval
JAN 2004 Title I, II design Bid and Award
JAN 2006 Construction
JAN 2008 Commissioning of New Tanks
JAN 2009 Operations.

2.6 OPTION 2 - Place New Tank Bottom and Line the Vault

Option 2 would install a new tank bottom on the existing WM-190 vessel (Ref. Sheet S-3). Part of the vault roof would be exposed and removed. A new tank bottom would be designed and placed inside of WM-190 and the tank vault would be used as secondary containment. The vault walls will be lined with epoxy to a height of 13-ft above the existing vault floor, to contain the 250,000-gallons of the modified WM-190 tank in the event of a leak.

2.6.1 Excavation

A sloping plan has been laid-out on sheet C-4. A standard 1-1/2 to 1 slope was used with a 30 by 56 foot working area around the tanks. The total projected area of sloping covers 56 feet by 86 feet. It is estimated that approximately 1150 cubic yards of soil would need to be removed for this method alone.

As stated in option 1, shoring may be required to prevent undermining of existing foundations due to their close proximity to the excavation.

2.6.2 Excavation Difficulties and Cost

Excavation difficulties and costs are as detailed in option 1.

The concrete vault and tank access requirements are detailed in option 1.

2.6.3 Internal Tank Bottom within the Existing Tank

- Engineering design of new tank bottom. The new tank bottom shall be 304L stainless steel, seam welded to the existing tank sides and capable of supporting a load capacity of 250,000-gallons (2085.42 kip)
- Design of new drainage system within the tank that allows liquid to drain into existing sumps.
- The vault shall be lined with an epoxy liner on the floor and walls to a height that would contain the volume of the WM-190 tank in the event of a catastrophic leak.
- Restore connections of all lines and instrumentation mentioned previously removed to facilitate construction modifications. (Applies to option 1)
- Prior to activation of the new tank system, an independent, qualified installation inspector or an independent qualified Professional Engineer, either of whom is trained and experienced in the proper installation of tank systems or components, shall inspect the system for the presence of any of the following items:
  - Weld breaks
  - Punctures
  - Scrapes of protective coatings
  - Cracks,
  - Corrosion
  - Other structural damage or inadequate construction/installation

An independent qualified Professional Engineer would be required to certify that the design and installation of option 2 complies with RCRA requirements.

2.6.4 WM-190 Vault Liner

A vault liner is required because the cold joints, as detailed on the construction drawings, do not indicate a method and/or detail to prevent leakage of waste from inside the vault. Prior to vault lining, the concrete walls and floor, shall be deconned to a reasonable level.

Note: Different manufactures have different products, processes, and applications. The liner selected must be compatible with the waste being stored.

Process below depicts a typical application by Stonhard.

2.6.5 Typical Process

- Prepare the existing concrete surface.
- All loose fragments, unsound concrete, laitance, and dirt must be removed.
- Loose and unsound concrete is removed using a chipping hammer or a hammer and chisel.
- All laitance is removed with abrasive blasting (shot blasting) or scarifying.
- Dirt is removed by abrasive blasting or scarifying. If dirt can not be removed with the mechanical preparation, scrub the contaminated area with industrial cleanser and mechanical or hand wire brush.

2.6.6 Priming

- Vacuum the surface before priming and make sure the surface is dry.
- Priming ensures maximum product adhesion and performance.

2.6.7 Mortar Coat

- Apply mortar-coat to vertical and horizontal surfaces immediately after the primed surface has fully cured.
- Mortar is applied using a rubber squeegee or trowel.

2.6.8 Top Coat

- After mortar coat has fully cured, ridges and imperfections may be ground smooth. Vacuum area completely.
- Dip roller and roll topcoat material onto vertical and horizontal surfaces.

Many epoxy liners, if not all, require the use of respirators or other filtered breathing apparatuses during application. Use shall take place only with adequate ventilation. Both options for retrofitting tank WM-190 will require partial or full roof removal. It is recommended that vault lining shall take place during that time.

2.6.9 Leak Testing

One proposal for leak testing of the WM-190 tank and concrete vault after modification is to fill the tank to incremental levels by steps, and holding that level to monitor be existing (restored) level instrumentation. After confirming there are no leaks at each level, continue to fill and monitor until modified tank capacity is reached. Fill height will not exceed that level corresponding with the 285,000-

gallon level in the existing WM-190. Then drain the tank to a level equal to that, which would be present in the case of a leak (full flood height in existing tank.). The drained water would be transferred for processing to one of the evaporators (PEW or HLLWE). Then introduce water into the vault while the modified tank contains fluid. Provide level instrumentation to monitor vault fluid level. Hold and monitor for a prescribed time period. After confirming no leaks, transfer the fluid into WM-190 while transferring out of WM-190 tank to the evaporators.

The test volume would result in approximately 455,000-gallons of liquid waste. At 8000-gal/day PEW capacity, it would take 56 plus days to process the waste. At a 2000:1 reduction ratio, there would be a net 230-gallon increase to the tank farm.

2.6.10 Construction Requirements/Limitations

The following items would be required prior to and during construction of option 2. The instrumentation lines, waste transfer lines, sump riser piping, tank vent and sparging supply lines would need to be cut, deconned, capped and/or removed. Construction personnel would be required to work in appropriate personnel protective equipment and would have to comply with requirements for confined space and hazardous waste operations.

WM-190 and its surrounding vault was constructed in place prior to construction of adjacent buildings and valve boxes. Any modifications to WM-190 would require lifting by crane. Because new buildings have been constructed in surrounding areas, hoists will have to be designed to accommodate movement and storage of removed items. Furthermore, wheel restrictions are applied due to potential damage to the concrete vaults and duct banks. Cranes, back-holes, and other necessary heavy equipment would have to be large enough to reach inside the tank farm without exceeding the maximum load requirements.

2.6.11 Design and Construction Schedule

Incorporating modifications as detailed in option 2:

JAN 2001	Conceptual Design and Funding Approval
JAN 2004	Title I, II design Bid and Award
JAN 2006	Construction
JUL 2007	Commissioning of Modified Tank
JAN 2008	Operations

2.7 Utilization of Tanks WM-100, 101, 102

Much of the following information came from an interview with Mike Swenson on August 24, 1999.

2.7.1 Interim Waste Storage Tanks (WM-100, 101, 102)

Tanks WM-100, 101 and 102 are RCRA compliant. They are housed in two separate vaults below grade on the north side of CPP-604. WM-100 is contained within one vault and WM-101 and 102 are contained in a separate vault east of WM-100. A 2-foot thick concrete wall separates the two vaults. These tanks were constructed between 1952 and 1953 and offer 18,400 gallons of capacity each. Each individual tank measures 30 feet in length and has an outside diameter of 10 feet. The material of construction is stainless steel 347 with a wall thickness of 5/16 inch. The tanks are welded in a horizontal orientation to saddles that are anchored to the slab floor.

Refer to the following drawings for information on tanks WM-100, 101 and 102: sheet numbers S-12, C-4, reference drawings 370858, 057945, 057498 and 057944.

At one time, the contents of the tanks were first cycle raffinates, but now they contain lesser levels of radiological waste.

Other design parameters include

- Design temperature = 200°F.
- Design pressure = atmospheric
- Operating pressure = -2 inches of water.

The tanks have a vessel off-gas system for ventilation.

2.7.2 Vaults

The vaults are RCRA compliant. They consist of the following features:

- WM-100 vault configuration: L = 43', W = 17', D = 16'
- M-101, 102 vault configuration: L = 43', W = 30'-5", D = 16'

The vault floors are located 42 feet below grade and slope to a managed sump with leak detection.

The secondary containment within the vault consists of 14-gage stainless steel sheet on the floor of the vault and running up the walls approximately 3'8". The total volume of waste that may be contained by the stainless steel liner in the WM-100 vault is approximately 19,000 gallons.

The total volume of waste that may be contained by the stainless steel liner in the WM-101, 102 vault is approximately 34,000 gallons.

The vaults are not ventilated.

Copper water stops are contained in the construction joint where the bottom of the wall meets the floor slab. There is no evidence that groundwater has leaked into the vaults from any other construction joints.

2.7.3 Ancillary Equipment

Ancillary equipment includes the following items:

VOG	The tanks are attached to the tank farm vessel off-gas (VOG) system. This VOG system keeps the tanks vented and will allow the tanks to breathe with the rising and lowering of the liquid level in the tanks.
Waste transfer lines	Embedded (non-sleeved) lines run between the two vaults. Currently, a facility assessment is being performed on the configuration of ancillary equipment (embedded lines) to demonstrate RCRA compliance. The lines out to the tank farm are capped from tanks WM-101, and 102. The lines out to the tank farm from tank WM-100 are still connected.

	There are two means by which to remove waste from these tanks. They are by overflow and by pumping out the contents by means of steam jets.
Pressure relief	No relief valves exist on the tanks due to the design pressure being atmospheric.
Sampling system	The existing sampler system is operational. As new sampling requirements are defined, the existing samplers will require upgrading.
Steam jets	The steam jets have a capacity of 50 gpm. Steam jets are the preferred motive source, which are maintenance free.
Agitation system	Agitation/mixing is done by air sparging. No modifications are planned for this system.
Cooling coils	The cooling coils are made of stainless steel 347, have never been used, and the chemical contents are unknown. No modifications to the coils will be necessary for NGLW storage.
Instrumentation	The instrumentation is operational and includes density, level, temperature, flow and radiation monitoring. These functions report to the tank farm alarm system.

2.7.4 Access

The only access to the inside of each vault is from a hatch located within the sample corridor above each of the two vaults. These hatches are adequate for inspection of the vaults and the tanks. The vaults are 16 feet in depth from the hatch to the floor slab. There are no ladders that provide access from the hatch to the floor of the vault.

2.7.5 ALARA

Remote videos were taken within the WM-101 and WM-102 vault in 1992. Radiation fields and NOX levels are indicated on these videos.

2.7.6 IH Considerations

The vaults would be considered confined space, permit required.

2.7.7 RCRA Compliance

The transfer line for the VES-VM 100-102 tanks have a secondary containment deficiency that is the subject of the facility assessment to determine RCRA compliance. There is no secondary containment sleeve where one transfer line passes through an interior vault wall. Therefore, the tank will be used as is, assuming the facility assessment establishes equivalency.

Per RCRA section 264.191 (Assessment of existing tank system's integrity), an assessment must determine that the tank system is adequately designed and has sufficient structural strength and

compatibility with the waste(s) to be stored or treated, to ensure that it will not collapse, rupture, or fail. At a minimum, this assessment must consider the following:

(1) Design standard(s), if available, according to which the tank and ancillary equipment were constructed.

There is no known documentation to determine what governing codes or standards were used to design the tanks. These tanks have operated continuously from initial plant start-up in the 1950's without evidence of leaks. In the course of this study, no documentation was available to confirm that seismic analysis has been performed to current standards.

(2) Hazardous characteristics of the waste(s) that have been or will be handled.

Operation logs and lab analysis reports provide sufficient documentation

(3) Existing corrosion protection measures.

There does not exist a corrosion monitoring (corrosion coupon) program for tanks WM-100, 101 and 102. However, waste compatibility is determined by lab analysis prior to transferring waste to these tanks. Since these tanks are not direct buried, no cathodic protection is necessary.

(4) Documented age of the tank system, if available, (otherwise, an estimate of the age)

The tanks were constructed between 1952 and 1953.

(5) Results of a leak test, internal inspection, or other tank integrity examination.

Periodic examinations are performed to determine tank integrity.

2.8 Utilization of Tanks Wm-103, 104, 105, 106

2.8.1 Physical Description

Tanks WM-103, 104, 105 and 106 are located on the northwest corner of the tank farm facility just north of WM-182. These four tanks were constructed in 1955 and offer 30,000 gallons of capacity each. These horizontal orientated tanks are direct-buried in soil with the bottom of the tanks at approximately 27 feet below grade. Each individual tank measures 42 feet in length and has an outside diameter of 12 feet. Concrete slabs 47.5' x 17' x 1.25' thick were constructed with a 0.75 by 1-foot high curb surrounding the slab perimeter to support the tanks. The slabs contain a 6-inch layer of gravel that cushions the tanks and provides slab drainage to the sumps. The sumps are 2 by 2 by 2-foot deep (~ 60 gallons) cast into the northeast corner of each base slab to contain minor leaks. Cooling coils containing deionized water are installed within each tank to minimize corrosion.

General information and tank dimensions are found in Table 1-1.

Refer to the following drawings for information on tanks WM-103, 104, 105 and 106:

Existing tank location: sheet numbers S-8, S-9, S-10, S-11, C-1, C-2, C-10, C-11, C-12 and P-4

New tank location: sheet numbers C-11 and C-15

Existing ancillary equipment consists of waste transfer, cooling, decontamination, instrumentation and vessel off-gas (VOG) pipelines.

Access to the tanks is provided through three 6-inch risers and one 3-inch riser. A 24" diameter (3-inch wall thickness) concrete pipe provides access to each of the tank's sumps.

Tanks WM-103 and WM-104 are installed with four liquid removing steam jets and Tanks WM-105 and WM-106 are installed with two. These jets can transfer waste from a tank at approximately 50-gpm.

In 1990 tanks WM-103, 104, 105 and 106 were flushed with water, RCRA samples were taken, and the remaining residue was deemed non-hazardous.

Presently, the tanks and associated piping are abandoned.

There does not currently exist a corrosion-monitoring program for tanks WM-103, 104, 105 and 106.

2.8.2 Soils

Tanks WM-103, 104,105,106 reside within the tank farm boundaries and are therefore located within an environmental control area (ECA-96). According to the INTEC TFF History Report, an undocumented environmental release site is located between VES-191 and WM-106. This area was used to decontaminate construction equipment before WM-191 was constructed prior to 1970. An unknown quantity of steam condensate, decontamination solution, petroleum products and radioactive contaminants were released. Although this area may have been used to decontaminate construction equipment, no contamination was found during WM-191 construction. (Reference: INTEC TFF History Report, authors: K.D. McAllister, L.E. Guillen, R.E. Johnson, C.O. Kingsford, Draft: November 1998).

A soil characterization and waste management plan will need to be developed prior to the start of excavation. This will address the procedure for boxing and shipping the soils to an approved processing facility.

New soil will need to be imported to the area to fill the void left by excavation activities. The top layer will be stabilized with a 6" layer of gravel in order to minimize erosion from the area.

Continuous monitoring will be necessary to detect changes in radiological conditions.

2.8.3 Construction Activities Necessary to Unearth and Expose the Four Tanks in Their Existing Location

2.8.3.1 Ground Excavation Campaign: No vegetation cleaning and grubbing will be necessary.

A sloping plan has been laid-out on drawing C-12 that covers no shoring activities. A standard 1 ½ to 1 slope was used with a 15 foot working area around the tanks. The total projected area of sloping covers 216 feet by 170 feet. It is estimated that approximately 24,000 cubic yards of soil would need to be removed for this method alone. This sloping plan was intended to identify the many obstructions that exist with excavations is this area if sloping occurred.

For estimating purposes, it will be assumed that 20% of the excavated area will be sloped and the other 80% shored. Shoring will be employed such that local structures/foundations are not undermined.

The berm surrounding the bulk diesel fuel tanks north of the tank farm must remain intact in order to provide secondary containment for the tanks located within.

Sloped access to the excavation will occur on the northwest and northeast corners of the excavation site.

It will be assumed that the shoring equipment will be abandoned in place and not reused.

2.8.3.2 Excavation Difficulties

- Extensive subsurface investigation using ground penetrating radar.
- Line contents will need to be identified, decontaminated, cut and capped.
- With all the congestion, a fair amount of hand digging will be necessary. Hand excavation is required within 2 feet (vertical) and 5 feet (horizontal) of line locations identified by underground radar.
- Design and construction of supports will be necessary for active lines.
- Extensive outages.
- Enclosure structure (large enough to house excavation area). "Sprung" makes an instant structure that would be suitable for this application. The containment dome will require a HEPA filtered ventilation system.

2.8.4 Items to Be Removed and Disposed of

- Waste transfer lines
- Instrument sensors
- Redwood lagging currently installed around tanks (excluding WM-103, has no lagging)
- Support pillars and concrete pipe encasements.
- Concrete pads and gravel (underneath existing tanks)
- The cooling coils, which contain deionized water as the coolant, will be flushed, purged with compressed air, and left in place.
- Existing instrumentation and control building CPP-619 will be taken out-of-service and abandoned in place. The foundation pillars supporting this building run down to bedrock. This building is located just south of the four tanks. See drawing sheet number C-2 for location of this building.
- Tank and sump risers.
- A portion of existing fencing near the construction area will need to be removed.

2.8.5 Cleaning/Flushing Process:

Tank cleaning prior to relocation: As was done in 1990, the tanks will be flushed again with water, and RCRA samples taken to ensure that the contents of the tanks are deemed non-hazardous.

A source of water for decontamination will need to be identified

The risers will need to be decontaminated as necessary.

Closure of pipelines will be conducted such that the remaining systems can be decontaminated and closed during subsequent closure activities.

2.8.6 Active Lines and Ductbanks That Must Remain in Place to Support Operations:

2" LA5NN-110663
4" HSNN-110653
DQ (Digiquartz level instrumentation) ductbank
Ductbank to 191
6" PLA-105556
Ductbanks from CPP-618 running north

2.8.7 Tank Relocation

A structural evaluation of the tanks and a relocation plan will need to take place prior to relocation of the tanks.

Estimated tank weight ~40,000 lb. each.

The four tanks will be lifted by an industrial size overhead crane and set on a flatbed truck for transport to the new location. See sheet C-12 for location of tanks. The new site is located in the area just west of CPP-664. See drawings C-11 and C-15 for new site location. It is assumed that the tanks have no lifting lugs based on vessel drawings. A hoisting and rigging plan will need to be developed. A protective material will need to be placed around the tanks for protection during transport.

Distance from existing tanks to new location is approximately 230 feet.

2.8.8 Status of Tank Documentation

Adequate documentation for the design and construction of tank WM-103-106 exists to support a RCRA Part B permit application

2.8.9 Construction Activities Necessary to Obtain a RCRA-Compliant Tankage System

2.8.9.1 RCRA Requirements

- Hazardous waste systems must conform to CFR 264, 265, subpart J
- Mixing and sampling system

RCRA upgrades to this system will take place at the new siting location. This will include a secondary contained tank/vault system along with upgraded waste transfer lines.

Per CFR 264.191, an assessment of the existing tank system's integrity shall be performed. At a minimum, the assessment must consider the following:

(1) Design standard(s), if available, according to which the tank and ancillary equipment were constructed;

The tanks were designed in accordance with contemporaneous design codes and standards.

(2) Hazardous characteristics of the waste(s) that have been or will be handled;

There appears to be sufficient documentation on the type of waste that is going to be stored in the tanks.

(3) Existing corrosion protection;

There is no corrosion protection/monitoring program for tanks WM-103, 104, 105 and 106.

(4) Documented age of the tank(s)

The tanks were constructed between 1954 and 1955

(5) Results of a leak test, internal inspection, or other tank integrity examination

No leak test results exist for tanks WM-103, 104, 105 and 106

2.8.10 New Siting Location

It will be assumed that the new location of the vault/tank system will be in the area directly west of CPP-664 on the north side of the tank farm. ECA-14 takes up a large part of the new site location (120' x 350'). This ECA is the site of a decommissioned sewage treatment plant that operated during the period 1951 through 1982. The treatment plant processed sanitary wastes from nine facilities at the Idaho Chemical Processing Plant (ICPP). Site ECA-14 is located in the north-central portion of the ICPP, south of Cypress Avenue, east of Beech Street, and north of the ICPP Tank Farm.

The sewage treatment facility was demolished as part of the Utility Replacement and Expansion Project (UREP) to upgrade the INEEL facilities. Demolition was completed in September 1983 and reportedly consisted of:

- Removal of the wastewater treatment facilities and associated equipment to a depth of 1.5-m (5-ft) below grade.
- Removal and disposal of all remaining sludge in the drying beds.
- Removal of all buried piping, with the exception of the 0.3-m (12-in) influent line and the 0.15-m (6-in) effluent lines from the chlorine contact basin to the drain field.

Demolition planning documents stated that salvageable items would be removed and stored, any remaining sludge would be pumped to the new sewage treatment plant, and any structures that were removed would be dismantled and disposed of in the INEEL landfill. The excavated area was back-filled and graded to match the surrounding ground surface.

The influent manhole, ejector pit, Imhoff tanks, final tank, and chlorination tank extended to a depth of 6.1-m (20-ft) below grade. The lower portions of these facilities were left abandoned in place. Demolition planning documents stated that drainage holes approximately 0.9 m^2 (1 ft^2) would be cut in the bottoms of all abandoned structures to prevent accumulation of infiltering surface water. Also left in place were the 0.3-m (12-in) diameter influent line, the 0.15-m (6-in) effluent line to the drain field, and the drain field distribution piping.

Based on the chemical screening, the following contaminants of potential concerns (COPCs) were identified for ECA-14:

Imhoff Tanks	Plant Site
Aroclor-1260	Aroclor-1260
Benzo(a)pyrene	Cesium-137
Cesium-137	Neptunium-237
Neptunium-237	Strontium-90
Strontium-90	Uranium-234
Uranium-235	Uranium-238

Regarding future land use, the total cancer risk to the future onsite worker from exposure to site-related chemicals in surface soil is estimated to be 2E-06. The risk is attributed to external radiation exposure, with the primary contaminant of concern (COC) being Np-237 2E-06. The total non-carcinogenic hazard index to the future onsite worker is estimated to be 0e-00. Further details are available in the following report: WINCO, 1993, Track 2 Summary Report WAG 3 OU 3-05 Old Sewage Treatment Plant West of CPP-664.

See drawing C-11 for location of ECA sites.

2.8.11 Soils

A soil characterization and waste management plan will need to be developed prior to the start of excavation.

An approved soil storage location will need to be established.

A geotechnical investigation of the site will be required prior to the final design effort.

2.8.12 Ground Excavation Campaign

Subsurface investigation using ground-penetrating radar will take place for the new siting locations.

Initial earthwork will consist of no vegetation clearing and grubbing. Some grading will be required.

It will be assumed that no rock excavation will be required

Sloping will be the method of excavation. As was identified on the earlier sloping plan, this excavation will also require the excavation of approximately 24,000 cubic yards of soil.

See drawing C-11 for the site/sloping plan.

Due to the new site area being designated as an ECA (13), it will be assumed that the excavated soil will also need to be boxed-up and sent to a regulated disposal facility. New soil will need to be imported for backfill. The backfill material must be noncorrosive, porous and a homogeneous substance that is installed so that the backfill is placed completely around the vault. Compaction will ensure that the vault and ancillary equipment are uniformly supported. The top layer will be stabilized with a 6" layer of gravel in order to minimize erosion from the area.

2.8.13 Configuration Modifications

Note: New configurations are for estimating purposes only.

- Vault

  Depth of the new vault will be approximately 30 feet.
  The tanks will be contained in a 125' x 80' x 25' deep vault
  These vaults will be reinforced concrete that shall be designed to provide sufficient shielding. A thickness of ~3 feet will be adequate.
  Stainless steel lining on the floors and on the walls to a height that would contain the entire contents of one tank per RCRA requirements.

  The exterior walls will be seal coated to prevent infiltration of ground water.

  A roofing system will be installed on the top of the vault to prevent ground water penetration.

  Sumps – local to each tank
  Sump steam jets – 50 gpm capacity
  Lighting will be installed within the new vault along with video equipment for remote monitoring.

  New instrumentation building

  A new instrumentation building, similar to CPP-619, will need to be constructed above the new tank/vault site. This facility will house the pipe & valve corridor, sampling corridor, and operation and maintenance corridor. The facility will also house a duplex HEPA filter system for vessel off-gas (VOG).

  Heating of this building will take place in the winter months along with ventilation the rest of the time.

- Tankage

  The tanks are ASME stamped vessels and any modifications to them will require an "R" stamp.

  The tanks will be supported on multiple saddles elevated approximately 4 feet off the ground.

  The saddles will be anchored to the floor of the vault

  Saddle configuration and quantity (TBD).

  The tanks will set on the saddles at a slight angle and new transfer jets will be installed to minimize tank heel.

  Cooling coils are not needed for the tanks but a heating system may need to be investigated as identified in the New Tank Farm Feasibility Study, 1999, Jensen, Scott A., et al.

  Pressure test procedure: The tanks will be pressure tested to 150% of design pressure prior to being placed into service.

  A solids collection vessel will be installed within the vault so that any solids will be collected prior to being sent to each individual tank.

- Ancillary equipment

  Sparging, atmospheric protection system (APS), instrumentation, decontamination and waste transfer lines. Radio frequency monitoring of tank fluid level. Overfill prevention (automatic feed cut-off). Pressure relief.

  A new sampling system will be installed within the tanks. This system will provide for representative samples of the waste.

  The new waste transfer piping will be double-contained pipe that drains to collection sumps. All ancillary equipment must be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.
  The waste transfer piping will be designed to allow transfer of liquid waste between tanks. Air and steam will be provided as motive sources. The primary motive source for the jets will be steam and the secondary source will be air for redundancy.

  A solids collection removal system will be installed.

  Any equipment or systems that require access to will need remote operating devices for maintenance and operations purposes.

  Install a utility corridor leading out and over tanks.

  Corrosion protection – hook into the existing tank farm cathodic protection system.

2.8.14 Construction Requirements/Limitations (Access, Work Area, Etc.)

- Extensive subsurface investigation using ground penetrating radar.
- Support structures for lines
- Sloping used for excavation
- Risers/tank/vault access for ancillary equipment.
- Enclosure structure (large enough to house the excavation area). "Sprung" makes an instant structure that would be suitable for this application.

2.8.15 Systems Operational/Functional Testing

Operational testing shall be performed upon completion of construction to ensure conformance to design requirements.

As stated in the RCRA regulations, 264.192, the owner operator of the new tank system must ensure that proper handling procedures are adhered to in order to prevent damage to systems during installation. Prior to covering, enclosing, or placing a new tank system or component in use, an independent, qualified installation inspector or an independent, qualified professional engineer, either of whom is trained and experienced in the proper installation of tank systems or components, must inspect the system for the presence of any of the following items:

- Weld breaks;

- Punctures;
- Scrapes of protective coatings;
- Crack;
- Other structural damage or inadequate construction/ installation

2.8.16 Security

A new security fence will need to be installed around this new site upon completion of the project.

2.8.17 Water Infiltration Reduction Methods

Installation of a new water-resistant ground cover membrane will be necessary to reduce infiltration of groundwater due to rain and snow.

The existing INTEC surface drainage system will be utilized with some slight modifications to drain surface water from the proposed project site.

2.8.18 Valve Boxes

The new process waste lines feeding the new tanks will come out of valve box DVB-WM-PW-B7. The drain line would need to be sealed to bring this vault into compliance.

A level detector will need to be added to the vault along with a 1" steam jet.

2.8.19 ALARA Considerations

Wayne Kanady will incorporate the radiation model.

2.8.20 IH Considerations

Potential confined space entries.

2.8.21 Leak Test

A leak test will be performed on both the tank and the vault.

Thirty thousand gallons of raw water will be used to fill the first tank. A visual inspection for leakage will be performed. Then this water will be transferred to the other tanks and each of them will be leak tested in succession.

The vault will be leak tested with 30,000 gallons of raw water as well.

The total liquid waste will be approximately 30,000 gallons from the tanks plus 30,000 gallons for the vault. At 8000 gallons per day PEW, it will take approximately 8 days to process the liquid waste. At a 2000:1 reduction, the condensed waste is a net 30 gallons to the tank farm.

2.8.22 Schedule For WM-103, 104, 105 And 106

JAN2001 Conceptual Design and Funding Approval
JAN 2004 Title I, II design Bid and Award

JAN 2006 Construction
JUL 2007 Commissioning of Tanks
JAN 2008 Operations

2.9 New Tanks Description

The New Tank Farm Feasibility Study by D.L. Lords, HLW Project Manager, and Scott Jensen, P.E., et al, documents a feasibility study for construction of new storage tanks, referred to as the "new tank farm", at the Idaho Nuclear Technology and Engineering Center (INTEC) at the Idaho National Engineering and Environmental Laboratory (INEEL). The facility will be used for storage of liquid mixed (radioactive and hazardous) wastes, including wastes historically known as the sodium-bearing waste (SBW) and others identified as newly generated liquid wastes (NGLW). The objective of this study was to determine the feasibility of a new tank farm to store the previously mentioned wastes in accordance with applicable federal, state and local laws. Several tank and vault layouts were made as part of this study. They all included at least 3 tanks and ranged in storage capacity from 300,000 gallons to 1,500,000 gallons.

One option, Option 3A, has been selected for use in this NGLW Storage study since it provides at least two tanks of an aggregate volume of approximately 300,000. The Total Estimated Cost (TEC) for this option is $24,900,000 or $83.00 per gallon of storage. TEC costs include direct and indirect construction costs, G&A, PIF, procurement fees, engineering costs, inspection costs, project management costs, escalation and contingency. Other Project Cost (OPC), including conceptual design costs, project support, permitting, SO testing and startup is $6,800,000 or $22.67 per gallon of storage.

The configuration of option 3A consists of 3 stainless steel liquid storage tanks, solids collection vessel and reinforced concrete vaults. The concrete vaults have a stainless steel liner of sufficient height to contain the volume of at least one tank. The total liquid storage volume is 300,000 gallons. This option is similar to the newest portion of the existing tank farm except that the tanks are smaller and in a rectangular vault.

The new tanks would be sited just north of the existing tank farm to facilitate installation of interconnecting piping and utilities. Advantages to being adjacent the existing tank farm are economy of construction, availability of land, and easy access for construction and operations.

The area disturbed by this project will be within the INTEC boundaries. Most of the area is void of natural vegetation. The design will minimize the amount of soil that erodes from the site. Areas disturbed by construction activities will be stabilized with gravel. Initial earthwork will consist of minimal vegetation clearing and grubbing. Some grading will also be required. Excavation will be required for utilities, paving, footing and foundations. Minimal rock excavation may be required. A geotechnical investigation of the site will be required prior to the final design effort. The existing INTEC surface drainage system will be utilized with some slight modifications to drain surface water from the proposed project site.

Paving will be provided as required for access to the facility. No parking areas are currently anticipated.

There are existing underground utility lines in the construction area that will require modification prior to construction. New underground utility extensions include raw water, fire water, steam, condensate, and plant air.

This study assumed that a safety assessment of the new tanks and vaults will designate the tanks and vaults as Performance Category (PC)-3 as defined by DOE STD 1021. The design basis earthquake, wind, flood, etc. will be derived from the performance category designation, and the DOE-ID Architectural Engineering Standards or site specific studies.

The tank material will be stainless steel similar to the existing tank farm tanks.

The tank vaults will be reinforced concrete of sufficient thickness to provide adequate shielding. Based on preliminary estimates approximately 3 feet of concrete will be required between the storage tanks and any occupied areas.

The ventilation system concept is based on the new facility consisting of 4 areas, the vault areas, the process pipe and valve corridor, the sampling corridor, and the operation and maintenance corridor. These areas will be occupied only for short periods of time, or for maintenance operations. The potentially occupied areas of the building will be heated to 50F in the winter and will have ventilation only, in the summer. The estimated cost is based on steam heat. Further analysis during conceptual design will indicate whether electric heat will be the basis for Title design.

Vault ventilation is not included in the study cost estimate; again, further analysis will be performed to determine if ventilation is required. The process pipe and valve corridor is a maintenance area that has the potential of becoming contaminated. It will receive ventilation at the rate of 4 air changes per hour. All exhaust from the process pipe and valve corridor will be HEPA filtered. The sampling corridor and the operating and maintenance corridors have the potential of becoming contaminated, however the contamination potential is less than the process pipe and valve corridor.

The ventilation for the building will be in a cascaded air flow pattern, from areas of least potential contamination to areas of greater potential contamination. The 4 air changes per hour of air necessary to ventilate the process pipe and valve corridor will be the quantity of inlet air supplied to the building. Heated air will be supplied to the operating corridor and the sampling corridor and then flow to the process pipe and valve corridor. From the process pipe and valve corridor all air will be exhausted from the building up a stack on top of the facility. Air in the building will not be recirculated. The HEPA filter system for the building will be located in the sample corridor. The study cost estimate reflects a single bank of filters with test sections; final configuration will be developed in design.

Utilities for the New Tank Farm facility will consist of raw water, steam, condensate, and air. Raw water will be installed for decontamination and janitorial services. Steam will be installed to operate the jets in the tanks and for heating. Air will be installed to operate jets and to supply air to instruments and control valves. Firewater will be installed to a hydrant located outside near the facility.

Liquid waste piping will be run in the vault areas and in the process pipe and valve corridor of the new facility. Steam, raw water and air supply piping will be run in the sampling corridor or in the operating and maintenance corridor. Condensate piping will also be placed outside the potentially contaminated areas. All piping in the vaults and in the process pipe and valve corridor will be 304L stainless steel. All sample lines will be 304L stainless steel. Piping that is in the operating and maintenance corridor or the sampling corridor may be carbon steel.

Liquid waste piping from the existing tank farm will enter the new facility from existing valve box B-7 or B-11, through two, buried, doubly encased 304L stainless steel pipes. The new piping will enter the new facility from underground and go directly to the solids collection vessel. There, some of the solids (if any) in the liquid waste will have the opportunity to fall out of solution. The remaining liquid waste will then be jetted to one of the liquid waste storage tanks in the facility.

The new facility will be designed to allow the transfer of liquid waste between any two tanks, as well as back to the old tank farm.

Steam/air jets were selected as the pumping method for the new tank farm. These jets are simple in function, extremely reliable over the 20-year design life, and virtually maintenance free. Both air and steam will be provided to each jet. Steam works best for transferring the liquid waste, but air also works and will be used as a secondary motive source. The transfer jets will be located inside the tanks, near the bottom. Each tank will have 2 transfer jets inside. One of them is redundant. The air or steam feed to each jet will be manually controlled and monitored from a panel in the operating corridor. The jets will operate by sucking liquid waste from near the bottom of the tank and then using the steam or air on the down stream side of the jet to propel the liquid down the pipe to a new location. This is the method currently being used in the existing tank farm.

The first isolation valve between the tanks and the operating and maintenance corridor or the sampling corridor on each of the steam and air lines shall be located in the process pipe and valve corridor. All valves on liquid waste lines shall be located in process pipe and valve corridor. All valves in the process pipe and valve corridor will be 304L stainless steel, welded ends, remotely repairable, top loading, ball valves. These valves have been used successfully for many years in the existing tank farm. The remaining valves in the facility may be carbon steel ball and globe control valves of standard design.

Sampling requirements for the new tank farm are not established at this time.

Some vessels at INTEC use an air or steam sparge to cause mixing of sediment from the bottom of the vessels with the liquid portion of the vessels. This requirement has not been established for the new tank farm at this time, and it is thought that a sparge system would be ineffective for a tank of the size required in this project. Mixing of the liquid phases in each tank into a homogenous solution also has not been established at this time. Therefore no sparge system or mixing has been included in this design.

The study cost estimate includes consideration for mixing of the fluid in a tank. The study indicates mixing by inserting a large airlift standpipe down into the tank and bubbling air down through it in order to cause liquid from the bottom of the tank to be lifted and circulated to the top of the tank.

During final facility closure of the new tank farm, it may be necessary to clean or re-suspend solids from the bottom of the tanks. Provisions for this operation have been designed into the facility. Two 30 inch flanged ports will be installed into the top of the tank directly opposite each other near the sides of the tank. A mixing unit known as a pulse jet mixer manufactured by AEA Technologies Inc may be inserted into these ports. This mixer will suck up liquid from the tank and then use air pressure to force the liquid back out of the mixer at a high velocity. This will cause high turbulence in the tank and will cause any solids on the bottom to be washed back into the liquid phase of the liquid. The liquid can then be jetted from the tank for disposal.

These pulse jet mixers may be relocated from tank to tank, and even from one facility to another. This system has been successfully used to clean sludge from waste tanks in other DOE facilities.

Each tank in the new tank farm facility will be attached to the vessel off gas system (VOG) This system will keep the tanks vented and will allow the tanks to breath with the rising and lowering of the liquid level in the tanks. The VOG system will be designed to accommodate the fast action level changes associated with the Pulse Jet Mixing system and air jet effluent inlet into the tanks. The VOG system will consist of one single bank HEPA filter and fan and will exhaust the off gas up the facility stack.

Fire extinguishers are to be installed in the facility. Fire hydrants will be installed outside the structure. No automatic fire protection systems will in installed in the facility. This is due to the size of the facility, location, the unoccupied status and the noncombustible nature of the construction materials.

The new tank farm facility will utilize electrical power at two voltage levels. The electrical power will be supplied to the facility at 480/277 Vac, 3 phase. Lighting and motors will operate at this level. For the remainder of the electrical loads, a local 480-208/120 Vac transformer will supply power. The study indicates a connected load of 220 kVA and a demand of approximately 70kVA.

The source of power for new tank farm facility will be PCC-NCE-773 within CPP-1750. A feed of 480 Vac, three phase power will be routed west in an existing duct bank. A new duct bank will be installed under Cypress Avenue and routed to the facility site. This will serve as the normal source of electrical power. At this time, because of the limited electrical loads and the nature of these loads, no standby power is anticipated for the facility. The facility has no electrical process equipment and the ventilation is not necessary for personnel safety.

Lighting for the operating and valve corridors will be fluorescent fixtures using 277 Vac. Selected fixtures will contain an integral battery backup for emergency lighting. Exit signs will also contain an integral battery backup for operation during loss of normal electrical power.

While standby power is not anticipated for operating equipment, some of the instrumentation and data processing equipment will likely require power during loss of normal power. For such loads, an uninterruptable power supply (UPS) will be necessary. The UPS will furnish 208/120 Vac to a lighting panel which will in turn supply ECS loads and necessary instrumentation and data acquisition equipment.

The operating and valve corridor will have receptacles for both commonly used 120 Vac as well as 480 Vac three phase welding receptacles for maintenance.

Grounding at INTEC is accomplished with bare copper conductors installed in all duct banks and ground rods installed in every manhole that is solidly connected to the casing of the deep wells. Facilities and structures throughout INTEC are connected to this ground system. The new tank farm will be connected to this system. The ground system shall comply with DOE-ID Architectural Engineering Standards, IEEE 142, and NFPA 70 (NEC).

Lightning protection will be provided in accordance with NFPA 78, "Lightning Protection Code."

Instrumentation of the new tank farm will focus on monitoring the tank liquid conditions, possible environmental impacts, and personnel safety. Each tank will have a redundant liquid level monitoring system. Two systems are currently being used successfully for the existing tank farm and recommended in this study for use in the new tank farm. One system is a common level measuring system using the hydrostatic pressure principal. This system has demonstrated the accuracy and reliability necessary for this operation. Further, INTEC has extensive experience in calibrating and maintaining these system. This system has also been used for measuring specific gravity.

A second suitable system for monitoring tank levels is based on reflection on electro-magnetic waves (EMW). INTEC currently uses a custom built system. This system could be adapted for the new tank farm or a standard product from an instrumentation company such as Rosemount could be used. The conceptual design should make a further evaluation before making a final selection. Of primary consideration in the selection process will be the location and number of ports for the pressure tubes and the EMW transmitter/receiver.

Each tank will have a redundant temperature monitoring system. RTDs are currently in use at the tank farm and have proven suitable for this environment. They are suggested for the new tank farm. The probes have access to the tanks in two ways. One has been to assemble the RTDs into one assembly and lower the assembly through a port at the top of the tank. The other is to locate thermowells along the exterior walls. In both configurations, the RTDs are offset at two-foot increment levels. This permits the tank temperature to be monitored at different levels and also gives an approximation of the liquid level. A final determination of thermowell configuration will be made later in the design process.

For personnel protection, the operating areas of the new tank farm will have protection by radiation area monitors (RAM) and constant air monitors (CAM). Outputs from these devices will feed the Emergency Communication System (ECS) at INTEC. The ECS will feed back to the operating areas of facility both strobe lights and audible alarms.

All of the sumps of facility will have leak detection. Depending on the sump, the sensing element may be a level switch or a radiation monitor. It is anticipated that tank vaults as well as valve boxes will need leak detection. As the design develops, piping and other areas may also need some form of leak detection.

The new tank farm will be fully interfaced to the Emergency Communication System (ECS) at INTEC. The RAM(s), CAM(s), loudspeakers, alarms, and strobe lights will all be integrated into this system. The UPS indicated above will be sized to support these loads for both power demand and support time.

The facility operating corridor will contain a telephone.

In the design process, access and conductor routing will be determined for the ECS and telephone.

If the New Tanks option is adopted, the schedule for accomplishment is projected as follows:

FY-2001 Conceptual Design & Funding Requests
FY-2002 Conceptual Design & Funding Requests
FY-2003 Advanced Conceptual Design & Funding Approval
FY-2004 Geotechnical Investigation and Title I Design
FY-2005 Title II Design
FY-2006 Bid and Award Subcontracts, Start Construction
FY-2007 Construction
FY-2008 Construction Complete

Escalation in the cost estimates is based on the schedule. (Jensen, Scott A., et al, New Tank Farm Feasibility Study, 1999)

2.10 Method of Construction Performance

2.10.1 Procurement Strategy---Line Item

The NGLW Storage Project is presumed to be a large enough to require Congressional Line Item funding. The schedule for such a project includes initial submittal of a Short Form Data Sheet. Following approval and with appropriate funding, the Planning and Conceptual Design stage of the project is initiated. Following Critical Decisions to continue the project, capital funding for Title Design and Permitting is appropriated and the project work continues

2.10.2 Resources Available

Operating Contractor design staff is fully capable of providing the design for this project. The construction work for this project is within the normal performance capabilities of regional and national private-sector tank-installation contractors.

2.10.3 Execution of the Work

2.10.3.1 Force Account. The initial site preparation and demolition may be performed by Operating Contractor Construction Forces (Force Account). These personnel have particular experience in, and are familiar with, specific requirements for Tank Farm excavation, demolition and minor construction involving RCRA, CERCLA and radiological operations.

2.10.3.2 Subcontract. It is anticipated that the construction work for this project will be performed by a construction company under subcontract to the INEEL Operating Contractor.

2.10.3.3 Support Services. Project Management, Permitting, Construction Management including ESH&Q, Industrial Hygiene, Radiation Control Engineering and Technical Support, and other project support will be provided by Operating Contractor.

2.10.3.4 Schedule. To meet January 2005, for segregation and independent storage of NGLW, the use of WM-100, -101, and/or -102, is essential. As soon as possible thereafter, the storage capacity to be provided by one of the alternatives described in this report must be available for additional NGLW. Operational scenarios must be monitored continually to confirm the schedule for storage, or to provide Management with appropriate information about volume limitations so Operations can react accordingly.

2.11 Cost

Comparative cost analysis has been performed. The following summary indicates TEC, OPC and TPC for each alternative. For additional information, see Detailed Cost Estimates at Appendix B.

2.12 Recommendations

On the basis of facts determined in the course of this study, it is recommended that two options be considered by Management for NGLW Storage.

The first recommended option for Management is to investigate the feasibility of using WM-190 for NGLW Storage AS-IS under provisions of the Consent Order, since the least costly alternative is to use WM-190 without modifications. There is a strong technical basis for allowing the continued use of WM-190, and there is a legal basis to support such use until 2012.

Considering potential difficulty with continued use of VES-WM-190 AS-IS, especially to meet storage needs beyond 2012, the flexibility associated with new tanks is very attractive. Therefore, it is the second recommended option of this study that Management pursue installation of new tanks for NGLW Storage, to meet RCRA-compliance with least cost and exposure to workers.

The third most attractive option is the new, second bottom in VES-WM-190, based on least cost and limited flexibility due to having a single tank for the total inventory.

Finally, based on Tank Farm Facility inventory projections, a combination of the three most attractive options in the order presented should be considered.

Appendix A

RCRA Compliant Piping List

INTEC Tank Farm Pipeline

Item #	Identification Number	Description	Origin Point of Origin	Termination Point of Termination	RCRA
1	1 ½"PW-AR-10013C	Process Waste High Level	Tie-in 2"PU-A-104853 exterior of DVB-WM-PW-C30	Tie-in 1 ½"PW-10015Y to VES-WM-100 @ Waste Tank Vault Wall	
2	1"PL-AR-153514	Process Waste Low Level	Tee w/ 3"VG-AR-2005 exterior of VES-WM-100 Waste Tank Vault	Tie-in w/ 1"PL-AR-153518 interior of DVB-WL-PL-C37	
3	3" PUA-1014 Active	Process Waste	3"PW-AR-151009 (from JET-WL-500, VES-WL-101) near valve box DVB-WM-PW-A7		
4	3" PW-AR-151009 Process	Carries process waste from VES-WL-101 through valve box C37 to pipeline 3" PUA-1014.	VES-WL-101, Jet-WL-500	Unknown connection point location, 3" PUA-1014	Y
5	4" PWM-2803C VOG	Carries process waste from condenser tank HE-WM-300 to 4" PWM-18032C VOG	CPP-737, condenser tank HE-WM-300	4" PWM-18032C (item 304)	Y
6	3" PWM-10018C	Carries process waste from VES-WM-100 in 604 to Valve Box A6	VES-WM-100, Jet WM-500	DVB-WM-PW-A6, PUV-WM-18	

;t VES-WM-100, 101 & 102

mpliant No	RCRA Upgrade Requirements	Pipeline Material	Comments
s	N/A	Stainless Steel	RCRA Controlled
;	N/A	Stainless Steel	Drain Line for VOG and Pressure Relief.
;	N/A	Schedule 40, seamless and welded, 347 SST or 304L SST	At DVB-WM-PW-A7 the following lines tie into it: 3"PU-A-631 (VES-WM-184) and 1" PU-AR-156326 (discharge from JET-WM-541 from the valve box sump). It then goes thru valve PUV-WM-23 and exits the box. At DVB-WM-PW-B1the following decon line, 1"PU-A-1087 and the discharge line from the sump jet, JET-WM-542 (thru isolation valve PUV-WM-73) tie to it. This line then exits the valve box thru isolation valve PUV-WM-71. At DVB-WM-PW-B2 the following lines tie into it: 3"PU-A-1036 (DVB-B5) between isolation valves PUV-WM-63 and PUV-WM-64, 3"PU-A-1040 (isolation valve PUV-WM-67) to VES-WM-186 tees off of this section of line near isolation valve PUV-WM-68. A cross tie, 3"PU-A-202 connects this line to 3"PU-A-1030 thru isolation valve PUV-WM-65. Another branch of 3"-PU-A-1014 from valve box DVB-WM-PW-C7 also enters valve box DVB-WM-PW-B2 and tees into the branch line from valve box DVB-WM-PW-A7 at isolation valves PUV-WM-63, 64. This branch line passes through DVB-WM-PW-B3 where it goes thru PUV-WM-60, connects to 3"PU-A-1037 to/from VES-WM-184 and goes thru PUV-WM-59 and exits the box. It then goes thru DVB-WM-PW-C15 and on to DVB-WM-PW-C7 where it connects to 3"PU-A-1036 from VES-WM-181, goes thru PUV-WM-125 and exits the box to where it transitions to 4"PW-M-28104Y to VES-WM-181. The line configuration is used to transport PL waste from VES-WL-101 to various tank farm tanks.
	N/A	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline runs from VES-WL-101 through valve box C37 (isolation valve PUV-WM-141) and transitions to 3" PUA-1014. The point of change is unknown.
	N/A	Schedule 40, seamless or welded, 347 SST or 304L SST	Process Waste drains into VES-WM-100 inside CPP-604. 4" PWM-18032C is renamed to 4"-VG-AR-18032 in Dwg. 377829.
		Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline changes to 3" PUA-1030 before terminating in Valve Box A6. Dwg. 057501-D2. The last letter in pipeline identification also changes from Y in Dwg. 057498 to C in Dwg. 057501. This could be a drawing mistake.

Item #	Identification Number	Description	Origin Point of Origin	Termination Point of Termination	RCR
7	3" PUA-1030	Process Waste	Transition to 3"PW-M-10018C from VES-WM-100 JET-WM-500	Tee to 3"PU-A-1218 w/in valve box DVB-WM-PW-B4	
8	2" PL-AR-113803	Carries process waste from VES-WL-133 to valve box C37	VES-WL-133, Jet-WL-533-1	DVB-WM-PW-C37, PLV-WL-216	
9	2" PUA-104853	Process Waste	CPP-601 U-Cell	Transition to line 1 ½"PW-M-10013C outside of VES-WM-101, 102 Waste Tank Vault	
10	3"PW-M-48048C	Process Waste	Open Ended in C37	VES-WL-102 in Waste Tank Vault	
11	1 ½"PL-AR-155565	Process Waste Low Level	VES-WL-150 jet JET-WL-550 (VES-WL-101, 102 Waste Tank Vault)	Transition to 1 ½"-pl-ar-155400 thru isolation valves PLV-WM-246 and HV-WM-36 w/in valve box DVB-WM-PW-C32	

t VES-WM-100, 101 & 102

mpliant No	RCRA Upgrade Requirements	Pipeline Material	Comments
	N/A	Schedule 40, seamless or welded, 347 SST or 304L SST	3" PUA-1030 is an active pipeline and carries process waste from VES-WM-100 inside CPP-604 through pipeline 3" PWM-10018C to Valve Box DVB-WM-PW-A6 at valve PUV-WM-13. Pipeline changes from 3" PWM-10018C to 3" PUA-1030 before entering DVB-WM-PW-A6. 3"PU-A-1030 travels thru valve box DVB-WM-PW B3 (isolation valve PUV-WM-57) and valve box DVB-WM-PW-B2 (isolation valve PUV-WM-61) before tee to 3"PU-A-1218 w/in valve box DVB-WM-PW-B4.
	N/A	Schedule 40, seamless or welded, 347 SST or 304L SST	This line tees into 1 ½"PL-AR-113808 w/in valve box DVB-WL-PL-C37 before exiting the valve box and teeing into 3"PY-2401Y to VES-WL-101.
	N/A	Schedule 40, seamless or welded, 347 SST or 304L SST	This line carries process waste from CPP-601, U-Cell through valve box C31 (PUV-YDA-329, 330), C29 (PUV-YDA-325) and C30 (PUV-WM-328, 336) 1 ½"PW-M-10013C empties to VES-WM-100 thru line 1 ½"PW-M-10015Y. 1"PU-A-104855 from DVB-WM-PW-C30 sump jet JET-WM-324 tee's into 2"PU-A-104853 w/in the valve box. Vent off gas line 1"VG-AR-113543 to VES-WM-196 tees to 2"PU-A-104853 w/in the valve box. This is a RCRA controlled pipeline.
	N/A		Drain Line for WM-300/310/A2 Return to Lined Vault.
	N/A	Stainless Steel	This line transitions once again into 3"PL-AR-113800 before leaving valve box DVB-WM-PW-C32.

Item #	Identification Number	Description	Origin Point of Origin	Termination Point of Termination	RCRA Y
1	1"PU-A-1022	Process Waste	Tee to 10"VG-A-1002 w/in VES-WM-185 North Sump Riser SR#1	Tee to 1 ½"PU-A-1022 w/in VES-WM-185 North Sump Riser SR#1	
2	1 1/4" PLA-104707	Process Waste	VES-WM-185 South Sump SR#2 JET-WM-585-4	Tee w/ 1 ½"PL-A-104710 thru valve PLV-WM-6 w/in DVB-WM-PW-C16	
3	2"PU-A-1025	Process Waste	VES-WM-185 South Sump SR#2 pit	VES-WM-185 South Sump SR#2 JET-WM-585-1	
4	1 1/2" PUA-1022	Process Waste	Tie to 4"PU-A-629 from CPP-722 thru valve PUV-WM-111	VES-WM-185	
5	3" PUA-1028	Process Waste	Valve DCV-WM-8 w/in DVB-WM-PW-B3	VES-WM-185	
6	3" PUA-1029	Process Waste	Tee w/ 3"PU-A-1005 thru valve PUV-WM-55 w/in DVB-WM-PW-B3	VES-WM-185	
7	3" PU-A-208	Process Waste	Tee w/ 3"PU-A-1030 thru valve PUV-WM-56 w/in DVB-WM-PW-B3	VES-WM-185	
8	1" PU-A-1023	Process Waste	DVB-WM-PW-B3 (drain line)	VES-WM-185 South Sump SR#2	
9	2"PU-A-1026	Process Waste	VES-WM-185 North Sump Riser SR#1 sump pit	JET-WM-585-2	
10	2"PU-A-1027	Process Waste	VES-WM-185 North Sump Riser SR#1 JET-WM-585-2	VES-WM-185	
11	2"PU-A-1024	Process Waste	VES-WM-185 South Sump SR#2 JET-WM-585-1	VES-WM-185	
12	2"PU-A-1094	Process Waste	VES-WM-185 JET-WM-585-3A	Tee to 3"PU-A-1038 thru valve PUV-WM-131 w/in DVB-WM-PW-C14	Y

ix

ɔeline List Ves-185

mpliant No	RCRA Upgrade Requirements	Pipeline Material	Comments
		Stainless Steel	1"PU-A-1022 serves as the condensate drain line for 10"VG-A-1002
		Schedule 40, seamless or welded, 347 SST or 304L SST	
		Stainless Steel	
		Schedule 40, seamless or welded, 347 SST or 304L SST	4"PU-A-629 is the drain line from CPP-722 vessel HE-WM-383
		Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is incased in concrete along with pipelines 3" PUA-1029 and 3" PUA-208. It is directly attached to a decon valve DCV-WM-8 inside valve box B3. Dwg. 057502 does not show any other attaching lines or valves before terminating at WM-185. Decontamination fluid placed through the pipeline at the valve will not decon any other line but itself (3" PUA-1028).
		Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is encased in concrete along with pipelines 3" PUA-1028 and 3" PUA-208. This line is attached to pipeline 3" PUA-1005 inside valve box B3
		Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is encased in concrete along with pipelines 3" PUA-1028 and 3" PUA-1029.
	Line Vault	Schedule 40, seamless or welded, 347 SST or 304L SST	An unnamed drain line leading from a concrete encasement housing 3" PUA-1028, 1029, 208 and 3" PUA-1023 - drain line from B4 - attaches to 1" PUA-1023 before it empties into CPP-785 south sump.
	Line Vault	Stainless Steel	
	Line Vault	Stainless Steel	
	Line Vault	Stainless Steel	
	Line Vault	Stainless Steel	

Item #	Identification Number	Description	Origin Point of Origin	Termination Point of Termination	RCRA Y
13	2"PU-A-1038	Process Waste	VES-WM-185 JET-WM-585-3B	Tie to 3"PU-A-1038 thru valve PUV-WM-130 w/in DVB-WM-PW-C14	

ix

peline List Ves-185

ıpliant	RCRA Upgrade	Pipeline	
No	Requirements	Material	Comments
s	Line Vault	Stainless Steel	

Item	Identification		Origin	Termination	RCRA
#	Number	Description	Point of Origin	Point of Termination	
1	1 1/4" PLA-104786	Carries process waste from CPP-713 (WM-190) cold sump to valve box C23.	Pipe reducer outside CPP-713 (VES-WM-190), attaching to 2" PUA-1318	DVB-WM-PW-C23, PLV-WM-79	Single
2	1 1/2" PUA-1311	Carries process waste from control pit #3 to WM-190	Control Pit #3, PUV-WM-318	VES-WM-190	Single
3	2" PU-A-1318	"Invault" Piping	SR-14, JET –WM-590-4 CPP-713 (VES-WM-190)	Transitions to1 ¼" PL-A-104786 then tee's into 1 ½"PL-A-104710 thru valve PLV-WM-79 w/in DVB-WM-PW-C23	Single
4	2" PU-A-1309	"Invault" Piping	SR-11, JET –WM-590-3 CPP-713	VES-WM-190	
5	2" PU-A-1308	"Invault" Piping	SR-12, JET –WM-590-2 CPP-713	VES-WM-190	
6	2" PU-A-1314	"Invault" Piping	TR-43, JET-WM-590-1 VES-WM-190	Tee's into 3" PU-A-1302 thru valve PUV-WM-311 w/in DVB-WM-PW-C-25	
7	3" PU-A-1302		TR-42, JET-WM-590-5 VES-WM-190	Tee's into 3"PU-A-1301 exterior of DVB-WM-PW-B10	
8	3" PU-A-1316		DVB-WM-PW-B-10	VES-WM-190	
9	3" PU-A-1315		DVB-WM-PW-B-10	VES-WM-190	

ıeline List Ves- 190

mpliant No	RCRA Upgrade Requirements	Pipeline Material	Comments
tainment	Add Secondary Containment	Schedule 40, seamless or welded, 347 SST or 304L SST	The pipe reducer location (outside CPP-713) is unknown at this time. Pipeline name seems to change from 2" PUA-1318 to 1 1/4" PLA-104786 at this reducer.
ainment	Difficult Upgrade	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is connected to other pipelines that route to WM-190 (1 1/2 PUA-1305) and condenser tank HE-WM-387 (CPP-743) inside Control Pit #3.
ainment	Add Secondary Containment		2" PU-A-1318 reduces to 1 ¼" PL-A-104786
	Cut and Cap Line 3" PUA 1301 in Valve Box C24	PUA	Goes thru DVB-WM-PW-C-25 valve PUV-WM-312
	Vault Penetration		3"PU-A-1316 diverts process waste from DVB-WM-PW-B10 to VES-WM-190. Cross tie 3"PU-A-1304 w/in valve box B10 connects line 3"PU-A-1221 to 3"P-A-1316 thru valves PUV-WM-306 and PUV-WM-308.
	Vault Penetration?		3"PU-A-1315 diverts process waste from DVB-WM-PW-B10 to VES-WM-190. Cross tie 3"PU-A-1303 w/in valve box B10 connects line 3"PU-A-1220 to 3"P-A-1315 thru valves PUV-WM-303 and PUV-WM-307.

Appendix B

Design Information Summary

Design Information Summary VES-WM-103 thru VES-WM-106 is shown in Table 1-1.
Design Information Summary VES-WM-190 is shown in Table 1-2.

Table 1-1. Design Information Summary for Tanks VES-WM-103 through VES-WM-106.

Tank Identification Number	*VES-WM-103*	*VES-WM-104*	*VES-WM-105*	*VES-WM-106*
Design Organization	Blaw – Knox Company	Blaw – Knox Company	Blaw – Knox Company	Blaw – Knox Company
Vendor	Alloy Fabricators	Alloy Fabricators	Alloy Fabricators	Alloy Fabricators
Years Constructed	1954 – 1955	1954 – 1955	1954 – 1955	1954 – 1955
Material	316 ELC SS	316 ELC SS	316 ELC SS	316 ELC SS
Orientation	Horizontal	Horizontal	Horizontal	Horizontal
Total Tank Volume (gal)	30,750	30,750	30,750	30,750
Operating Volume (gal)	24,500	24,500	24,500	24,500
Tank Cylindrical Length (feet)	38'	38'	38'	38'
Cylindrical Heads (two per tank)	ASME Standard Flanged and Dished Heads (~2-feet deep)	ASME Standard Flanged and Dished Heads (~2-feet deep)	ASME Standard Flanged and Dished Heads (~2-feet deep)	ASME Standard Flanged and Dished Heads (~2-feet deep)
Total Tank Length (feet)	42'	42'	42'	42'
Tank Inner Diameter (feet)	11.5'	11.5'	11.5'	11.5'
Tank Wall Thickness (inches)	Shell = 11/16"; Head = 9/16"	Shell = 11/16"; Head = 9/16"	Shell = 11/16"; Head = 9/16"	Shell = 11/16"; Head = 9/16"
Tank Supporting Base Slab Size (feet)	47.5' x 17' x 1.25' thick	47.5' x 17' x 1.25' thick	47.5' x 17' x 1.25' thick	47.5' x 17' x 1.25' thick
Liquid Containment Perimeter Curb Size (inches)	12" high x 9" wide	12" high x 9" wide	12" high x 9" wide	12" high x 9" wide
Tank Access Risers (inches)	Three – 6" Diameter One – 3" Diameter	Three – 6" Diameter One – 3" Diameter	Three – 6" Diameter One – 3" Diameter	Three – 6" Diameter One – 3" Diameter
Sump Riser (concrete pipe) (inches)	24" Diameter Pipe Wall 3" Thick	24" Diameter Pipe Wall 3" Thick	24" Diameter Pipe Wall 3" Thick	24" Diameter Pipe Wall 3" Thick
Sump Dimensions (feet)	2' x 2' x 2'	2' x 2' x 2'	2' x 2' x 2'	2' x 2' x 2'
Buried Tank Depths (dimensions to tank bottom) (feet)	28.5'	29'	29.5'	29.5'
Design Temperature (°F)	135	135	135	135
Design Pressure (psig)	External = 9.3 Internal = 50	External = 9.3 Internal = 50	External = 9.3 Internal = 50	External = 9.3 Internal = 50
Operating Pressure (psig)	10 in. of H_2O to atmosphere	10 in. of H_2O to atmosphere	10 in. of H_2O to atmosphere	10 in. of H_2O to atmosphere
Agitation	Air sparge	Air sparge	Air sparge	Air sparge
Cooling Coils (material)	316 SS	316 SS	316 SS	316 SS

Table 1-2. Design Information Summary for Tanks VES-WM-190.

Tank Identification Number	VES-WM-190
Design Organization	Flour Corp.
Vendor	Industrial Contractors
Years Constructed	1964
Initial Service Date	Spare
Design Code	API-650
Material	304L Stainless Steel
Orientation	Vertical
Total Tank Volume (gal)	300,000
Operating Volume (gal)	285,000
Design Liquid Specific Gravity[1]	1.4
Total Tank Length-Straight Side (feet)	21' (32' to roof)
Tank Diameter-OD (feet)	50'
Tank Wall Thickness (inches)	Floor and lower 8-ft of Walls = 5/16 Upper 13-ft of Walls = 1/4" Roof = 3/16"
Tank Supporting Base Slab Size (feet)	56' x 56' x 2'-6" Thick
Buried Tank Depths (dimensions to tank bottom) (feet)	45'
Design Temperature (°F)	220
Design Pressure (psig)	Range in H_2O: -2.5 - 10
Operating Pressure (psig)	In H_2O Vacuum : 0.4 – 0.7
Agitation	None
Cooling Coils (material)	304L Stainless Steel
Corrosion Allowance[2] (mils)[1]	125

[1] This is the original design value. Changes in the design standards after the tank was constructed resulted in the corrosion allowance for the tank being reduced to 50 mils and the specific gravity being set to 1.3, as a result of the seismic studies described in Section 4.3 of Report INEEL/EXT-99-00743 written in July 1999

[2] Corrosion allowance is the thickness of the metal that can be lost from the tank wall and still meet structural and operational requirements.

Appendix C

Detailed Cost Estimate

INEEL
Idaho National Engineering & Environmental Laboratory

INTEROFFICE MEMORANDUM

Date: November 3, 1999

To: R. J. Waters MS 5304 6-6013

From: R. D. Adams MS 3655 6-2963

Subject: SEGREGATION AND RCRA-COMPLIANT STORAGE OF INTEC NGLW – RDA-34-99

Estimating Services has prepared planning cost estimates for the subject project. These estimates were based on information received between February 2, 1999 and the present.

The Total Estimated Costs (TEC) for the three options are shown below. These costs include direct and indirect construction costs, G&A, PIF, procurement fees, Engineering costs, Inspection costs, Project Management costs, Construction Management costs, Conduct of Operation/Conduct of Maintenance adjustments, escalation and contingency. The estimated costs have been escalated to the midpoint of the anticipated schedule. For more detailed information, please refer to the Cost Estimate Support Data Recapitulation form.

	TEC	OPC	TPC
WM-190 Option #1 -	$34,000,000	$ 7,300,000	$41,300,000
WM-190 Option #2 -	$21,300,000	$ 6,300,000	$27,600,000
Three New 100,000 Gallon Tanks -	$26,200,000	$ 6,000,000	$32,200,000

Attached for your review are the Summary Estimate sheets, the Cost Estimate Support Data Recapitulation forms, detailed estimate sheets, Contingency Analysis sheets, Contractor Markup Distribution Report, and G&A/PIF Calculation Sheet.

If you have any questions regarding this estimate, please contact me at 526-2963.

RDA

Attachments:

cc: Estimate File #2502
R. J. Turk MS 3875
R. D. Adams File

Bechtel BWXT Idaho, LLC

COST ESTIMATE SUPPORT DATA RECAPITULATION

Project Title: SEGREGATION AND RCRA-COMPLIANT STORAGE OF INTEC NGLW
Estimator: R. D. Adams
Date: November 3, 1999
Estimate Type: Planning
File: 2502
Approved By:

I. **SCOPE OF WORK:** *Brief description of the proposed project.*

This study identifies four possible solutions to storing INTEC's Newly Generated Liquid Waste (NGLW). The first two options involve modifications to the existing WM-190 tank and vault located in the INTEC tank farm. WM-190, Option 1 would clean the existing tank, place a layer of grout in the bottom of the tank to fix contamination and provide a foundation for a new tank. This new tank would be wholly contained within the existing WM-190 tank, thus Wm-190 would provide a RCRA secondary containment for the new tank.

WM-190, Option 2 would place a new stainless steel floor in WM-190 on top of grout. The new floor would be seal-welded to the WM-190 walls. An epoxy finish would be added to the WM-190 vault floor and walls sufficiently high enough to provide RCRA secondary containment for the modified WM-190.

The third option would relocate existing tanks WM-103, -104, -105, and -106 to an area just north of the INTEC tank farm. This relocation would involve unearthing the existing tanks, building a new, RCRA-compliant vault for the tanks, relocating the tanks to the vault, and providing new transfer piping.

The forth option would build a new tank vault structure containing three 100,000 gallon storage tanks. The design and cost would be similar to Option 3A as described in the New Tank Farm Feasibility Study (estimate # 2497-3A). The same estimate will be used for this study.

II. **BASIS OF THE ESTIMATE:** *Drawings, Design Report, Engineers Notes and/or other documentation upon which the estimate is originated.*

The basis for the estimates was information provided in the NGLW Storage Study report, additional engineering input, the INTEC Tank Farm Facility Tank WM-182/WM-183 Closure Study - RDA-37-98, and the New Tank Farm Feasibility Study – RDA-23-99.

Previous HLW EIS estimates were used to estimate tank prices and yard work. Many of the demolition activities were based on actual productivity experienced on the Tank Farm Upgrades Project. Engineering provided tank vault excavation quantities.

III. **ASSUMPTIONS:** *Conditions statements accepted or supposed true without proof of demonstration. An assumption has a direct impact on total estimated cost.*

General assumptions for all options:

1. Subcontractors familiar with work at the INEEL will do all work.
2. The contract will be awarded through the competitive-bid process.
3. All tanks will be RCRA compliant.
4. INEEL Site Stabilization wages will apply, no construction overtime or shift differential has been included in these estimates.
5. No rock will be encountered during excavations.
6. No asbestos containing material (ACM) will be encountered during construction.
7. All new tank vaults will be constructed of concrete with stainless steel liners.
8. All excavated dirt from the tank farm will have to be disposed of at a LLW landfill such as Envirocare in Utah.
9. All tanks will be stainless steel.
10. For double-encased lines, the encasement will be schedule 10, 304L stainless steel.
11. All final tie-in welds will receive x-ray NDE. All other welds will receive 10% x-ray.
12. All pipelines exposed to soil will not receive a coat and wrap application, per C. W. McKnight.
13. BBWI QA personnel will apply and interpret all pipe PT's.

WM-190 Options:

14. For Option 1, the cooling coil piping that enters WM-189 through CPP-636 will have to be cleaned, filled with grout and capped similar to the WM-190 cooling coils due to removal of CPP-636.

15. For Option 2, the cooling coil piping will be cut and capped inside CPP-636. Within WM-190, cooling coils will be cut and capped where they enter the tank; cut, filled with grout, and capped at floor level; piping on the tank walls will be removed, sized, and boxed.

16. For Option 1, all instrument lines associated with WM-189 that currently terminate in or pass through CPP-636 will have to be rerouted.

17. All existing piping above or around WM-190 is radiologically contaminated. Pipe demolition and disposal will be conducted according to rad waste procedures.

18. The cooling coils within the tank will be grouted, capped, and left in place except as stated in assumption number fourteen.

19. When reinstalling or rerouting pipes, there will be one elbow fitting every twenty-five feet unless current drawings indicate otherwise.

20. Twenty percent of the excavation required for tank vault roof removal will be shored to avoid undermining existing permanent structures that must remain active.

21. Tank vault roof concrete slabs will be sawcut into manageable pieces in-place.

22. All demolished material will be removed in as large of pieces as possible and sized in the decon/boxing structure within the weather enclosure.

23. The new tank will be fabricated onsite and installed as one assembly for Option 1. This will require considerable structural additions to the standard tank design.

24. The new or modified tanks will have the same number of penetrations and lines entering the tanks as the current tank except for cooling coils.

25. Tank leak tests are estimated as described in the study.

26. When reinstalling near-surface piping and ductbanks, assume no radiological hazards exist except at tie-in points.

27. Weather enclosure will have to be removed and replaced in order to remove the existing tank roof and install the new tank in one piece for Option 1.

28. A large, heavy-lift crane like a ringer will be required. It will have to be staged outside the existing tank farm area due to load limitations above the existing tank vaults.

New Three 100,000-Gallon Tanks:

29. New Tanks are to be located north of the existing Tank Farm.

30. Piping quantities within the tank vaults are based on the flow sheets provided in the draft INTEC New Liquid Waste Storage Tanks report. Estimator-generated isometric routing sketches were used to help define the quantities.

31. Radiologically contaminated material will not be encountered during construction, except as noted in the estimate details.

32. When a discrepancy existed between the architectural sketches and the mechanical flow sheets, the architectural sketch information was used.

33. Estimates include steel tank supports to raise the tanks off of the vault floor, creating a secondary containment.

34. Each tank vault has two sumps with two steam/air jets per sump.

35. Electrical costs for the tank vaults were based on historical, square foot allowances.

36. Supply line and return line ball valves will be top entry, captive valves similar to those used in the diversion valve boxes. All other valves do not have to be remotely maintainable.

37. Minor changes from the original INTEC New Liquid Waste Storage Tanks estimates were made to reflect current charging practices for Conduct of Operations/Conduct of Maintenance.

IV. **CONTINGENCY GUIDELINE IMPLEMENTATION:** *The percentage used for contingency as determined by the contingency allowance guidelines can be altered to reflect the type of construction and conditions that may impact the total estimated cost.*

Risks normally present with a project at this stage of development would apply. The high end of the suggested percentage from the INEEL Cost Estimating Guide for a Planning level estimate should be sufficient to address risk for WM-190, Option 1 and 2.

Areas considered to be risk drivers for WM-190, Option 1 & 2 include:

- Existing conditions of work area may differ from those assumed.
- Radiation levels may vary.
- Existing tank and vault components may not be able to be removed in the size pieces assumed.

- New tank may have to be fabricated in-place instead of placed in one piece.

Risks normally present with a project at this stage of development would apply. The suggested percentage from the INEEL Cost Estimating Guide for a Planning level estimate should be sufficient to address risk for the new 100,000-gallon tanks.

V. OTHER COMMENTS/CONCERNS SPECIFIC TO THE ESTIMATE

- The option that addresses relocating and reusing WM-103 through WM-106 was considered. It was not fully estimated after initial figures indicated that this would be a much more costly option than the others. The cost difference stemmed from disposal costs for the large quantity of excavated material. The estimate was not completed with concurrence of the requestor.

- Procurement Fee is applied against construction cost at a rate of 3.5%. G&A is applied against construction cost and Procurement Fee at a rate of 27% with a ceiling of $500,000 per year. PIF is applied against construction cost, Procurement Fee, and G&A at a rate of 4.5%.

- The estimating program used to do this cost estimate has the following hierarchy when costs are rolled up to the summary sheet.
  - The detailed cost estimate sheets show raw costs without subcontractor/prime contractor markups or sales taxes.
  - Sales tax is applied at 5% of material costs (not shown on a specific report).
  - Subcontractor/prime contractor markups are applied next. The details are shown in the Contractor Markup Distribution Report.
  - The appropriate escalation and contingency are calculated and the details are shown in the Contingency Analysis sheet.
  - All of these costs and factors roll up to the Cost Estimate Summary.
  - Subcontractor/prime contractor markups are applied next. The details are shown in the Contractor Markup Distribution Report.
  - The appropriate escalation and contingency are calculated and the details are shown in the Contingency Analysis sheet.
  - All of these costs and factors roll up to the Cost Estimate Summary.

Bechtel BWXT Idaho, LLC
Rev. 10-99

COST ESTIMATE SUMMARY

PROJECT NAME: SEGREGATION AND RCRA-COMPLIANT STORAGE OF INTEC NGLW - WM-190
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO: 2502-1
PREPARED BY: R. D. ADAMS
REPORT NAME: Cost Estimate Summary

DATE: 03-Nov-1999
TIME: 10:44:56
CHECKED BY:
APPR'D BY:

WBS Element	Cost Estimate Element	Total Unescalated	Escalation		Total Incl Escalation
1.1	ENGINEERING, DESIGN AND INSPECTION			>>	$4,260,503
1.1.1	DESIGN ENGINEERING TITLE I & II	2,938,500	558,315		3,496,815
1.1.2	QUALITY ASSURANCE	596,631	167,057		763,688
1.2	MANAGEMENT COSTS			>>	$4,365,436
1.2.1	PROJECT MANAGEMENT	2,163,912	432,782		2,596,694
1.2.2	CONSTRUCTION MANAGEMENT	1,381,830	386,912		1,768,742
1.3	CONSTRUCTION			>>	$12,537,517
1.3.1	GENERAL CONDITIONS	2,933,285	821,320		3,754,605
1.3.2	SITEWORK	2,431,946	680,945		3,112,891
1.3.3	CONCRETE	461,083	129,103		590,186
1.3.5	METALS	80,495	22,539		103,034
1.3.7	THERMAL & MOISTURE PROTECTION	116,159	32,524		148,683
1.3.9	FINISHES	22,112	6,191		28,303
1.3.13	SPECIAL CONSTRUCTION	3,103,104	868,869		3,971,973
1.3.15	MECHANICAL	561,705	157,277		718,982
1.3.16	ELECTRICAL	85,047	23,813		108,860
1.4	GOVERNMENT FURNISHED EQUIP.			>>	$1,726,214
1.4.1	GOVERNMENT FURNISHED EQUIP.	1,450,600	275,614		1,726,214
1.5	G&A/PIF			>>	$1,697,600
1.5.1	G&A/PIF ADDER	1,326,250	371,350		1,697,600
1.5.2	PROCUREMENT FEES	393,594	105,637	>>	$499,231
	SUBTOTAL INCLUDING ESCALATION	20,046,253	5,040,248	>>	$25,086,501
	PROJECT CONTINGENCY				
	MANAGEMENT RESERVE			>>	$1,646,056
	CONTINGENCY			>>	$7,267,443
	TOTAL ESTIMATED COST			>>	$34,000,000

PROJECT COST PARAMETERS

EDI AS A % OF CONST. + GFE= *30.00%*

CONTINGENCY= *35.63%*

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Rev 10-99

DETAILED COST ESTIMATE SHEET

PAGE # 1

PROJECT NAME: SEGREGATION AND RCRA-COMPLIANT STORAGE OF INTEC NGLW - WM-190 OPT. 1
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO.: 2502-1
PREPARED BY: R. D. ADAMS

DATE 03-Nov-1999
TIME: 10:38:37
REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.1.1	DESIGN ENGINEERING TITLE I & II											
	TITLE I&II DESIGN @ 30% OF CONSTRUCTION COST	1	LOT			0.000		2,938,500				2,938,500
	DESIGN ENGINEERING TITLE I & II S/T						0	$2,938,500				$2,938,500
1.1.2	QUALITY ASSURANCE Quality Assurance @ 6% OF CONSTRUCTION COSTS	1	lot			0.000		587,700				587,700
	NDE OF WELDS	658	DI	0.15	Z-7250	0.300	197	8,828		99		8,926
	QUALITY ASSURANCE S/T						197	$596,528		$99		$596,626
1.2.1	PROJECT MANAGEMENT											
	PROJECT MANAGEMENT S/T						0					
1.2.1.1	PROJECT MANAGEMENT Project Manager Cost @ 14% OF CONSTRUCTION COSTS	1	LOT			0.000		1,371,300				1,371,300
	PROJECT MANAGEMENT S/T						0	$1,371,300				$1,371,300
1.2.1.2	COST ESTIMATING Cost Estimate - Title II / AFC	1	Lot		Z-6330	450.000	450	27,639				27,639

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.2.1.2	COST ESTIMATING											
	CID SUPPORT	2	YR		Z-6330	200.000	400	24,568				24,568
	Cost Estimating Management Support - 14% Of Estimating Total	1	Lot			0.000		7,309				7,309
	COST ESTIMATING S/T						850	$59,516				$59,516
1.2.1.3	RADIOLOGICAL CONTROL TECHNICIANS											
	Radiological Control Technicians	104	Wks		Z-7132	80.000	8,320	372,070				372,070
	Radiation Control - Management Support - 10% OF RCT Total	1	Lot			0.000		37,200				37,200
	RADIOLOGICAL CONTROL TECHNICIANS S/T						8,320	$409,270				$409,270
1.2.1.4	ENVIRONMENTAL SAFETY & HEALTH											
	Environmental Safety & Health	104	Wks		Z-7120	40.000	4,160	256,630				256,630
	ES&H Management Support - 10% Of ES&H Total	1	Lot			0.000		25,700				25,700
	ENVIRONMENTAL SAFETY & HEALTH S/T						4,160	$282,330				$282,330
1.2.1.5	PM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE											
	Assemble Planning Team	1	Lot		Z-6310	10.000	10	740				740
	ORIGINATE WCF	1	LOT		Z-6310	4.000	4	296				296
	UPDATE WCF	104	WK		Z-6310	4.000	416	30,772				30,772
	INITIATE HAZARDS ANALYSIS PROCESS	1	LOT		Z-6310	40.000	40	2,959				2,959

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.2.1.6	PM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE											
	PREPARE SUPPORTING HAZARDS PROJECT DOCUMENTATION	1	LOT		Z-6310	30.000	30	2,219				2,219
	POST JOB REVIEW	1	LOT		Z-6310	10.000	10	740				740
	Project Management - Management Support - 10% Of P.M. Total	1	Lot			0.000		3,770				3,770
	PM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE S/T						510	$41,495				$41,495
1.2.2	CONSTRUCTION MANAGEMENT											
	CM @ 12% OF CONSTRUCTION COSTS	1	LOT			0.000		1,175,400				1,175,400
	CONSTRUCTION MANAGEMENT S/T						0	$1,175,400				$1,175,400
1.2.2.1	CM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE											
	Assemble Planning Team	1	Lot		Z-6340	60.000	60	4,438				4,438
	INITIATE HAZARDS ANALYSIS	1	LOT		Z-6340	10.000	10	740				740
	PREPARE SUPPORTING HAZARDS PROJECT DOCUMENTATION	1	LOT		Z-6340	30.000	30	2,219				2,219
	APPROVE WORK ORDER	1	LOT		Z-6340	50.000	50	3,699				3,699
	Develop Initial JSA & Input To Work Plans	1	Lot		Z-6340	60.000	60	4,438				4,438
	SCHEDULE WORK ON POD	104	WKS		Z-6340	4.000	416	30,772				30,772

PROJECT NAME: SEGREGATION AND RCRA-COMPLIANT STORAGE OF INTEC NGLW - WM-190 OPT. 1
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO.: 2502-1
PREPARED BY: R. D. ADAMS

DATE 03-Nov-1999
TIME: 10:38:37
REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.2.2.1	CM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE											
	OUTAGES	20	EA		Z-6340	20.000	400	29,588				29,588
	SUBSURFACE INVESTIGATION	1	LOT		Z-6340	80.000	80	5,918				5,918
	Project Continuous Surviellance (2 Hours / Day)	104	Wks		Z-6340	8.000	832	61,543				61,543
	POST JOB REVIEW	1	LOT		Z-6340	10.000	10	740				740
00401400	Pool Account (CC + CE Direct Hours)	1,948	Hours		Z-CPP	1.000	1,948	62,336				62,336
	CM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE S/T						3,896	$206,430				$206,430
1.3.1	GENERAL CONDITIONS											
	SUPERVISION @ 10% OF LABOR HOURS	7,475	HRS		PIPF GEN	1.000	7,475	307,746				307,746
	OUTAGE COORDINATOR	1,870	HRS		PIPE GEN	1.000	1,870	70,275				70,275
	TRAINING @ 5% OF LABOR HOURS	3,740	HRS		SKWK GEN	1.000	3,740	129,105				129,105
	HEAVY RINGER CRANE W/ MIN. OF 300' BOOM	20	MO		EQHV GEN	170.000	3,400	110,704	1,000,000			1,110,704
	MOB/DEMOB CRANE	1	LOT		ENGR GEN	800.000	800	26,048	16,000			42,048
	SMALL TOOLS & CONSUMABLES @ 4% OF LABOR COST	1	LOT	106,900.00	GEN	0.000				106,900		106,900
	CONTRACTOR MOB/DEMOB @ 1.5% OF LABOR HOURS	1,120	HRS		SKWK GEN	1.000	1,120	38,662				38,662
	GENERAL CONDITIONS S/T						18,405	$682,540	$1,016,000	$106,900		$1,805,440

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.1.5	GC - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE ***GENERAL CONTRACTOR***											
	WORKABILITY WALKDOWN - 1 HR/DAY X 21 MEN X 4 DAY/WK	104	Wks		SKWK GEN	84.000	8,736	301,567				301,567
	CHANGED CONDITIONS - .5 HR/DAY X 21 MEN X 4 DAY/WEEK	104	WKS		SKWK GEN	42.000	4,368	150,783				150,783
	POST JOB REVIEW	1	LOT		CARF GEN	10.000	10	359				359
	GC - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE S/T						13,114	$452,709				$452,709
1.3.2	SITEWORK											
	SITEWORK S/T						0					
1.3.2.1.1	MISC CONCRETE DECON SR #11,12,14 DVB B-10, B-11, C-23, C-25	7	EA		LABR GEN	80.000	560	16,850				16,850
	REMOVE TR'S, SR'S, MANWAY CAPS & JB FOUNDATIONS	14	EA		DEMO1 GEN	20.000	280	8,771				8,771
	DEMO DVB C-25	1	LOT		DEMO1 GEN	80.000	80	2,506				2,506
	MISC CONCRETE S/T						920	$28,127				$28,127

DETAILED COST ESTIMATE SHEET

PROJECT NAME: SEGREGATION AND RCRA-COMPLIANT STORAGE OF INTEC NGLW - WM-190 OPT. 1
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO.: 2502-1
PREPARED BY: R. D. ADAMS

DATE 03-Nov-1999
TIME: 10:38:37
REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.2.1.1.	BLDG. 636											
	DEACTIVATION	1	LOT		GEN	0.000					3,000	3,000
Memo:	Based on the HLW EIS Facility Disposition											
	Assume Bldg. 636 is similar to Bldg. 634 covered in the HLW Facility Disposition study.											
	CHARACTERIZATION	1	LOT		GEN	0.000					6,500	6,500
	D&D	1	LOT		GEN	0.000					25,000	25,000
	BLDG. 636 S/T						0				$34,500	$34,500
1.3.2.1.2.	CUT, DECON, & CAP PIPE											
	*****COOLING COIL ISOLATION*****											
	ISOLATE SUPPLY HEADER	1	LOT		PIPE PIPE	16.000	16	601	40			641
	SET UP CATCH BASIN	2	PLC	200.00	PIPE PIPE	16.000	32	1,203	80	400		1,683
	DISPOSE OF LIQUIDS	2	EA		PIPE PIPE	12.000	24	902	60			962
	REMOVE 6" VALVES	2	EA		PIPE PIPE	8.000	16	601	40			641
	DISPOSE OF LIQUIDS FROM VALVE REMOVAL	2	PLC		PIPE PIPE	12.000	24	902	60			962
	PURGE SUPPLY HEADER	1	LOT		PIPE PIPE	12.000	12	451	30		500	981
	INSTALL TEMP PURGE LINE TO PEW	1	LOT	2,500.00	PIPE PIPE	80.000	80	3,006	200	2,500		5,706
	6" BLIND FLANGE W/ B&G	2	EA	350.00	PIPE PIPE	4.000	8	301	20	700		1,021
	SETUP RADIOLOGICAL CONTROL ZONE	1	LOT	500.00	PIPE PIPE	60.000	60	2,255		500		2,755
	*****INDIVIDUAL LINES*****											
	SUPPORT EXISTING, EXPOSED LINES	2,100	LF	7.15	SKWK PIPE	0.860	1,806	62,343		15,015		77,358
	SET UP CATCH BASIN	22	PLC	20.00	PIPE PIPE	4.000	88	3,307	220	440		3,967
	SET UP INSTR. LINE CATCH TROUGHS	6	EA	3,600.00	PIPE PIPE	120.000	720	27,058	1,800	21,600		50,458

PROJECT NAME: SEGREGATION AND RCRA-COMPLIANT STORAGE OF INTEC NGLW - WM-190 OPT. 1
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO.: 2502-1
PREPARED BY: R. D. ADAMS

DATE 03-Nov-1999
TIME: 10:38:37
REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.2.1.2.	CUT, DECON, & CAP PIPE DISPOSE OF LIQUIDS	1	LOT		PIPE PIPE	40.000	40	1,503	60			1,563
	UNBOLT & REMOVE COOLING COIL FLANGES 1 1/2"	72	PLC		PIPE PIPE	2.000	144	5,412	360			5,772
	WATER & H.P. AIR FLUSH (3 TIMES)	81	PLC	50.00	PIPE PIPE	16.000	1,296	48,704	3,240	4,050		55,994
	TEMP PURGE LINE TO PEW	81	EA	30.00	PIPE PIPE	2.500	203	7,610	1,013	2,430		11,052
	SET UP RADIOLOGICAL CONTROL ZONE	1	LOT	500.00	PIPE PIPE	200.000	200	7,516	450	500		8,466
	CONFINED SPACE ENTRY REQUIREMENTS	4	EA		PIPE PIPE	40.000	160	6,013				6,013
	CUT 10" LINE	2	EA		PIPE PIPE	8.625	17	648	43			691
	REMOVE 10" PIPE	40	LF		PIPE PIPE	0.675	27	1,015	68			1,082
	CAP 10" LINE	1	EA	160.00	PIPE PIPE	30.000	30	1,127	75	160		1,362
	SIZE & BOX 10" PIPE	5	CUTS		PIPE PIPE	1.400	7	263	18			281
	CUT 6" ENCASEMENT	14	EA		PIPE PIPE	6.000	84	3,157	210			3,367
	REMOVE 6" PIPE	265	LF		PIPE PIPE	0.375	99	3,735	249			3,984
	CAP 6" PIPE	3	EA	50.00	PIPE PIPE	16.500	50	1,860	124	150		2,134
	SIZE & BOX 6" PIPE	35	CUTS		PIPE PIPE	0.875	31	1,151	77			1,228
	CUT 4" ENCASEMENT	2	EA		PIPE PIPE	5.250	11	395	26			421
	REMOVE 4" PIPE	30	LF		PIPE PIPE	0.280	8	316	21			337
	SIZE & BOX 4" PIPE	4	CUTS		PIPE PIPE	0.800	3	120	8			128
	CUT 3" PIPE	18	EA		PIPE PIPE	4.880	88	3,301	219			3,520
	REMOVE 3" PIPE	390	LF		PIPE PIPE	0.225	88	3,298	218			3,516
	CAP 3" PIPE	6	EA	25.00	PIPE PIPE	10.130	61	2,284	152	150		2,586

Bechtel BWXT Idaho, LLC
Rev 10-99

DETAILED COST ESTIMATE SHEET

PROJECT NAME: SEGREGATION AND RCRA-COMPLIANT STORAGE OF INTEC NGLW - WM-190 OPT. 1
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO.: 2502-1
PREPARED BY: R. D. ADAMS

DATE 03-Nov-1999
TIME: 10:38:37
REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.2.1.2.	CUT, DECON, & CAP PIPE											
	SIZE & BOX 3" PIPE	45	CUTS		PIPE PIPE	0.735	33	1,243	83			1,326
	CUT 2" PIPE	16	EA		PIPE PIPE	1.310	21	788	52			840
	REMOVE 2" PIPE	370	LF		PIPE PIPE	0.188	70	2,614	174			2,788
	CAP 2" PIPE	1	EA	25.00	PIPE PIPE	3.400	3	128	8	25		161
	SIZE & BOX 2" PIPE	47	CUTS		PIPE PIPE	0.610	29	1,077	72			1,149
	CUT 1 1/2" PIPE	78	EA		PIPE PIPE	1.310	102	3,840	256			4,096
	REMOVE 1 1/2" PIPE	1,035	LF		PIPE PIPE	0.188	195	7,312	486			7,799
	CAP 1 1/2" PIPE	39	EA	17.00	PIPE PIPE	2.625	102	3,847	256	663		4,766
	SIZE & BOX 1 1/2" PIPE	54	CUTS		PIPE PIPE	0.610	33	1,238	83			1,321
	CUT 1 1/4" PIPE	2	EA		PIPE PIPE	1.310	3	98	7			105
	REMOVE 1 1/4" PIPE	40	LF		PIPE PIPE	0.188	8	283	19			301
	CAP 1 1/4" PIPE	1	EA	20.00	PIPE PIPE	3.400	3	128	8	20		156
	SIZE & BOX 1 1/4" PIPE	5	CUTS		PIPE PIPE	0.610	3	115	8			122
	CUT 1" PIPE	14	EA		PIPE PIPE	1.310	18	689	46			735
	REMOVE 1" PIPE	310	LF		PIPE PIPE	0.188	58	2,190	146			2,336
	CAP 1" PIPE	2	EA	10.00	PIPE PIPE	3.400	7	256	17	20		292
	SIZE & BOX 1" PIPE	39	CUTS		PIPE PIPE	0.610	24	894	60			954
	CUT 1/2" PIPE	102	EA		PIPE PIPE	1.310	134	5,021	335			5,356
	REMOVE 1/2" PIPE	775	LF		PIPE PIPE	0.150	116	4,369	295			4,663
	CAP 1/2" PIPE	48	EA	10.00	PIPE PIPE	2.250	108	4,059	270	480		4,809
	SIZE & BOX 1/2" PIPE	93	CUTS		PIPE PIPE	0.610	57	2,132	142			2,274

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1.3.2.1.2.	CUT, DECON, & CAP PIPE											
	CUT 1/4" PIPE	88	EA		PIPE PIPE	1.310	115	4,332	289			4,621
	REMOVE 1/4" PIPE	800	LF		PIPE PIPE	0.188	150	5,652	376			6,028
	CAP 1/4" PIPE	44	EA	10.00	PIPE PIPE	1.875	83	3,100	206	440		3,747
	SIZE & BOX 1/4" PIPE	110	CUTS		PIPE PIPE	0.610	67	2,522	168			2,690
	CUT, DECON, & CAP PIPE S/T						7,073	$260,282	$13,041	$50,243	$500	$324,066
1.3.2.1.2.	INSTRUMENT & ELECTRICAL											
	TC CONDUIT & WIRE	2,400	LF		ELEC ELEC	0.150	360	12,283	912			13,195
	PULL BACK CABLE IN DUCTBANKS	4	EA		ELEC ELEC	90.000	360	12,283				12,283
	CUT, RUBBLIZE & BOX DUCTBANK CONCRETE	26	CY		LABR ELEC	20.000	520	15,647				15,647
	REMOVE DIRECT-BURIED	500	LF		ELEC ELEC	0.050	25	853				853
	INSTRUMENT & ELECTRICAL S/T						1,265	$41,066	$912			$41,978
1.3.2.1.3	CLEAN & TEST TANK											
	INSTALL PUMP IN WM-190	1	EA	3,500.00	WASH PIPE	80.000	80	2,798	500	3,500		6,798
	CONTROL TRAILER	1	EA	70,000.00	WASH PIPE	80.000	80	2,798	500	70,000		73,298
	INSTALL TANK WASHER	2	EA	11,000.00	WASH PIPE	80.000	160	5,596	1,000	22,000		28,596
	WASH TANKS (3 WASHES PER TANK)	3	EA		WASH PIPE	50.000	150	5,246	938			6,183
	DISCONNECT AND DECON PUMP	1	EA		WASH PIPE	40.000	40	1,399	250			1,649
	CHARACTERIZATION TEST	4	EA		WASH PIPE	20.000	80	2,798	500		120,000	123,298

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1.3.2.1.3	**CLEAN & TEST TANK**											
	pH TESTS (1 PER RISER,3 TIMES)	24	EA		WASH PIPE	20.000	480	16,787	3,000		7,200	26,987
	CLEAN & TEST TANK S/T						1,070	$37,421	$6,688	$95,500	$127,200	$266,808
1.3.2.1.4	**GROUT TANK BOTTOMS**											
	ACCESS RISERS NOT ALREADY OPEN	4	EA		GROUT GEN	20.000	80	2,694	666			3,360
	SET UP GROUT PUMP	1	LOT	30,000.00	GROUT GEN	10.000	10	337	83	30,000		30,420
	FLEXIBLE LINE/BALL VALVE SETS FOR WASTE REMOVAL & LIQUID REMOVAL PIPE	1	LOT	400.00	GROUT GEN	100.000	100	3,367	833	400		4,600
	PLACE GROUT	146	CY	80.00	GROUT GEN	3.000	438	14,747	3,649	11,680		30,076
	GROUT TANK BOTTOMS S/T						628	$21,145	$5,231	$42,080		$68,456
1.3.2.1.5	**REMOVE VAULT ROOF**											
	SAWCUT ROOF DECK	122	LF		CD	0.000					3,660	3,660
	ATTACH LIFTING EYES	112	EA	10.00	LABR CD	3.750	420	12,638		1,120		13,758
	DECON & BOX CONCRETE SLAB	1,215	CF		LABR CD	0.150	182	5,484				5,484
	REMOVE BEAMS	9	EA		ENGR GEN	140.000	1,260	41,026				41,026
	DECON, SIZE & DISPOSE OF BEAMS	1	LOT		LABR GEN	800.000	800	24,072				24,072
	REMOVE VAULT ROOF S/T						2,662	$83,219		$1,120	$3,660	$87,999
1.3.2.1.6	**REMOVE TANK ROOF**											
	CUT & PREP TANK WALL FOR NEW ROOF	157	LF		BOIL TANK	3.750	589	26,641	1,473			28,114
	REMOVE TANK ROOF	1	LOT		BOIL TANK	300.000	300	13,575				13,575

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1.3.2.1.6	REMOVE TANK ROOF											
	CUT UP & DISPOSE OF TANK ROOF	700	LF		BOIL TANK	0.300	210	9,503	525			10,028
	TANK WALL BRACING - ALLOW	1	LOT	10,000.00	BOIL TANK	300.000	300	13,575	750	10,000		24,325
	REMOVE TANK ROOF S/T						1,399	$63,293	$2,748	$10,000		$76,041
1.3.2.2	EARTHWORK											
	MACHINE EXCAVATE TO EXPOSE VAULT ROOF	1,000	CY		EXC DIRT	1.875	1,875	57,963	12,500			70,463
	HAND EXCAVATE AROUND PIPES, ETC.	1,000	CY		EXC DIRT	11.250	11,250	347,775	75,000			422,775
	SHORE AS REQUIRED - ALLOW	450	SF		IRON DIRT	0.000					6,750	6,750
	IMPORT FILL MATERIAL	2,000	CY		TRHV DIRT	0.050	100	3,260	1,600			4,860
	BACKFILL	2,000	CY		ENGR DIRT	0.500	1,000	32,560	8,000			40,560
	DRAINAGE FABRIC	7,400	SF		DIRT	0.000					2,590	2,590
	EARTHWORK S/T						14,225	$441,558	$97,100		$9,340	$547,998
1.3.2.2.1	TEMPORARY VOG LINE EARTHWORK											
	SURVEY & LAYOUT EXCAVATION SITE	1	LOT		ENGR DIRT	20.000	20	651				651
	SET UP RADIOLOGICAL CONTROLS	1	LOT		ENGR DIRT	40.000	40	1,302				1,302
	EXCAVATE AREA (MACHINE)	100	CYD		DIRT	0.000					7,500	7,500
	HAND EXCAVATION	38	CYD		LABR DIRT	11.250	428	12,863	250			13,114
	BACKFILL & COMPACT	138	CYD		DIRT	0.000					8,280	8,280
	DECON EARTH MOVING EQUIPMENT	1	LOT		ENGR DIRT	90.000	90	2,930	2,000			4,930

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1.3.2.2.1	TEMPORARY VOG LINE EARTHWORK											
	SURVEY EARTH MOVING EQUIPMENT	1	LOT		ENGR DIRT	20.000	20	651	2,000			2,651
	TEMPORARY VOG LINE EARTHWORK S/T						598	$18,399	$4,250		$15,780	$38,429
1.3.2.3	TEMPORARY SERVICES											
	VOG BLOWER - 2000CFM	1	EA	1,000.00	SHEE HVAC	20.000	20	710	50	1,000		1,760
	HEPA SKIDS - 2000CFM SINGLE PASS	2	EA	10,000.00	SHEE HVAC	20.000	40	1,419	100	20,000		21,519
	CONDENSATE RECEIVER TANK	1	EA	4,000.00	PIPE PIPE	20.000	20	752	50	4,000		4,802
	CONDENSATE RECEIVER TANK SHIELDING	1	LOT	2,500.00	PIPE PIPE	20.000	20	752	50	2,500		3,302
	DBL. ENCASED CONDENSATE LINE - 2"X4"	70	LF	110.00	PIPE PIPE	2.900	203	7,629	508	7,700		15,836
	DBL. ENCASED VOG LINE - 4"X6"	250	LF	160.00	PIPE PIPE	3.750	938	35,231	2,345	40,000		77,576
	4" SST MAINLINE	50	LF	80.00	PIPE PIPE	1.400	70	2,631	175	4,000		6,806
	PIPE SLEEPER SUPPORTS	37	EA	20.00	PIPE PIPE	0.500	19	695	46	740		1,481
	TEMPORARY UTILITIES	1	LOT		PIPE	0.000					20,000	20,000
	PIPE SLEEPER SUPPORTS	37	EA	20.00	PIPE PIPE	0.500	19	695		740		1,435
	PIPE TIE-INS	4	EA		PIPE PIPE	20.000	80	3,006				3,006
	DISCONNECT, DECON AND REMOVE SYSTEM	1	LOT		VOG PIPE	300.000	300	10,606				10,606
	BOX & PROCESS WASTE	3	EA		VOG PIPE	10.000	30	1,061				1,061
	TEMPORARY SERVICES S/T						1,758	$65,186	$3,324	$80,680	$20,000	$169,190
1.3.3	CONCRETE											

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1.3.3	CONCRETE											
	ADD SLOPED GROUT TO TANK BOTTOM	10	CY	80.00	LABR GEN	7.000	70	2,106		800		2,906
	CONCRETE S/T						70	$2,106		$800		$2,906
1.3.3.1	PRECAST/PRETRESSED											
	VAULT BEAMS	9	EA	25,000.00	PCCONC GEN	70.000	630	20,103		225,000		245,103
	ROOF SLAB	2,400	SF	15.00	PCCONC GEN	0.250	600	19,146		36,000		55,146
	PRECAST/PRETRESSED S/T						1,230	$39,249		$261,000		$300,249
1.3.3.2	CONCRETE RISERS											
	RISERS	5	EA	4,000.00	SKWK GEN	20.000	100	3,452	800	20,000		24,252
	DVB-C25	1	EA	12,000.00	SKWK GEN	40.000	40	1,381	320	12,000		13,701
	CONCRETE RISERS S/T						140	$4,833	$1,120	$32,000		$37,953
1.3.6	METALS											
	DVB-C25 3" SST LID	1	EA	31,000.00	IRON GEN	15.000	15	602	160	31,000		31,762
	DVB C-25 SST LINER	216	SF	25.00	BOIL TANK	2.000	432	19,648	1,080	5,400		26,028
	METALS S/T						447	$20,150	$1,240	$36,400		$57,790
1.3.7	THERMAL & MOISTURE PROTECTION											

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1.3.7	THERMAL & MOISTURE PROTECTION VAULT ROOFING	6,700	SF	4.50	ROFC *ROOF*	0.200	1,340	40,133	10,050	30,150		80,333
	THERMAL & MOISTURE PROTECTION S/T						1,340	$40,133	$10,050	$30,150		$80,333
1.3.9	FINISHES											
	FINISHES S/T						0					
1.3.9.1	EPOXY BETWEEN OLD & NEW TANK WASH, RINSE & DRY FLOOR	375	SF		LABR *PAINT*	0.210	79	2,370				2,370
	SAND/ABRADE FLOOR	375	SF	0.20	LABR *PAINT*	0.210	79	2,370	188	75		2,632
	VACUUM FLOOR & CURB	1	LOT		LABR *PAINT*	80.000	80	2,407				2,407
	APPLY SEMSTONE OR SIMILAR SYSTEM	375	SF	5.88	EPOXFL *PAINT*	0.500	188	5,766	96	2,205		8,056
	EPOXY BETWEEN OLD & NEW TANK S/T						425	$12,902	$283	$2,280		$15,465
1.3.13	SPECIAL CONSTRUCTION											
	DECON/SIZING AREA - ERECT & DISMANTLE	1,500	SF		*GEN*	0.000					75,000	75,000
	SPECIAL CONSTRUCTION S/T						0				$75,000	$75,000
1.3.13.1	WEATHER ENCLOSESURE "SPRUNG"-TYPE STRUCTURE OVER TANK AREA, 15,000SF	1	LOT	271,800.00	SKWK *GEN*	800.000	800	27,616	15,000	271,800		314,416

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1.3.13.1	WEATHER ENCLOSESURE											
	FOUNDATION	171	cy		CONC	0.000					76,950	76,950
	LIGHTING	15,000	SF		ELEC	0.000					45,000	45,000
	H&V	15,000	SF		HVAC	0.000					52,500	52,500
	DISMANTLE STRUCTURE	1	LOT		SKWK GEN	800.000	800	27,616	8,000			35,616
	WEATHER ENCLOSESURE S/T						1,600	$55,232	$23,000	$271,800	$174,450	$524,482
1.3.13.2	200,000 GALLON NEW TANK											
	FAB 200,000 GAL TANK SST	1	LOT	556,000.00	BOIL TANK	6120.00	6,120	276,930		556,000		832,930
	ANCHOR BOLTS	24	EA	500.00	BOIL TANK	30.000	720	32,680		12,000		44,680
	POSITIONING GUIDES - ALLOW	1	LOT	15,000.00	BOIL TANK	400.000	400	18,100		15,000		33,100
	REMOVE WEATHER ENCLOSURE	1	LOT		LABR GEN	800.000	800	24,072	8,000			32,072
	RIG, PICK, SET, BOLT DOWN NEW TANK	1	LOT		BOIL TANK	500.000	500	22,625				22,625
	INDEPENDENT INSPECTION OF TANK	1	LOT		TANK	0.000					25,000	25,000
	LEAK TEST											
	PERFORM TEST	1	LOT		TEST TANK	1400.00	1,400	48,843				48,843
	LEAK TEST INSTRUMENTS	1	LOT	40,000.00	ELEC TANK	0.000				40,000		40,000
	200,000 GALLON NEW TANK S/T						9,940	$423,150	$8,000	$623,000	$25,000	$1,079,150
1.3.13.3	NEW ROOF ON OLD TANK											
	NEW ROOF ON OLD TANK	1	LOT	270,000.00	BOIL TANK	3980.00	3,980	180,095		270,000		450,095

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Rev 10-99

DETAILED COST ESTIMATE SHEET

PAGE # 16

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1.3.13.3	NEW ROOF ON OLD TANK REPLACE WEATHER ENCLOSURE	1	LOT		SKWK GEN	800.000	800	27,616	15,000			42,616
	NEW ROOF ON OLD TANK S/T						4,780	$207,711	$15,000	$270,000		$492,711
1.3.15	MECHANICAL											
	MECHANICAL S/T						0					
1.3.15.1	NEW SUMP DRAIN PIPES 304L PIPE	20	LF	15.00	PIPE PIPE	0.750	15	564	38	300		901
	ELBOWS	6	EA	15.00	PIPE PIPE	0.750	5	169	11	90		270
	CUT HOLE IN OLD TANK	2	EA		PIPE PIPE	11.250	23	846	56			902
	FIELD BW	12	EA		PIPE PIPE	4.400	53	1,984	132			2,116
	TIE-IN SEAL WELD	2	EA		PIPE PIPE	17.250	35	1,297	86			1,383
	NEW SUMP DRAIN PIPES S/T						129	$4,859	$323	$390		$5,572
1.3.15.2	TANK RISERS 12" SCH40 304L PIPE	180	LF	230.00	PIPE PIPE	1.300	234	8,794	585	41,400		50,779
	12" WN FLANGE	4	EA	700.00	PIPE PIPE	1.000	4	150	10	2,800		2,960
	12" BLIND FLANGE	4	EA	600.00	PIPE PIPE	1.000	4	150	10	2,400		2,560
	12" B&G SETS	4	EA	100.00	PIPE PIPE	22.500	90	3,382	225	400		4,007
	12" BW	4	EA		PIPE PIPE	14.500	58	2,180	145			2,325
	12" TIE-IN BW/SEAL WELDS	8	EA		PIPE PIPE	102.400	819	30,786	2,048			32,834

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1.3.15.2	TANK RISERS											
	10" SCH 40 304L	22	LF	164.00	PIPE PIPE	1.200	26	992	66	3,608		4,666
	10" WN FLANGE	1	EA	700.00	PIPE PIPE	1.000	1	38	3	700		740
	10" BLIND FLANGE	1	EA	600.00	PIPE PIPE	1.000	1	38	3	600		640
	10" B&G SETS	1	EA	90.00	PIPE PIPE	18.750	19	705	47	90		842
	10" BW	1	EA		PIPE PIPE	8.000	8	301	20			321
	10" TIE-IN BW	2	EA		PIPE PIPE	87.750	176	6,595	439			7,034
	TANK RISERS S/T						1,440	$54,110	$3,600	$51,998		$109,707
1.3.15.3	DVB-C25 PIPE PENETRATIONS											
	PIPE PENETRATIONS - ALLOW	6	EA		PIPE	0.000					6,000	6,000
	DVB-C25 PIPE PENETRATIONS S/T						0				$6,000	$6,000
1.3.15.4	REPLACE REMOVED LINES											
	10" SCH 40 304L PIPE	40	LF	164.00	PIPE PIPE	0.600	24	902	60	6,560		7,522
	10" 90 DEG BW EL	1	EA	995.00	PIPE PIPE	0.400		15	1	995		1,011
	10" SHOP BW	1	EA		PIPE PIPE	5.500	6	207	14			220
	10" FIELD BW	2	EA		PIPE PIPE	8.000	16	601	40			641
	10" TIE-IN BW	2	EA		PIPE PIPE	87.750	176	6,595	439			7,034
	10" CUT OFF CAP	1	EA		PIPE PIPE	8.625	9	324	22			346
	10" SHOP XRAY	1	EA		PIPE PIPE	0.000					40	40
	10" FIELD XRAY	1	EA		PIPE PIPE	0.000					410	410

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1.3.15.4	REPLACE REMOVED LINES											
	10" TIE-IN XRAY	2	EA		PIPE PIPE	0.000					1,000	1,000
	6" SCH 10 304L PIPE	270	LF	30.80	PIPE PIPE	0.350	95	3,551	238	8,316		12,105
	6" 90 DEG BW EL	16	EA	135.00	PIPE PIPE	10.000	160	6,013	400	2,160		8,573
	6" FIELD BW	7	EA		PIPE PIPE	8.700	61	2,289	152			2,441
	6" TIE-IN BW	10	EA		PIPE PIPE	26.100	261	9,808	653			10,461
	6" CUT OFF CAP	3	EA		PIPE PIPE	6.000	18	676	45			721
	4" SCH 10 304L PIPE	30	LF	19.30	PIPE PIPE	0.250	8	282	19	579		880
	4" FIELD BW	1	EA		PIPE PIPE	7.300	7	274	18			293
	4" TIE-IN BW	2	EA		PIPE PIPE	21.900	44	1,646	110			1,756
	3" SCH 10 304L PIPE	95	LF	15.65	PIPE PIPE	0.200	19	714	48	1,487		2,248
	3" 90 DEG BW EL	4	EA	25.00	PIPE PIPE	5.600	22	842	56	100		998
	3" FIELD BW	2	EA		PIPE PIPE	6.100	12	458	31			489
	3" TIE-IN BW	4	EA		PIPE PIPE	18.300	73	2,751	183			2,934
	3" CUT OFF CAP	3	EA		PIPE PIPE	4.880	15	550	37			587
	3" SCH 40 304L PIPE	295	LF	25.50	PIPE PIPE	0.200	59	2,217	148	7,523		9,887
	3" 90 DEG BW EL	17	EA	47.50	PIPE PIPE	0.220	4	141	9	808		957
	3" SHOP BW	17	EA		PIPE PIPE	1.750	30	1,118	74			1,192
	3" FIELD BW	25	EA		PIPE PIPE	2.500	63	2,349	156			2,505
	3" TIE-IN BW	14	EA		PIPE PIPE	37.500	525	19,730	1,313			21,042
	3" CUT OFF CAP	4	EA		PIPE PIPE	4.880	20	734	49			782
	3" SHOP XRAY	2	EA		PIPE PIPE	0.000					60	60

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.15.4	REPLACE REMOVED LINES											
	3" FIELD XRAY	3	EA		PIPE PIPE	0.000					1,230	1,230
	3" TIE-IN XRAY	14	EA		PIPE PIPE	0.000					7,000	7,000
	2" SCH 10 304L PIPE	110	LF	10.25	PIPE PIPE	0.170	19	703	47	1,128		1,878
	2" 90 DEG BW EL	5	EA	14.00	PIPE PIPE	4.200	21	789	53	70		912
	2" FIELD BW	3	EA		PIPE PIPE	4.600	14	519	35			553
	2" TIE-IN BW	4	EA		PIPE PIPE	13.800	55	2,074	138			2,212
	2" CUT OFF CAP	1	EA		PIPE PIPE	1.310	1	49	3			53
	2" SCH 40 304L PIPE	260	LF	14.90	PIPE PIPE	0.170	44	1,661	112	3,874		5,647
	2" 90 DEG BW EL	11	EA	16.80	PIPE PIPE	0.200	2	83	6	185		273
	2" SHOP BW	11	EA		PIPE PIPE	0.800	9	331	22			353
	2" FIELD BW	18	EA		PIPE PIPE	1.150	21	778	52			830
	2" TIE-IN BW	10	EA		PIPE PIPE	17.250	173	6,483	431			6,914
	2" SHOP XRAY	2	EA		PIPE PIPE	0.000					60	60
	2" FIELD XRAY	2	EA		PIPE PIPE	0.000					820	820
	2" TIE-IN XRAY	10	EA		PIPE PIPE	0.000					5,000	5,000
	1 1/2" SCH 40 304L PIPE	135	LF	11.24	PIPE PIPE	0.150	20	761	51	1,517		2,330
	1 1/2" 90 DEG BW EL	6	EA	12.60	PIPE PIPE	0.200	1	45	3	76		124
	1 1/2" SHOP BW	6	EA		PIPE PIPE	0.650	4	147	10			156
	1 1/2" FIELD BW	10	EA		PIPE PIPE	0.900	9	338	23			361
	1 1/2" TIE-IN BW	6	EA		PIPE PIPE	13.500	81	3,044	203			3,246
	1 1/2" CUT OFF CAP	3	EA		PIPE PIPE	1.310	4	148	10			158

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.15.4	REPLACE REMOVED LINES											
	1 1/2" SHOP XRAY	1	EA		PIPE PIPE	0.000					30	30
	1 1/2" FIELD XRAY	1	EA		PIPE PIPE	0.000					410	410
	1 1/2" TIE-IN XRAY	6	EA		PIPE PIPE	0.000					3,000	3,000
	1 1/4" SCH 40 304L PIPE	40	LF	8.90	PIPE PIPE	0.150	6	225	16	356		597
	1 1/4" 90 DEG BW EL	2	EA	15.10	PIPE PIPE	0.200		15	1	30		46
	1 1/4" SHOP BW	2	EA		PIPE PIPE	0.600	1	45	3			48
	1 1/4" FIELD BW	2	EA		PIPE PIPE	0.850	2	64	4			68
	1 1/4" TIE-IN BW	2	EA		PIPE PIPE	12.750	26	958	64			1,022
	1 1/4" SHOP XRAY	1	EA		PIPE PIPE	0.000					35	35
	1 1/4" FIELD XRAY	1	EA		PIPE PIPE	0.000					410	410
	1 1/4" TIE-IN XRAY	2	EA		PIPE PIPE	0.000					1,000	1,000
	1" SCH 40 304L PIPE	310	LF	7.53	PIPE PIPE	0.130	40	1,514	102	2,334		3,951
	1" 90 DEG BW EL	13	EA	10.10	PIPE PIPE	0.200	3	98	7	131		236
	1" SHOP BW	13	EA		PIPE PIPE	0.550	7	269	18			287
	1" FIELD BW	21	EA		PIPE PIPE	0.800	17	631	42			673
	1" TIE-IN BW	14	EA		PIPE PIPE	12.000	168	6,313	420			6,733
	1" CUT OFF CAP	2	EA		PIPE PIPE	1.310	3	98	7			105
	1" SHOP XRAY	2	EA		PIPE PIPE	0.000					70	70
	1" FIELD XRAY	3	EA		PIPE PIPE	0.000					1,230	1,230
	1" TIE-IN XRAY	14	EA		PIPE PIPE	0.000					7,000	7,000
	1/2" SCH 40 304L PIPE	775	LF	4.81	PIPE PIPE	0.130	101	3,786	256	3,728		7,770

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.15.4	REPLACE REMOVED LINES											
	1/2" 90 DEG BW EL	31	EA	8.90	PIPE PIPE	0.200	6	233	16	276		524
	1/2" SHOP BW	31	EA		PIPE PIPE	0.450	14	524	35			559
	1/2" FIELD BW	51	EA		PIPE PIPE	0.650	33	1,246	83			1,329
	1/2" TIE-IN BW	54	EA		PIPE PIPE	9.750	527	19,786	1,317			21,102
	1/2" SHOP XRAY	1	EA		PIPE PIPE	0.000					30	30
	1/2" FIELD XRAY	1	EA		PIPE PIPE	0.000					410	410
	1/2" TIE-IN XRAY	6	EA		PIPE PIPE	0.000					3,000	3,000
	1/4" SCH 40 304L PIPE	800	LF	3.32	PIPE PIPE	0.130	104	3,908	264	2,656		6,828
	1/4" 90 DEG BW EL	66	EA	8.90	PIPE PIPE	0.200	13	496	33	587		1,116
	1/4" SHOP BW	66	EA		PIPE PIPE	0.400	26	992	66			1,058
	1/4" FIELD BW	86	EA		PIPE PIPE	0.600	52	1,939	129			2,068
	1/4" TIE-IN BW	44	EA		PIPE PIPE	8.600	378	14,220	946			15,166
	1/4" SHOP XRAY	7	EA		PIPE PIPE	0.000					245	245
	1/4" FIELD XRAY	9	EA		PIPE PIPE	0.000					3,690	3,690
	1/4" TIE-IN XRAY	44	EA		PIPE PIPE	0.000					22,000	22,000
	REPLACE REMOVED LINES S/T						3,728	$140,101	$9,335	$45,475	$58,180	$253,091
1.3.16	ELECTRICAL											
	CONSTRUCTION POWER & LIGHTING	1	LOT	5,000.00	ELEC ELEC	300.000	300	10,236		5,000		15,236
	RELOCATE/REPLACE DUCTBANKS	335	LF		ELEC	0.000					33,500	33,500

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.16	ELECTRICAL											
	REPLACE DIRECT-BURIED CABLE	350	LF	2.00	ELEC ELEC	0.200	70	2,388		700		3,088
	REPLACE THERMOCOUPLE WIRES	2,400	LF	0.50	ELEC ELEC	0.080	192	6,551		1,200		7,751
	ELECTRICAL S/T						562	$19,175		$6,900	$33,500	$59,575
1.4.1	GOVERNMENT FURNISHED EQUIP.											
	DISPOSAL BOXES - ALLOW	50	EA	500.00		0.000				25,000		25,000
	SPECIAL DISPOSAL BOXES/WRAPPING	1	LOT			0.000					20,000	20,000
	DISPOSE OF EXCAVATED SOIL	2,000	CY			0.000					1,000,000	1,000,000
	PROCESS WASTE BOXES	50	EA			0.000					250,000	250,000
	PPE	4,200	EA	35.00		0.000				147,000		147,000
	GOVERNMENT FURNISHED EQUIP. S/T						0			$172,000	$1,270,000	$1,442,000
1.5.1 00701000	G&A/PIF ADDER G&A - 27%	1	LOT			0.000					767,932	767,932
	PIF - 4.5%	1	LOT			0.000					558,318	558,318
	G&A/PIF ADDER S/T						0				$1,326,250	$1,326,250
	PROJECT SUBTOTAL						106,881	$10,299,426	$1,221,244	$2,190,815	$3,179,360	$16,890,845

Bechtel BWXT Idaho, LLC

CONTINGENCY ANALYSIS

PROJECT NAME: SEGREGATION AND RCRA-COMPLIANT STORAGE OF INTEC NGLW - WM-190
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO: 2502-1
PREPARED BY: R. D. ADAMS

DATE: 03-Nov-1999
TIME: 10:44:58

REPORT NAME: Contingency Analysis

PROBABLE % VARIATION									PROJECT CONTINGENCY		SUMMAR
WBS Element	Cost Estimate Element	Total Cost w/o Contingency	% Total Cost	Prob. % Var. From Est. -	Prob. % Var. From Est. +	Wt. % of Prob. -	Wt. % of Prob. +	Contingency	%	Cost	Total Cost by Elemer
1.1.1	DESIGN ENGINEERING TITLE I & II	2,938,500	11.71	5	40	0.59	4.69	4.158%	11.94%	1,064,195	4,002,6
1.1.2	QUALITY ASSURANCE	596,631	2.38	10	30	0.24	0.71	0.618%	1.78%	158,251	754,882
1.2.1	PROJECT MANAGEMENT	2,163,912	8.63	10	35	0.86	3.02	2.631%	7.55%	673,297	2,837,2
1.2.2	CONSTRUCTION MANAGEMENT	1,381,830	5.51	5	45	0.28	2.48	2.203%	6.33%	563,874	1,945,7
1.3.1	GENERAL CONDITIONS	2,933,285	11.69	10	40	1.17	4.68	4.092%	11.75%	1,047,344	3,980,6
1.3.2	SITEWORK	2,431,946	9.69	0	50	0.00	4.85	4.362%	12.53%	1,116,435	3,548,381
1.3.3	CONCRETE	461,083	1.84	10	35	0.18	0.64	0.561%	1.61%	143,465	604,5
1.3.5	METALS	80,495	0.32	10	35	0.03	0.11	0.098%	0.28%	25,046	105,5
1.3.7	THERMAL & MOISTURE PROTECTION	116,159	0.46	10	30	0.05	0.14	0.120%	0.35%	30,810	146,9
1.3.9	FINISHES	22,112	0.09	5	45	0.00	0.04	0.035%	0.10%	9,023	31,135
1.3.13	SPECIAL CONSTRUCTION	3,103,104	12.37	20	45	2.47	5.57	4.762%	13.67%	1,218,777	4,321,8
1.3.15	MECHANICAL	561,705	2.24	5	40	0.11	0.90	0.795%	2.28%	203,425	765,1
1.3.16	ELECTRICAL	85,047	0.34	5	40	0.02	0.14	0.120%	0.35%	30,800	115,847
1.4.1	GOVERNMENT FURNISHED EQUIP.	1,450,600	5.78	5	40	0.29	2.31	2.053%	5.89%	525,343	1,975,943
1.5.1	G&A/PIF ADDER	1,326,250	5.29	10	35	0.53	1.85	1.612%	4.63%	412,660	1,738,9
1.5.2	PROCUREMENT FEES	393,594	1.57	10	35	0.16	0.55	0.479%	1.37%	122,466	516,0
	ESCALATION	5,040,248	20.09	10	35	2.01	7.03	6.128%	17.59%	1,568,288	6,608,536
	SUBTOTAL	25,086,501	100.00					34.829%			
	CALCULATED CONTINGENCY	8,737,353									
	RESULTANT TEC	33,823,854									
	ROUNDED TEC	34,000,000									
	PROJECT CONTINGENCY	8,913,499						35.53%			
	MANAGEMENT RESERVE	1,646,056									
	CONTINGENCY	7,267,443									
	TOTAL ESTIMATED COST	34,000,000								8,913,499	34,000,(

CONFIDENCE LEVEL AND ASSUMED RISKS:
The Bechtel BWXT Idaho, LLC Cost Estimate Contingency Analysis Model is based on the applied contingency and the assumptions upon which the estimate was predicated. The model is applied with a suggested risk level of 18% and a level of confidence of 90% the estimate will fall within the bid range. The Contingency Analysis is based on a weighted average to provide a 90 % probability of underrun and a 10% probability of overrun.

CONTINGENCY ANALYSIS GUIDE BY TYPE OF ESTIMATE
Guidelines established by DOE/FM 50, Cost Estimating Guide, Vol. 6, Cost Guide, and as presented in the INEEL Cost Estimating Guide.

PLANNING	20% – 30%
Experimental/Special Conditions	Up to 50%
Conceptual	15% – 25%
Experimental/Special Conditions	Up to 40%
TITLE I	10% – 20%
TITLE II	5% – 15%
TITLE II/AFC	Market Conditions

Bechtel BWXT Idaho, LLC

CONTRACTOR MARKUP DISTRIBUTION REPORT

PROJECT: SEGREGATION AND RCRA-COMPLIANT STORAGE OF INTEC NGLW - WM-190 OPT. 1
LOCATION: INEEL/INTEC
ESTIMATOR: R. D. ADAMS
CLIENT: R. J. WATERS

DATE: November 3, 1999
ESTTYPE: PLANNING
PROJECT NO: 2602-1

CONTRACTOR		LABOR HOURS	LABOR	MATERIAL	EQUIPMENT	OTHERS	SUBTOTAL	% MARKUP	% DIRECT COST	% TOTAL COST
PRIME CONTRACTOR			$0	$0	$0	$0	$0		0.00%	0.00%
TOTAL FOR PRIME CONTRACTOR		0	*$0*	*$0*	*$0*	*$0*	*$0*	***.**%		
CORE DRILL/SAW CUTTING CONTRACTOR - CD			$18,122	$1,176	$0	$3,660	$22,958		0.32%	0.23%
PROFIT	10.00%		$1,812	$118	$0	$366	$2,296	10.00%		
OVERHEADS	15.00%		$2,990	$194	$0	$604	$3,788	16.50%		
TOTAL FOR CORE DRILL/SAW CUTTING CONTRACTOR - CD		602	*$22,924*	*$1,488*	*$0*	*$4,630*	*$29,041*	26.50%		
CONCRETE CONTRACTOR - CONC			$0	$0	$0	$76,950	$76,950		1.08%	0.79%
PROFITS	10.00%		$0	$0	$0	$7,695	$7,695	10.00%		
OVERHEADS	15.00%		$0	$0	$0	$12,697	$12,697	16.50%		
TOTAL FOR CONCRETE CONTRACTOR - CONC		0	*$0*	*$0*	*$0*	*$97,342*	*$97,342*	26.50%		
EARTHWORK CONTRACTOR - DIRT			$459,956	$0	$101,350	$25,120	$586,426		8.21%	5.99%
PROFIT	10.00%		$45,996	$0	$10,135	$2,512	$58,643	10.00%		
OVERHEADS	15.00%		$75,893	$0	$16,723	$4,145	$96,760	16.50%		
TOTAL FOR EARTHWORK CONTRACTOR - DIRT		14,823	*$581,845*	*$0*	*$128,208*	*$31,777*	*$741,829*	26.50%		
ELECTRICAL CONTRACTOR - ELEC			$60,242	$7,245	$912	$78,500	$146,899		2.06%	1.50%
PROFIT	10.00%		$6,024	$725	$91	$7,850	$14,690	10.00%		
OVERHEADS	15.00%		$9,940	$1,195	$150	$12,952	$24,238	16.50%		
TOTAL FOR ELECTRICAL CONTRACTOR - ELEC		1,827	*$76,206*	*$9,165*	*$1,154*	*$99,303*	*$185,827*	26.50%		
GENERAL CONTRACTOR - GEN			$1,403,330	$782,859	$1,068,511	$109,500	$3,364,200		47.10%	34.35%
PROFIT	10.00%		$140,333	$78,286	$106,851	$10,950	$336,420	10.00%		
OVERHEADS	5.00%		$77,183	$43,057	$58,768	$6,023	$185,031	5.50%		
TOTAL FOR GENERAL CONTRACTOR - GEN		39,782	*$1,620,846*	*$904,202*	*$1,234,130*	*$126,473*	*$3,885,651*	15.50%		
HVAC CONTRACTOR - HVAC			$2,129	$22,050	$150	$52,500	$76,829		1.08%	0.78%
PROFIT	10.00%		$213	$2,205	$15	$5,250	$7,683	10.00%		
OVERHEADS	18.00%		$422	$4,366	$30	$10,395	$15,212	19.80%		
TOTAL FOR HVAC CONTRACTOR - HVAC		60	*$2,763*	*$28,621*	*$195*	*$68,145*	*$99,724*	29.80%		

Bechtel BWXT Idaho, LLC

CONTRACTOR MARKUP DISTRIBUTION REPORT

PROJECT: SEGREGATION AND RCRA-COMPLIANT STORAGE OF INTEC NGLW - WM-180 OPT. 1
LOCATION: INEEL/INTEC
ESTIMATOR: R. D. ADAMS
CLIENT: R. J. WATERS

DATE: November 3, 1999
ESTTYPE: PLANNING
PROJECT NO: 2502-1

CONTRACTOR		LABOR HOURS	LABOR	MATERIAL	EQUIPMENT	OTHERS	SUBTOTAL	% MARKUP	% DIRECT COST	% TOTAL COST
PAINTING CONTRACTOR - PAINT			$12,902	$2,394	$283	$0	$15,579		0.22%	0.16%
PROFIT	10.00%		$1,290	$239	$28	$0	$1,558	10.00%		
OVERHEADS	15.00%		$2,129	$395	$47	$0	$2,571	16.50%		
TOTAL FOR PAINTING CONTRACTOR - PAINT		425	*$16,321*	*$3,028*	*$358*	*$0*	*$19,708*	26.50%		
PIPING CONTRACTOR - PIPE			$559,830	$316,450	$36,160	$211,880	$1,126,320		15.77%	11.50%
PROFIT	10.00%		$55,983	$31,845	$3,616	$21,188	$112,632	10.00%		
OVERHEADS	20.00%		$123,163	$70,059	$7,955	$46,614	$247,790	22.00%		
TOTAL FOR PIPING CONTRACTOR - PIPE		15,138	*$738,976*	*$420,354*	*$47,731*	*$279,682*	*$1,486,743*	32.00%		
ROOFING CONTRACTOR - ROOF			$40,133	$31,658	$10,050	$0	$81,841		1.15%	0.84%
PROFIT	10.00%		$4,013	$3,166	$1,005	$0	$8,184	10.00%		
OVERHEAD	15.00%		$6,622	$5,223	$1,658	$0	$13,504	16.50%		
TOTAL FOR ROOFING CONTRACTOR - ROOF		1,340	*$50,768*	*$40,047*	*$12,713*	*$0*	*$103,528*	26.50%		
TANK CONTRACTOR - TANK			$662,014	$953,820	$3,828	$25,000	$1,644,662		23.03%	16.79%
PROFIT	10.00%		$66,201	$95,382	$383	$2,500	$164,466	10.00%		
OVERHEADS	15.00%		$109,232	$157,380	$632	$4,125	$271,369	16.50%		
TOTAL FOR TANK CONTRACTOR - TANK		14,951	*$837,448*	*$1,206,582*	*$4,842*	*$31,625*	*$2,080,497*	26.50%		
TOTAL DIRECT COST		88,947	$3,218,657	$2,119,662	$1,221,244	$583,110	$7,142,663		100.00%	
TOTAL SUBCONTRACTOR MARKUPS			$729,439	$493,836	$208,087	$155,865	$1,587,227			16.20%
TOTAL COST TO PRIME			$3,948,096	$2,613,487	$1,429,331	$738,975	$8,729,890			
PRIME CONTRACTOR MARKUP	12.20%		$481,668	$318,846	$174,378	$90,155	$1,065,047			10.87%
TOTAL PROJECT COST			**$4,429,763**	**$2,932,333**	**$1,603,710**	**$829,130**	**$9,794,936**			

FY-00 G&A/PIF ADDER CALCULATION SHEET

PROJECT: SEGREGATION AND RCRA-COMPLIANT STORAGE OF INTEC NGLW - WM-190 OPT. 1

DATE: 11/3/99

PROCUREMENT FEE:

CONSTRUCTION =	$9,794,936		
GFE =	$1,450,600		
Subtotal	$11,245,536		
FEE @ 3.5% =	$11,245,536	* 0.035 =	$393,593.76

G&A @ 27% (with a ceiling of $500,000 imposed per year)

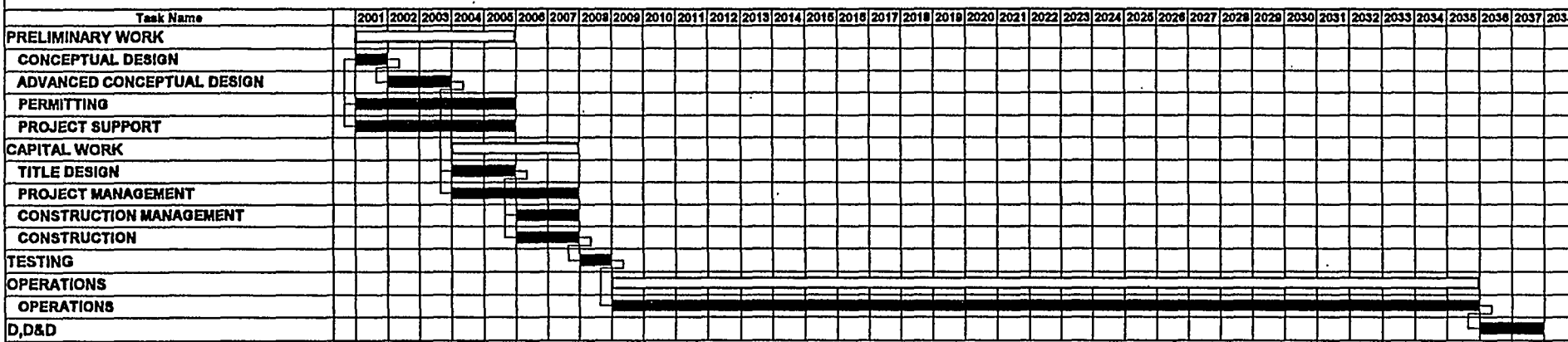
CONSTRUCTION $ OR YEARS OF CONST. =	CEILING * # OF YEARS 2	$1,000,000	
	GFE =	$1,450,600	
	PROCUREMENT FEE =	$393,594	
	Subtotal	$2,844,194	
	FEE @ 27% =	$2,844,194	* 0.27 = $767,932

PIF @ 4.5%

	CONSTRUCTION =	$9,794,936	
	GFE =	$1,450,600	
	PROCUREMENT FEE =	$393,594	
	G&A =	$767,932	
	Subtotal	$12,407,062	
	FEE @ 4.5% =	$12,407,062	* 0.045 = $558,318

TOTAL PROCUREMENT FEE:	$393,594
TOTAL G&A FEE:	$767,932
TOTAL PIF:	$558,318

NGLW TANK WM-190 OPT.1



Default

Complete | Complete Milestone | Remaining | Remaining Milestone | Free Float | Total Float (+) | Total Float (-) | Delay | Non-Resource | Required Date | % Labor Complete

Critical

Remaining | Remaining Milestone

Parent

NGLW TANK WM-190 OPT.1

Task Name	Duration	Schedule Start	Schedule Finish
PRELIMINARY WORK	1304d	01/02/01	12/30/05
CONCEPTUAL DESIGN	261d	01/02/01	01/01/02
ADVANCED CONCEPTUAL DESIGN	523d	01/02/02	01/02/04
PERMITTING	1304d	01/02/01	12/30/05
PROJECT SUPPORT	1304d	01/02/01	12/30/05
CAPITAL WORK	1041d	01/05/04	12/31/07
TITLE DESIGN	521d	01/05/04	01/02/06
PROJECT MANAGEMENT	1041d	01/05/04	12/31/07
CONSTRUCTION MANAGEMENT	520d	01/03/06	12/31/07
CONSTRUCTION	520d	01/03/06	12/31/07
TESTING	262d	01/01/08	12/31/08
OPERATIONS	7043d	01/01/09	12/31/35
OPERATIONS	7043d	01/01/09	12/31/35
D,D&D	523d	01/01/36	12/31/37

Bechtel BWXT Idaho, LLC
Rev. 10-99

COST ESTIMATE SUMMARY

PROJECT NAME: RCRA-COMPLIANT STOR. OF NGLW WM-190 OPT. 1 - OPC
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO: 2502-10
PREPARED BY: R. D. ADAMS
REPORT NAME: Cost Estimate Summary

DATE: 03-Nov-1999
TIME: 10:52:29
CHECKED BY: DR
APPR'D BY: [signature]

WBS Element	Cost Estimate Element	Total Unescalated	Escalation		Total Incl Escalation
1.1	CONCEPTUAL DESIGN			>>	$634,082
1.1.1	CONCEPTUAL DESIGN	592,600	41,482		634,082
1.2	MANAGEMENT COSTS			>>	$1,308,670
1.2.1	PROJECT SUPPORT	1,189,700	118,970		1,308,670
1.3	PERMITTING			>>	$2,392,050
1.3.1	PERMITTING	2,155,000	237,050		2,392,050
1.4	SO TEST & STARTUP			>>	$1,037,500
1.4.1	SO TEST & STARTUP	830,000	207,500		1,037,500
1.5.2	PROCUREMENT FEES	0	0	>>	$0
	SUBTOTAL INCLUDING ESCALATION	4,767,300	605,002	>>	$5,372,302
	PROJECT CONTINGENCY				
	MANAGEMENT RESERVE			>>	$0
	CONTINGENCY			>>	$1,927,698
	TOTAL ESTIMATED COST			>>	$7,300,000

PROJECT COST PARAMETERS	
EDI AS A % OF CONST. + GFE=	*18.00%*
CONTINGENCY=	*35.88%*

Bechtel BWXT Idaho, LLC
Rev 10-99

DETAILED COST ESTIMATE SHEET

PROJECT NAME: RCRA-COMPLIANT STOR. OF NGLW
WM-190 OPT. 1 - OPC
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO.: 2502-10
PREPARED BY: R. D. ADAMS

DATE 03-Nov-1999
TIME: 10:51:37
REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.1.1	CONCEPTUAL DESIGN											
	PRE-CONCEPTUAL DESIGN @ 1.5% OF CONSTRUCTION	1	LOT			0.000		146,900				146,900
	CONCEPTUAL DESIGN @ 4% OF CONSTRUCTION	1	LOT			0.000		391,800				391,800
	CONCEPTUAL DESIGN S/T						0	$538,700				$538,700
1.1.1.2	PROJECT SUPPORT DURING CONCEPTUAL DESIGN PROJECT SUPPORT @ 10% OF CONCEPTUAL DESIGN COST	1	LOT			0.000		53,900				53,900
	PROJECT SUPPORT DURING CONCEPTUAL DESIGN S/T						0	$53,900				$53,900
1.2.1	PROJECT SUPPORT											
	ACDC/SOW,CPDS,PEP,DC/SOW & REVIEWS @ 5% OF CONSTRUCTION	1	LOT			0.000		489,700				489,700
	PHA/SAR & SAR	1	LOT			0.000		700,000				700,000
	PROJECT SUPPORT S/T						0	$1,189,700				$1,189,700
1.3.1	PERMITTING											
	Siting Agreement	1	Lot		Z-4170	0.000					25,000	25,000
	AIR PERMITS	1	LOT			0.000					200,000	200,000

Bechtel BWXT Idaho, LLC
Rev 10-99

DETAILED COST ESTIMATE SHEET

PAGE # 2

PROJECT NAME: RCRA-COMPLIANT STOR. OF NGLW WM-190 OPT. 1 - OPC
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO.: 2502-10
PREPARED BY: R. D. ADAMS

DATE 03-Nov-1999
TIME: 10:51:37
REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.1	PERMITTING HWMA / RCRA Permit	1	Lot		Z-4170	0.000					1,750,000	1,750,000
	Permit To Construct	1	Lot		Z-4170	0.000					50,000	50,000
	CWA, Storm Water, Historical, Other Reg. Compliance	1	Lot		Z-4170	0.000					100,000	100,000
	P.E. Certification	1	Lot			0.000					30,000	30,000
	PERMITTING S/T						0				$2,155,000	$2,155,000
1.4.1	SO TEST & STARTUP											
	ORR	1	Lot			0.000		150,000				150,000
	SO Test & Training @ 1% OF TEC	1	Lot			0.000		340,000				340,000
	SO TEST & STARTUP S/T						0	$490,000				$490,000
1.4.1.1	PROJECT SUPPORT Support During Startup - 1% OF TEC	1	Lot			0.000		340,000				340,000
	PROJECT SUPPORT S/T						0	$340,000				$340,000
	PROJECT SUBTOTAL						0	$2,612,300	$0	$0	$2,155,000	$4,767,300

Bechtel BWXT Idaho, LLC

CONTINGENCY ANALYSIS

PROJECT NAME: RCRA-COMPLIANT STOR. OF NGLW WM-190 OPT. 1 - OPC
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO: 2502-10
PREPARED BY: R. D. ADAMS

DATE: 03-Nov-1999
TIME: 10:52:34

REPORT NAME: Contingency Analysis

PROBABLE % VARIATION									PROJECT CONTINGENCY		SUMMAR
WBS Element	Cost Estimate Element	Total Cost w/o Contingency	% Total Cost	Prob. % Var. From Est. -	Prob. % Var. From Est. +	Wt. % of Prob. -	Wt. % of Prob. +	Contingency	%	Cost	Total Cost by Eleme
1.1.1	CONCEPTUAL DESIGN	592,600	11.03	0	40	0.00	4.41	3.971%	11.39%	219,535	812,135
1.2.1	PROJECT SUPPORT	1,189,700	22.15	10	40	2.21	8.86	7.751%	22.23%	428,494	1,618,194
1.3.1	PERMITTING	2,155,000	40.11	10	40	4.01	16.05	14.040%	40.26%	776,168	2,931,1
1.4.1	SO TEST & STARTUP	830,000	15.45	5	45	0.77	6.95	6.180%	17.72%	341,647	1,171,f
1.5.2	PROCUREMENT FEES	0	0.00	10	40	0.00	0.00	0.000%	0.00%	0	0
	ESCALATION	605,002	11.26	10	30	1.13	3.38	2.928%	8.40%	161,856	766,8??
	SUBTOTAL	5,372,302	100.00					34.869%			
	CALCULATED CONTINGENCY	1,873,282									
	RESULTANT TEC	7,245,584									
	ROUNDED TEC	7,300,000									
	PROJECT CONTINGENCY	1,927,698						35.88%			
	MANAGEMENT RESERVE	0									
	CONTINGENCY	1,927,698									
	TOTAL ESTIMATED COST	7,300,000								1,927,698	7,300,

CONFIDENCE LEVEL AND ASSUMED RISKS:
The Bechtel BWXT Idaho, LLC Cost Estimate Contingency Analysis Model is based on the applied contingency and the assumptions upon which the estimate was predicated. The model is applied with a suggested risk level of 18% and a level of confidence of 90% the estimate will fall within the bid range. The Contingency Analysis is based on a weighted average to provide a 90 % probability of underrun and a 10% probability of overrun.

CONTINGENCY ANALYSIS GUIDE BY TYPE OF ESTIMATE
Guidelines established by DOE/FM 50, Cost Estimating Guide, Vol. 6, Cost Guide, and as presented in the INEEL Cost Estimating Guide.

PLANNING	20% – 30%
Experimental/Special Conditions	Up to 50%
Conceptual	15% – 25%
Experimental/Special Conditions	Up to 40%
TITLE I	10% – 20%
TITLE II	5% – 15%
TITLE II/AFC	Market Conditions

Bechtel BWXT Idaho, LLC
Rev. 10-99

COST ESTIMATE SUMMARY

PROJECT NAME: SEGREGATION AND RCRA-COMPLIANT STOR.OF INTEC NGLW - WM-190 OP
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO: 2502-2
PREPARED BY: R. D. ADAMS
REPORT NAME: Cost Estimate Summary

DATE: 03-Nov-1999
TIME: 11:25:49
CHECKED BY: DE
APPR'D BY: BM

WBS Element	Cost Estimate Element	Total Unescalated	Escalation		Total Incl Escalation
1.1	ENGINEERING, DESIGN AND INSPECTION			>>	$2,725,834
1.1.1	DESIGN ENGINEERING TITLE I & II	1,893,700	359,803		2,253,503
1.1.2	QUALITY ASSURANCE	380,912	91,419		472,331
1.2	MANAGEMENT COSTS			>>	$2,913,150
1.2.1	PROJECT MANAGEMENT	1,472,847	294,569		1,767,416
1.2.2	CONSTRUCTION MANAGEMENT	923,979	221,755		1,145,734
1.3	CONSTRUCTION			>>	$7,827,455
1.3.1	GENERAL CONDITIONS	2,053,322	492,797		2,546,119
1.3.2	SITEWORK	1,767,859	424,286		2,192,145
1.3.3	CONCRETE	258,002	61,921		319,923
1.3.5	METALS	71,572	17,177		88,749
1.3.7	THERMAL & MOISTURE PROTECTION	83,218	19,972		103,190
1.3.9	FINISHES	126,058	30,254		156,312
1.3.13	SPECIAL CONSTRUCTION	1,726,765	414,424		2,141,189
1.3.15	MECHANICAL	168,931	40,543		209,474
1.3.16	ELECTRICAL	56,737	13,617		70,354
1.4	GOVERNMENT FURNISHED EQUIP.			>>	$1,050,683
1.4.1	GOVERNMENT FURNISHED EQUIP.	847,325	203,358		1,050,683
1.5	G&A/PIF			>>	$1,147,490
1.5.1	G&A/PIF ADDER	925,395	222,095		1,147,490
1.5.2	PROCUREMENT FEES	250,593	60,142	>>	$310,735
	SUBTOTAL INCLUDING ESCALATION	13,007,215	2,968,132	>>	$15,975,347
	PROJECT CONTINGENCY				
	MANAGEMENT RESERVE			>>	$1,033,636
	CONTINGENCY			>>	$4,291,017
	TOTAL ESTIMATED COST			>>	$21,300,000

PROJECT COST PARAMETERS

EDI AS A % OF CONST. + GFE= *31.00%*

CONTINGENCY= *33.33%*

Bechtel BWXT Idaho, LLC
Rev 10-99

PROJECT NAME: SEGREGATION AND RCRA-COMPLIANT STOR.OF INTEC NGLW - WM-190 OPT. 2
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

DETAILED COST ESTIMATE SHEET

TYPE OF ESTIMATE: PLANNING
PROJECT NO.: 2502-2
PREPARED BY: R. D. ADAMS

DATE 03-Nov-1999
TIME: 11:25:52
REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.1.1	DESIGN ENGINEERING TITLE I & II											
	TITLE I&II DESIGN @ 30% OF CONSTRUCTION COST	1	LOT			0.000		1,893,700				1,893,700
	DESIGN ENGINEERING TITLE I & II S/T						0	$1,893,700				$1,893,700
1.1.2	QUALITY ASSURANCE											
	Quality Assurance @ 6% OF CONSTRUCTION COSTS	1	lot			0.000		378,700				378,700
	NDE OF WELDS	163	DI	0.15	Z-7250	0.300	49	2,187		24		2,211
	QUALITY ASSURANCE S/T						49	$380,887		$24		$380,911
1.2.1	PROJECT MANAGEMENT											
	PROJECT MANAGEMENT S/T						0					
1.2.1.1	PROJECT MANAGEMENT Project Manager Cost @ 14% OF CONSTRUCTION COSTS	1	LOT			0.000		883,700				883,700
	PROJECT MANAGEMENT S/T						0	$883,700				$883,700
1.2.1.2	COST ESTIMATING Cost Estimate - Title II / AFC	1	Lot		Z-6330	350.000	350	21,497				21,497

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.2.1.2	COST ESTIMATING											
	CID SUPPORT	2	YR		Z-6330	130.000	195	11,977				11,977
	Cost Estimating Management Support - 14% Of Estimating Total	1	Lot			0.000		4,686				4,686
	COST ESTIMATING S/T						545	$38,160				$38,160
1.2.1.3	RADIOLOGICAL CONTROL TECHNICIANS											
	Radiological Control Technicians	78	Wks		Z-7132	80.000	6,240	279,053				279,053
	Radiation Control - Management Support - 10% OF RCT Total	1	Lot			0.000		27,900				27,900
	RADIOLOGICAL CONTROL TECHNICIANS S/T						6,240	$306,953				$306,953
1.2.1.4	ENVIRONMENTAL SAFETY & HEALTH											
	Environmental Safety & Health	78	Wks		Z-7120	40.000	3,120	192,473				192,473
	ES&H Management Support - 10% Of ES&H Total	1	Lot			0.000		19,200				19,200
	ENVIRONMENTAL SAFETY & HEALTH S/T						3,120	$211,673				$211,673
1.2.1.5	PM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE											
	Assemble Planning Team	1	Lot		Z-6310	10.000	10	740				740
	ORIGINATE WCF	1	LOT		Z-6310	4.000	4	296				296
	UPDATE WCF	78	WK		Z-6310	4.000	312	23,079				23,079
	INITIATE HAZARDS ANALYSIS PROCESS	1	LOT		Z-6310	40.000	40	2,959				2,959

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.2.1.5	PM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE PREPARE SUPPORTING HAZARDS PROJECT DOCUMENTATION	1	LOT		Z-6310	25.000	25	1,849				1,849
	POST JOB REVIEW	1	LOT		Z-6310	10.000	10	740				740
	Project Management - Management Support - 10% Of P.M. Total	1	Lot			0.000		2,700				2,700
	PM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE S/T						401	$32,362				$32,362
1.2.2	CONSTRUCTION MANAGEMENT											
	CM @ 12% OF CONSTRUCTION COSTS	1	LOT			0.000		757,500				757,500
	CONSTRUCTION MANAGEMENT S/T						0	$757,500				$757,500
1.2.2.1	CM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE Assemble Planning Team	1	Lot		Z-6340	60.000	60	4,438				4,438
	INITIATE HAZARDS ANALYSIS	1	LOT		Z-6340	10.000	10	740				740
	PREPARE SUPPORTING HAZARDS PROJECT DOCUMENTATION	1	LOT		Z-6340	25.000	25	1,849				1,849
	APPROVE WORK ORDER	1	LOT		Z-6340	30.000	30	2,219				2,219
	Develop Initial JSA & Input To Work Plans	1	Lot		Z-6340	180.000	180	13,315				13,315
	SCHEDULE WORK ON POD	78	WKS		Z-6340	4.000	312	23,079				23,079

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.2.2.1	CM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE											
	OUTAGES	15	EA		Z-6340	20.000	300	22,191				22,191
	SUBSURFACE INVESTIGATION	1	LOT		Z-6340	20.000	20	1,479				1,479
	Project Continuous Surviellance (2 Hours / Day)	78	Wks		Z-6340	8.000	624	46,157				46,157
	POST JOB REVIEW	1	LOT		Z-6340	10.000	10	740				740
00401400	Pool Account (CC + CE Direct Hours @ $-- Per Hour)	1,571	Hours		Z-CPP	1.000	1,571	50,272				50,272
	CM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE S/T						3,142	$166,479				$166,479
1.3.1	GENERAL CONDITIONS											
	SUPERVISION @ 10% OF LABOR HOURS	4,760	HRS		PIPF GEN	1.000	4,760	195,969				195,969
	OUTAGE COORDINATOR	1,190	HRS		PIPE GEN	1.000	1,190	44,720				44,720
	TRAINING @ 5% OF LABOR HOURS	2,380	HRS		SKWK GEN	1.000	2,380	82,158				82,158
	HEAVY RINGER CRANE W/ MIN. OF 300' BOOM	15	MO		EQHV GEN	170.000	2,550	83,028	750,000			833,028
	MOB/DEMOB CRANE	1	LOT		ENGR GEN	800.000	800	26,048	16,000			42,048
	SMALL TOOLS & CONSUMABLES @ 4% OF LABOR COST	1	LOT	67,500.00	GEN	0.000				67,500		67,500
	CONTRACTOR MOB/DEMOB @ 1.5% OF LABOR HOURS	710	HRS		SKWK GEN	1.000	710	24,509				24,509

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.1	GENERAL CONDITIONS											
	GENERAL CONDITIONS S/T						12,390	$456,432	$766,000	$67,500		$1,289,932
1.3.1.5	GC - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE ***GENERAL CONTRACTOR***											
	WORKABILITY WALKDOWN - 1 HR/DAY X 18 MEN X 4 DAY/WK	78	Wks		SKWK GEN	72.000	5,616	193,864				193,864
	CHANGED CONDITIONS - .5 HR/DAY X 18 MEN X 4 DAY/WEEK	78	WKS		SKWK GEN	36.000	2,808	96,932				96,932
	POST JOB REVIEW	1	LOT		CARF GEN	10.000	10	359				359
	GC - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE S/T						8,434	$291,156				$291,156
1.3.2	SITEWORK											
	SITEWORK S/T						0					
1.3.2.1.2.	CUT, DECON & CAP LINES *****COOLING COIL ISOLATION*****											
	ISOLATE SUPPLY HEADER	1	LOT		PIPE PIPE	16.000	16	601	40			641
	SET UP CATCH BASIN	2	PLC	200.00	PIPE PIPE	16.000	32	1,203	80	400		1,683
	DISPOSE OF LIQUIDS	2	EA		PIPE PIPE	12.000	24	902	60			962
	REMOVE 6" VALVES	2	EA		PIPE PIPE	8.000	16	601	40			641

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.2.1.2.	CUT, DECON & CAP LINES											
	DISPOSE OF LIQUIDS FROM VALVE REMOVAL	2	PLC		PIPE PIPE	12.000	24	902	60			962
	PURGE SUPPLY HEADER	1	LOT		PIPE PIPE	12.000	12	451	30		500	981
	INSTALL TEMP PURGE LINE TO PEW	1	LOT	2,500.00	PIPE PIPE	80.000	80	3,006	200	2,500		5,706
	6" BLIND FLANGE W/ B&G	2	EA	350.00	PIPE PIPE	4.000	8	301	20	700		1,021
	SETUP RADIOLOGICAL CONTROL ZONE	1	LOT	500.00	PIPE PIPE	60.000	60	2,255		500		2,755
	*****INDIVIDUAL LINES*****											
	SUPPORT EXISTING, EXPOSED LINES	1,200	LF	7.15	SKWK PIPE	0.860	1,032	35,625		8,580		44,205
	SET UP CATCH BASIN	22	PLC	20.00	PIPE PIPE	4.000	88	3,307	220	440		3,967
	DISPOSE OF LIQUIDS	1	LOT		PIPE PIPE	40.000	40	1,503	60			1,563
	UNBOLT & REMOVE COOLING COIL FLANGES 1 1/2"	36	PLC		PIPE PIPE	2.000	72	2,706	180			2,886
	WATER & H.P. AIR FLUSH (3 TIMES)	18	PLC	50.00	PIPE PIPE	16.000	288	10,823	720	900		12,443
	TEMP PURGE LINE TO PEW	18	EA	30.00	PIPE PIPE	2.500	45	1,691	225	540		2,456
	SET UP RADIOLOGICAL CONTROL ZONE	1	LOT	500.00	PIPE PIPE	200.000	200	7,516	450	500		8,466
	CONFINED SPACE ENTRY REQUIREMENTS	4	EA		PIPE PIPE	40.000	160	6,013				6,013
	CUT 10" LINE	2	EA		PIPE PIPE	8.625	17	648	43			691
	REMOVE 10" PIPE	40	LF		PIPE PIPE	0.675	27	1,015	68			1,082
	CAP 10" LINE	1	EA	160.00	PIPE PIPE	30.000	30	1,127	75	160		1,362
	SIZE & BOX 10" PIPE	5	CUTS		PIPE PIPE	1.400	7	263	18			281
	CUT 3" PIPE	4	EA		PIPE PIPE	4.880	20	734	48			782
	REMOVE 3" PIPE	50	LF		PIPE PIPE	0.225	11	423	28			451

Bechtel BWXT Idaho, LLC
Rev 10-99
PROJECT NAME: SEGREGATION AND RCRA-COMPLIANT STOR.OF INTEC NGLW - WM-190 OPT. 2
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

DETAILED COST ESTIMATE SHEET

TYPE OF ESTIMATE: PLANNING
PROJECT NO.: 2502-2
PREPARED BY: R. D. ADAMS

DATE 03-Nov-1999
TIME: 11:25:52
REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.2.1.2.	CUT, DECON & CAP LINES											
	CAP 3" PIPE	2	EA	25.00	PIPE PIPE	10.130	20	761	51	50		862
	SIZE & BOX 3" PIPE	6	CUTS		PIPE PIPE	0.735	4	166	11			177
	CUT 2" PIPE	10	EA		PIPE PIPE	1.310	13	492	33			525
	REMOVE 2" PIPE	155	LF		PIPE PIPE	0.188	29	1,095	73			1,168
	SIZE & BOX 2" PIPE	20	CUTS		PIPE PIPE	0.610	12	458	31			489
	CUT 1 1/2" PIPE	130	EA		PIPE PIPE	1.310	170	6,400	426			6,826
	REMOVE 1 1/2" PIPE	2,250	LF		PIPE PIPE	0.188	423	15,896	1,058			16,954
	CAP 1 1/2" PIPE	38	EA	17.00	PIPE PIPE	2.625	100	3,749	249	646		4,644
	SIZE & BOX 1 1/2" PIPE	222	CUTS		PIPE PIPE	0.610	135	5,089	340			5,429
	CUT 1" PIPE	2	EA		PIPE PIPE	1.310	3	98	7			105
	REMOVE 1" PIPE	45	LF		PIPE PIPE	0.188	8	318	21			339
	CAP 1" PIPE	1	EA	10.00	PIPE PIPE	3.400	3	128	8	10		146
	SIZE & BOX 1" PIPE	6	CUTS		PIPE PIPE	0.610	4	138	9			147
	CUT 1/2" PIPE	102	EA		PIPE PIPE	1.310	134	5,021	335			5,356
	REMOVE 1/2" PIPE	625	LF		PIPE PIPE	0.150	94	3,523	238			3,761
	CAP 1/2" PIPE	48	EA	10.00	PIPE PIPE	2.250	108	4,059	270	480		4,809
	SIZE & BOX 1/2" PIPE	72	CUTS		PIPE PIPE	0.610	44	1,651	110			1,761
	CUT 1/4" PIPE	22	EA		PIPE PIPE	1.310	29	1,083	72			1,155
	REMOVE 1/4" PIPE	55	LF		PIPE PIPE	0.188	10	389	26			414
	CUT, DECON & CAP LINES S/T						3,653	$134,129	$8,032	$16,406	$500	$157,066

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.2.1.2.	INSTRUMENT & ELECTRICAL											
	TC CONDUIT & WIRE	2,400	LF		ELEC ELEC	0.150	360	12,283	912			13,195
	PULL BACK CABLE IN DUCTBANKS	2	EA		ELEC ELEC	90.000	180	6,142				6,142
	CUT, RUBBLIZE & BOX DUCTBANK CONCRETE	21	CY		LABR ELEC	20.000	420	12,638				12,638
	REMOVE DIRECT-BURIED	450	LF		ELEC ELEC	0.050	23	768				768
	INSTRUMENT & ELECTRICAL S/T						983	$31,830	$912			$32,742
1.3.2.1.3	CLEAN & TEST TANK											
	INSTALL PUMP IN WM-190	1	EA	3,500.00	WASH PIPE	80.000	80	2,798	500	3,500		6,798
	CONTROL TRAILER	1	EA	70,000.00	WASH PIPE	80.000	80	2,798	500	70,000		73,298
	INSTALL TANK WASHER	2	EA	11,000.00	WASH PIPE	80.000	160	5,596	1,000	22,000		28,596
	WASH TANKS (3 WASHES PER TANK)	3	EA		WASH PIPE	50.000	150	5,246	938			6,183
	DISCONNECT AND DECON PUMP	1	EA		WASH PIPE	40.000	40	1,399	250			1,649
	CHARACTERIZATION TEST	4	EA		WASH PIPE	20.000	80	2,798	500		120,000	123,298
	pH TESTS (1 PER RISER,3 TIMES)	24	EA		WASH PIPE	20.000	480	16,787	3,000		7,200	26,987
	CLEAN & TEST TANK S/T						1,070	$37,421	$6,688	$95,500	$127,200	$266,808
1.3.2.1.4	GROUT TANK BOTTOMS											
	ACCESS RISERS NOT ALREADY OPEN	4	EA		GROUT GEN	20.000	80	2,694	666			3,360
	SET UP GROUT PUMP	1	LOT	30,000.00	GROUT GEN	10.000	10	337	83	30,000		30,420
	FLEXIBLE LINE/BALL VALVE SETS FOR WASTE REMOVAL & LIQUID REMOVAL PIPE	1	LOT	400.00	GROUT GEN	100.000	100	3,367	833	400		4,600

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.2.1.4	GROUT TANK BOTTOMS											
	PLACE 1/2 THE GROUT	73	CY	80.00	GROUT GEN	0.833	61	2,047	507	5,840		8,394
	GROUT TANK BOTTOMS S/T						251	$8,445	$2,089	$36,240		$46,774
1.3.2.1.5	REMOVE VAULT ROOF											
	SAWCUT ROOF DECK	60	LF		CD	0.000					1,800	1,800
	ATTACH LIFTING EYES	56	EA	10.00	LABR CD	3.750	210	6,319		560		6,879
	DECON & BOX CONCRETE SLAB	610	CF		LABR CD	0.150	92	2,753				2,753
	REMOVE BEAMS	5	EA		ENGR GEN	70.000	350	11,396				11,396
	DECON, SIZE & DISPOSE OF BEAMS	1	LOT		LABR GEN	550.000	550	16,550				16,550
	REMOVE VAULT ROOF S/T						1,202	$37,018		$560	$1,800	$39,378
1.3.2.1.6	REMOVE TANK ROOF											
Memo:	CUT & PREP TANK FOR NEW ROOF 1/4 OF ROOF AREA, PIE-SHAPED	90	LF		BOIL TANK	3.750	338	15,272	844			16,116
	REMOVE TANK ROOF SECTION	1	LOT		BOIL TANK	100.000	100	4,525				4,525
	CUT UP & DISPOSE OF TANK ROOF	175	LF		BOIL TANK	0.300	53	2,376	131			2,507
	TANK WALL BRACING - ALLOW	1	LOT	3,000.00	BOIL TANK	100.000	100	4,525	250	3,000		7,775
	REMOVE TANK ROOF S/T						590	$26,698	$1,225	$3,000		$30,923
1.3.2.1.6	NEW TANK FLOOR EMBEDS											
Memo:	INSTALL EMBEDS REQUIRED FOR NEW TANK BOTTOM	3,730	lbs	3.50	BOIL TANK	0.113	421	19,072	1,044	13,055		33,172
	These embeds will be similar to embeds used when install stainless steel liners in hot cells. The sst angles will be fabbed and supported to provide backing for tank floor fabrication joints.											

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.2.1.6	NEW TANK FLOOR EMBEDS											
	WELD EMBED RING TO EXISTING TANK WALL	157	LF		BOIL TANK	1.875	294	13,320	736			14,057
	PLACE 1/2 THE GROUT	73	CY	80.00	GROUT GEN	0.833	61	2,047	507	5,840		8,394
	NEW TANK FLOOR EMBEDS S/T						777	$34,440	$2,287	$18,885		$55,623
1.3.2.2	EARTHWORK											
	MACHINE EXCAVATE TO EXPOSE VAULT ROOF	575	CY		EXC DIRT	1.875	1,078	33,328	7,188			40,516
	HAND EXCAVATE AROUND PIPES, ETC.	575	CY		EXC DIRT	11.250	6,469	199,971	43,125			243,096
	SHORE AS REQUIRED - ALLOW	250	SF		IRON DIRT	0.000					3,750	3,750
	IMPORT FILL MATERIAL	1,150	CY		TRHV DIRT	0.050	58	1,875	920			2,795
	BACKFILL	1,150	CY		ENGR DIRT	0.500	575	18,722	4,600			23,322
	DRAINAGE FABRIC	4,820	SF		DIRT	0.000					1,687	1,687
	EARTHWORK S/T						8,179	$253,886	$56,833		$5,437	$316,165
1.3.2.2.1	TEMPORARY VOG LINE EARTHWORK											
	SURVEY & LAYOUT EXCAVATION SITE	1	LOT		ENGR DIRT	20.000	20	651				651
	SET UP RADIOLOGICAL CONTROLS	1	LOT		ENGR DIRT	40.000	40	1,302				1,302
	EXCAVATE AREA (MACHINE)	100	CYD		DIRT	0.000					7,500	7,500
	HAND EXCAVATION	38	CYD	6.58	LABR DIRT	11.250	428	12,863		250		13,114
	BACKFILL & COMPACT	138	CYD		DIRT	0.000					8,280	8,280
	DECON EARTH MOVING EQUIPMENT	1	LOT		ENGR DIRT	90.000	90	2,930	2,000			4,930

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.2.2.1	TEMPORARY VOG LINE EARTHWORK											
	SURVEY EARTH MOVING EQUIPMENT	1	LOT		ENGR DIRT	20.000	20	651	2,000			2,651
	TEMPORARY VOG LINE EARTHWORK S/T						598	$18,399	$4,000	$250	$15,780	$38,429
1.3.2.3	TEMPORARY SERVICES											
	VOG BLOWER - 2000CFM	1	EA	1,000.00	SHEE HVAC	20.000	20	710	50	1,000		1,760
	HEPA SKIDS - 2000CFM SINGLE PASS	2	EA	10,000.00	SHEE HVAC	20.000	40	1,419	100	20,000		21,519
	CONDENSATE RECEIVER TANK	1	EA	4,000.00	PIPE PIPE	20.000	20	752	50	4,000		4,802
	CONDENSATE RECEIVER TANK SHIELDING	1	LOT	2,500.00	PIPE PIPE	20.000	20	752	50	2,500		3,302
	DBL. ENCASED CONDENSATE LINE - 2"X4"	70	LF	110.00	PIPE PIPE	2.900	203	7,629	508	7,700		15,836
	DBL. ENCASED VOG LINE - 4"X6"	250	LF	160.00	PIPE PIPE	3.750	938	35,231	2,345	40,000		77,576
	4" SST MAINLINE	50	LF	80.00	PIPE PIPE	1.400	70	2,631	175	4,000		6,806
	PIPE SLEEPER SUPPORTS	37	EA	20.00	PIPE PIPE	0.500	19	695	46	740		1,481
	TEMPORARY UTILITIES	1	LOT		PIPE	0.000					20,000	20,000
	PIPE SLEEPER SUPPORTS	37	EA	20.00	ZF-PF FA	0.500	19	1,125		740		1,865
	PIPE TIE-INS	4	EA		ZF-PF FA	20.000	80	4,863				4,863
	DISCONNECT, DECON AND REMOVE SYSTEM	1	LOT		VOG FA	300.000	300	10,606				10,606
	BOX & PROCESS WASTE	3	EA		VOG FA	10.000	30	1,061				1,061
	TEMPORARY TANK & VAULT VENTILATION SYSTEM											

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.2.3	TEMPORARY SERVICES FILTERED VENTILATION SYSTEM	1	LOT	50,000.00	SHEE *HVAC*	300.000	300	10,644		50,000		60,644
	TEMPORARY SERVICES S/T						2,058	$78,116	$3,324	$130,680	$20,000	$232,120
1.3.3	CONCRETE											
	ADD SLOPED GROUT TO TANK BOTTOM	10	CY	80.00	LABR *GEN*	7.000	70	2,106		800		2,906
	CONCRETE S/T						70	$2,106		$800		$2,906
1.3.3.1	PRECAST/PRETRESSED VAULT BEAMS	5	EA	25,000.00	PCCONC *GEN*	70.000	350	11,169		125,000		136,169
	ROOF SLAB	1,200	SF	15.00	PCCONC *GEN*	0.250	300	9,573		18,000		27,573
	PRECAST/PRETRESSED S/T						650	$20,742		$143,000		$163,742
1.3.3.2	CONCRETE RISERS RISERS	5	EA	4,000.00	SKWK *GEN*	20.000	100	3,452	800	20,000		24,252
	CONCRETE RISERS S/T						100	$3,452	$800	$20,000		$24,252
1.3.5	METALS											
	SST PLATE FROM TANK TO SUMP	3,270	LBS	3.00	BOIL *TANK*	0.113	370	16,720	916	9,810		27,446

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.6	METALS											
	SEAL WELD TO TANK	157	LF		BOIL TANK	3.000	471	21,313	1,178			22,490
	METALS S/T						841	$38,033	$2,093	$9,810		$49,936
1.3.7	THERMAL & MOISTURE PROTECTION											
	VAULT ROOFING	4,800	SF	4.50	ROFC ROOF	0.200	960	28,752	7,200	21,600		57,552
	THERMAL & MOISTURE PROTECTION S/T						960	$28,752	$7,200	$21,600		$57,552
1.3.9	FINISHES											
	FINISHES S/T						0					
1.3.9.1	EPOXY BETWEEN OLD & NEW TANK											
	WASH, RINSE & DRY SURFACE	4,140	SF		LABR PAINT	0.010	41	1,246				1,246
	SAND/ABRADE SURFACE	4,140	SF	0.20	LABR PAINT	0.040	166	4,983	2,070	828		7,881
	VACUUM SURFACE	1	LOT		LABR PAINT	80.000	80	2,407				2,407
	APPLY BUILT-UP EPOXY SYSTEM	4,140	SF	5.88	EPOXFL PAINT	0.400	1,656	50,835	845	24,343		76,022
	EPOXY BETWEEN OLD & NEW TANK S/T						1,943	$59,471	$2,915	$25,171		$87,556
1.3.13	SPECIAL CONSTRUCTION											

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.13	SPECIAL CONSTRUCTION											
	DECON/SIZING AREA - ERECT & DISMANTLE	1,500	SF		GEN	0.000					75,000	75,000
	SPECIAL CONSTRUCTION S/T						0				$75,000	$75,000
1.3.13.1	WEATHER ENCLOSESURE											
	"SPRUNG"-TYPE STRUCTURE OVER TANK AREA, 15,000SF	1	LOT	271,800.00	SKWK GEN	800.000	800	27,616	15,000	271,800		314,416
	FOUNDATION	171	cy		CONC	0.000					76,950	76,950
	LIGHTING	15,000	SF		ELEC	0.000					45,000	45,000
	H&V	15,000	SF		HVAC	0.000					52,500	52,500
	DISMANTLE STRUCTURE	1	LOT		SKWK GEN	800.000	800	27,616	8,000			35,616
	WEATHER ENCLOSESURE S/T						1,600	$55,232	$23,000	$271,800	$174,450	$524,482
1.3.13.2	NEW TANK FLOOR											
	FAB TANK SST TANK FLOOR	1	LOT	150,000.00	BOIL TANK	1800.00	1,800	81,450		150,000		231,450
	POSITION & WELD NEW FLOOR	760	LF		BOIL TANK	3.000	2,280	103,170	5,700			108,870
	INDEPENDENT INSPECTION OF TANK	1	LOT		TANK	0.000					25,000	25,000
	LEAK TEST											
	PERFORM TEST	1	LOT		TEST TANK	2800.00	2,800	97,685				97,685
	LEAK TEST INSTRUMENTS	1	LOT	40,000.00	ELEC TANK	0.000				40,000		40,000
	NEW TANK FLOOR S/T						6,880	$282,305	$5,700	$190,000	$25,000	$503,005

Bechtel BWXT Idaho, LLC
Rev 10-99

DETAILED COST ESTIMATE SHEET

PROJECT NAME: SEGREGATION AND RCRA-COMPLIANT STOR.OF INTEC NGLW - WM-190 OPT. 2
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO.: 2502-2
PREPARED BY: R. D. ADAMS

DATE 03-Nov-1999
TIME: 11:25:52
REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.13.3	NEW ROOF ON OLD TANK NEW ROOF ON OLD TANK	1	LOT	70,000.00	BOIL *TANK*	1200.00	1,200	54,300		70,000		124,300
	NEW ROOF ON OLD TANK S/T						1,200	$54,300		$70,000		$124,300
1.3.15	MECHANICAL											
	MECHANICAL S/T						0					
1.3.15.2	TANK RISERS 12" SCH40 304L PIPE	80	LF	230.00	PIPE *PIPE*	1.300	104	3,908	260	18,400		22,568
	12" WN FLANGE	3	EA	700.00	PIPE *PIPE*	1.000	3	113	8	2,100		2,220
	12" BLIND FLANGE	3	EA	600.00	PIPE *PIPE*	1.000	3	113	8	1,800		1,920
	12" B&G SETS	3	EA	100.00	PIPE *PIPE*	22.500	68	2,537	169	300		3,005
	12" BW	4	EA		PIPE *PIPE*	14.500	58	2,180	145			2,325
	12" TIE-IN BW/SEAL WELDS	3	EA		PIPE *PIPE*	102.400	307	11,545	768			12,313
	TANK RISERS S/T						543	$20,395	$1,357	$22,600		$44,351
1.3.15.4	REPLACE REMOVED LINES 10" SCH 40 304L PIPE	40	LF	164.00	PIPE *PIPE*	0.600	24	902	60	6,560		7,522
	10" 90 DEG BW EL	1	EA	995.00	PIPE *PIPE*	0.400		15	1	995		1,011
	10" SHOP BW	1	EA		PIPE *PIPE*	5.500	6	207	14			220
	10" FIELD BW	2	EA		PIPE *PIPE*	8.000	16	601	40			641
	10" TIE-IN BW	2	EA		PIPE *PIPE*	87.750	176	6,595	439			7,034

Bechtel BWXT Idaho, LLC
Rev 10-99

DETAILED COST ESTIMATE SHEET

PAGE # 16

PROJECT NAME: SEGREGATION AND RCRA-COMPLIANT STOR.OF INTEC NGLW - WM-190 OPT. 2
LOCATION 1: INEEL/INTEC
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PROJECT NO.: 2502-2
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REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.15.4	REPLACE REMOVED LINES											
	10" CUT OFF CAP	1	EA		PIPE PIPE	8.625	9	324	22			346
	10" SHOP XRAY	1	EA		PIPE PIPE	0.000					40	40
	10" FIELD XRAY	1	EA		PIPE PIPE	0.000					410	410
	10" TIE-IN XRAY	2	EA		PIPE PIPE	0.000					1,000	1,000
	3" SCH 10 304L PIPE	45	LF	15.65	PIPE PIPE	0.200	9	338	23	704		1,065
	3" 90 DEG BW EL	2	EA	25.00	PIPE PIPE	5.600	11	421	28	50		499
	3" FIELD BW	1	EA		PIPE PIPE	6.100	6	229	15			244
	3" TIE-IN BW	2	EA		PIPE PIPE	18.300	37	1,375	92			1,467
	3" CUT OFF CAP	2	EA		PIPE PIPE	4.880	10	367	24			391
	3" TIE-IN BW	1	EA		PIPE PIPE	37.500	38	1,409	94			1,503
	3" TIE-IN XRAY	1	EA		PIPE PIPE	0.000					500	500
	2" SCH 40 304L PIPE	120	LF	14.90	PIPE PIPE	0.170	20	767	52	1,788		2,606
	2" 90 DEG BW EL	5	EA	16.80	PIPE PIPE	0.200	1	38	3	84		124
	2" SHOP BW	5	EA		PIPE PIPE	0.800	4	150	10			160
	2" FIELD BW	8	EA		PIPE PIPE	1.150	9	346	23			369
	2" TIE-IN BW	3	EA		PIPE PIPE	17.250	52	1,945	129			2,074
	2" SHOP XRAY	1	EA		PIPE PIPE	0.000					30	30
	2" FIELD XRAY	1	EA		PIPE PIPE	0.000					410	410
	2" TIE-IN XRAY	5	EA		PIPE PIPE	0.000					2,500	2,500
	1 1/2" SCH 40 304L PIPE	45	LF	11.24	PIPE PIPE	0.150	7	254	17	506		777
	1 1/2" 90 DEG BW EL	2	EA	12.60	PIPE PIPE	0.200		15	1	25		41

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.15.4	REPLACE REMOVED LINES											
	1 1/2" SHOP BW	2	EA		PIPE PIPE	0.650	1	49	3			52
	1 1/2" FIELD BW	3	EA		PIPE PIPE	0.900	3	101	7			108
	1 1/2" TIE-IN BW	2	EA		PIPE PIPE	13.500	27	1,015	68			1,082
	1 1/2" CUT OFF CAP	2	EA		PIPE PIPE	1.310	3	98	7			105
	1 1/2" SHOP XRAY	1	EA		PIPE PIPE	0.000					30	30
	1 1/2" FIELD XRAY	1	EA		PIPE PIPE	0.000					410	410
	1 1/2" TIE-IN XRAY	2	EA		PIPE PIPE	0.000					1,000	1,000
	1" SCH 40 304L PIPE	45	LF	7.53	PIPE PIPE	0.130	6	220	15	339		574
	1" 90 DEG BW EL	2	EA	10.10	PIPE PIPE	0.200		15	1	20		36
	1" SHOP BW	2	EA		PIPE PIPE	0.550	1	41	3			44
	1" FIELD BW	3	EA		PIPE PIPE	0.800	2	90	6			96
	1" TIE-IN BW	2	EA		PIPE PIPE	12.000	24	902	60			962
	1" CUT OFF CAP	1	EA		PIPE PIPE	1.310	1	49	3			53
	1" SHOP XRAY	1	EA		PIPE PIPE	0.000					35	35
	1" FIELD XRAY	1	EA		PIPE PIPE	0.000					410	410
	1" TIE-IN XRAY	2	EA		PIPE PIPE	0.000					1,000	1,000
	1/2" SCH 40 304L PIPE	625	LF	4.81	PIPE PIPE	0.130	81	3,053	206	3,006		6,266
	1/2" 90 DEG BW EL	25	EA	8.90	PIPE PIPE	0.200	5	188	13	223		423
	1/2" SHOP BW	25	EA		PIPE PIPE	0.450	11	423	28			451
	1/2" FIELD BW	30	EA		PIPE PIPE	0.650	20	733	49			782
	1/2" TIE-IN BW	48	EA		PIPE PIPE	9.750	468	17,687	1,170			18,758

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.15.4	REPLACE REMOVED LINES 18" SCH 40 304L INTERNAL RISER TIE-IN BW	1	EA		PIPE *PIPE*	55.000	55	2,067	138			2,204
	REPLACE REMOVED LINES S/T						1,142	$42,930	$2,861	$14,300	$7,775	$67,866
1.3.16	ELECTRICAL											
	CONSTRUCTION POWER & LIGHTING	1	LOT	5,000.00	ELEC *ELEC*	300.000	300	10,236		5,000		15,236
	RELOCATE/REPLACE DUCTBANKS	140	LF		*ELEC*	0.000					14,000	14,000
	REPLACE DIRECT-BURIED CABLE	300	LF	2.00	ELEC *ELEC*	0.200	60	2,047		600		2,647
	REPLACE THERMOCOUPLE WIRES	2,400	LF	0.50	ELEC *ELEC*	0.080	192	6,551		1,200		7,751
	ELECTRICAL S/T						552	$18,834		$6,800	$14,000	$39,634
1.4.1	GOVERNMENT FURNISHED EQUIP.											
	DISPOSAL BOXES	30	EA	500.00		0.000				15,000		15,000
	SPECIAL DISPOSAL BOXES/WRAPPING	1	LOT			0.000						
	DISPOSE OF EXCAVATED SOIL	1,150	CY			0.000					575,000	575,000
	PROCESS WASTE BOXES	30	EA			0.000					150,000	150,000
	PPE	2,900	EA	35.00		0.000				101,500		101,500
	GOVERNMENT FURNISHED EQUIP. S/T						0			$116,500	$725,000	$841,500

PROJECT NAME: SEGREGATION AND RCRA-COMPLIANT STOR.OF INTEC NGLW - WM-190 OPT. 2
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO.: 2502-2
PREPARED BY: R. D. ADAMS

DATE 03-Nov-1999
TIME: 11:25:52
REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.5.1	G&A/PIF ADDER											
00701000	G&A - 27%	1	LOT			0.000					566,438	566,438
	PIF - 4.5%	1	LOT			0.000					358,957	358,957
	G&A/PIF ADDER S/T						0				$925,395	$925,395
	PROJECT SUBTOTAL						70,161	$6,705,943	$894,314	$1,281,437	$2,117,337	$10,999,031

Bechtel BWXT Idaho, LLC

CONTRACTOR MARKUP DISTRIBUTION REPORT

PROJECT: SEGREGATION AND RCRA-COMPLIANT STOR.OF INTEC NGLW - WM-190 OPT. 2
LOCATION: INEEL/INTEC
ESTIMATOR: R. D. ADAMS
CLIENT: R. J. WATERS

DATE: November 3, 1999
ESTTYPE: PLANNING
PROJECT NO: 2602-2

CONTRACTOR		LABOR HOURS	LABOR	MATERIAL	EQUIPMENT	OTHERS	SUBTOTAL	% MARKUP	% DIRECT COST	% TOTAL COST
PRIME CONTRACTOR			$0	$0	$0	$0	$0		0.00%	0.00%
TOTAL FOR PRIME CONTRACTOR		0	*$0*	*$0*	*$0*	*$0*	*$0*	***.**%		
CORE DRILL/SAW CUTTING CONTRACTOR - CD			$9,072	$588	$0	$1,800	$11,460		0.25%	0.18%
PROFIT	10.00%		$907	$59	$0	$180	$1,146	10.00%		
OVERHEADS	15.00%		$1,497	$97	$0	$297	$1,891	16.50%		
TOTAL FOR CORE DRILL/SAW CUTTING CONTRACTOR - CD		302	*$11,476*	*$744*	*$0*	*$2,277*	*$14,497*	26.50%		
CONCRETE CONTRACTOR - CONC			$0	$0	$0	$76,950	$76,950		1.67%	1.22%
PROFITS	10.00%		$0	$0	$0	$7,695	$7,695	10.00%		
OVERHEADS	15.00%		$0	$0	$0	$12,697	$12,697	16.50%		
TOTAL FOR CONCRETE CONTRACTOR - CONC		0	*$0*	*$0*	*$0*	*$97,342*	*$97,342*	26.50%		
EARTHWORK CONTRACTOR - DIRT			$272,294	$263	$59,833	$21,217	$353,606		7.66%	5.60%
PROFIT	10.00%		$27,229	$26	$5,983	$2,122	$35,361	10.00%		
OVERHEADS	15.00%		$44,929	$43	$9,872	$3,501	$58,345	16.50%		
TOTAL FOR EARTHWORK CONTRACTOR - DIRT		8,777	*$344,452*	*$332*	*$75,688*	*$26,840*	*$447,312*	26.50%		
ELECTRICAL CONTRACTOR - ELEC			$50,665	$7,140	$912	$59,000	$117,717		2.55%	1.86%
PROFIT	10.00%		$5,066	$714	$91	$5,900	$11,772	10.00%		
OVERHEADS	15.00%		$8,360	$1,178	$150	$9,735	$19,423	16.50%		
TOTAL FOR ELECTRICAL CONTRACTOR - ELEC		1,535	*$64,091*	*$9,032*	*$1,154*	*$74,635*	*$148,911*	26.50%		
Imitco force account - FA			$17,654	$777	$0	$0	$18,431		0.40%	0.29%
	%		$0	$0	$0	$0	$0	0.00%		
TOTAL FOR Imitco force account - FA		429	*$17,654*	*$777*	*$0*	*$0*	*$18,431*			
GENERAL CONTRACTOR - GEN			$867,558	$572,439	$792,396	$75,000	$2,307,392		49.95%	36.55%
PROFIT	10.00%		$86,756	$57,244	$79,240	$7,500	$230,739	10.00%		
OVERHEADS	5.00%		$47,716	$31,484	$43,582	$4,125	$126,907	5.50%		
TOTAL FOR GENERAL CONTRACTOR - GEN		24,456	*$1,002,029*	*$661,167*	*$915,217*	*$86,625*	*$2,665,038*	15.50%		

Bechtel BWXT Idaho, LLC

CONTRACTOR MARKUP DISTRIBUTION REPORT

PROJECT: SEGREGATION AND RCRA-COMPLIANT STOR.OF INTEC NGLW - WM-190 OPT. 2
LOCATION: INEEL/INTEC
ESTIMATOR: R. D. ADAMS
CLIENT: R. J. WATERS

DATE: November 3, 1999
ESTTYPE: PLANNING
PROJECT NO: 2602-2

CONTRACTOR		LABOR HOURS	LABOR	MATERIAL	EQUIPMENT	OTHERS	SUBTOTAL	% MARKUP	% DIRECT COST	% TOTAL COST
HVAC CONTRACTOR - HVAC			$12,773	$74,550	$150	$52,500	$139,973		3.03%	2.22%
PROFIT	10.00%		$1,277	$7,455	$15	$5,250	$13,997	10.00%		
OVERHEADS	18.00%		$2,529	$14,761	$30	$10,395	$27,715	19.80%		
TOTAL FOR HVAC CONTRACTOR - HVAC		360	*$16,579*	*$96,766*	*$195*	*$68,145*	*$181,685*	29.80%		
PAINTING CONTRACTOR - PAINT			$59,471	$26,430	$2,915	$0	$88,815		1.92%	1.41%
PROFIT	10.00%		$5,947	$2,643	$291	$0	$8,881	10.00%		
OVERHEADS	15.00%		$9,813	$4,361	$481	$0	$14,654	16.50%		
TOTAL FOR PAINTING CONTRACTOR - PAINT		1,943	*$75,230*	*$33,434*	*$3,687*	*$0*	*$112,351*	26.50%		
PIPING CONTRACTOR - PIPE			$282,563	$218,133	$20,110	$155,475	$676,282		14.64%	10.71%
PROFIT	10.00%		$28,256	$21,813	$2,011	$15,548	$67,628	10.00%		
OVERHEADS	20.00%		$62,164	$47,989	$4,424	$34,205	$148,782	22.00%		
TOTAL FOR PIPING CONTRACTOR - PIPE		7,677	*$372,984*	*$287,936*	*$26,545*	*$205,227*	*$892,692*	32.00%		
ROOFING CONTRACTOR - ROOF			$28,752	$22,680	$7,200	$0	$58,632		1.27%	0.93%
PROFIT	10.00%		$2,875	$2,268	$720	$0	$5,863	10.00%		
OVERHEAD	15.00%		$4,744	$3,742	$1,188	$0	$9,674	16.50%		
TOTAL FOR ROOFING CONTRACTOR - ROOF		960	*$36,371*	*$28,690*	*$9,108*	*$0*	*$74,169*	26.50%		
TANK CONTRACTOR - TANK			$433,728	$300,158	$10,799	$25,000	$769,686		16.66%	12.19%
PROFIT	10.00%		$43,373	$30,016	$1,080	$2,500	$76,969	10.00%		
OVERHEADS	15.00%		$71,565	$49,526	$1,782	$4,125	$126,998	16.50%		
TOTAL FOR TANK CONTRACTOR - TANK		10,226	*$548,667*	*$379,700*	*$13,661*	*$31,625*	*$973,653*	26.50%		

Bechtel BWXT Idaho, LLC

CONTRACTOR MARKUP DISTRIBUTION REPORT

PROJECT: SEGREGATION AND RCRA-COMPLIANT STOR.OF INTEC NGLW - WM-190 OPT. 2
LOCATION: INEEL/INTEC
ESTIMATOR: R. D. ADAMS
CLIENT: R. J. WATERS

DATE: November 3, 1999
ESTTYPE: PLANNING
PROJECT NO: 2502-2

CONTRACTOR		LABOR HOURS	LABOR	MATERIAL	EQUIPMENT	OTHERS	SUBTOTAL	% MARKUP	% DIRECT COST	% TOTAL COST
TOTAL DIRECT COST		66,664	$2,034,530	$1,223,168	$894,314	$466,942	$4,618,944		100.00%	
TOTAL SUBCONTRACTOR MARKUPS			$455,003	$275,420	$150,941	$125,773	$1,007,137			15.95%
TOTAL COST TO PRIME			$2,489,533	$1,498,578	$1,045,255	$592,715	$5,626,082			
PRIME CONTRACTOR MARKUP	12.20%		$303,723	$182,827	$127,521	$72,311	$686,382			10.87%
TOTAL PROJECT COST			**$2,793,256**	**$1,681,405**	**$1,172,776**	**$665,027**	**$6,312,464**			

FY-00 G&A/PIF ADDER CALCULATION SHEET

PROJECT: **SEGREGATION AND RCRA-COMPLIANT STORAGE OF INTEC NGLW - WM-190 OPT. 2**

DATE: 11/3/99

PROCUREMENT FEE:

	CONSTRUCTION =	$6,312,463		
	GFE =	$847,325		
	Subtotal	$7,159,788		
	FEE @ 3.5% =	$7,159,788	* 0.035 =	$250,593

G&A @ 27% (with a ceiling of $500,000 imposed per year)

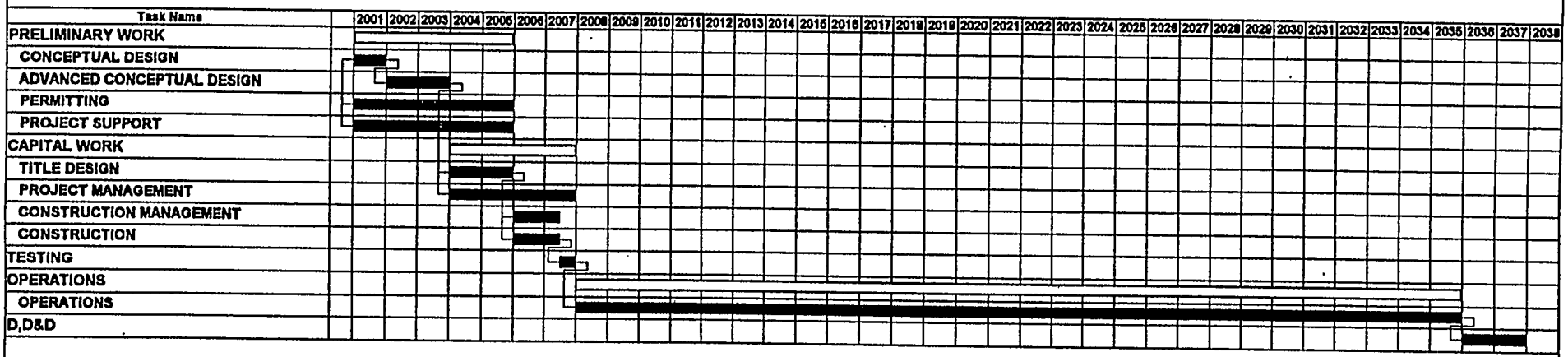
CONSTRUCTION $ OR YEARS OF CONST. =	CEILING * # OF YEARS			
	2	$1,000,000		
	GFE =	$847,325		
	PROCUREMENT FEE =	$250,593		
	Subtotal	$2,097,918		
	FEE @ 27% =	$2,097,918	* 0.27 =	$566,438

PIF @ 4.5%

	CONSTRUCTION =	$6,312,463		
	GFE =	$847,325		
	PROCUREMENT FEE =	$250,593		
	G&A =	$566,438		
	Subtotal	$7,976,818		
	FEE @ 4.5% =	$7,976,818	* 0.045 =	$358,957

TOTAL PROCUREMENT FEE:	$250,593
TOTAL G&A FEE:	$566,438
TOTAL PIF:	$358,957

NGLW TANK WM-190 OPT. 2



Default

Complete | Complete Milestone | Remaining | Remaining Milestone | Free Float | Total Float (+) | Total Float (-) | Delay | Non-Resource | Required Date | % Labor Complete

Critical

Remaining | Remaining Milestone

Parent

NGLW TANK WM-190 OPT. 2

Task Name	Duration	Schedule Start	Schedule Finish
PRELIMINARY WORK	1305d	01/02/01	01/02/06
CONCEPTUAL DESIGN	261d	01/02/01	01/01/02
ADVANCED CONCEPTUAL DESIGN	523d	01/02/02	01/02/04
PERMITTING	1305d	01/02/01	01/02/06
PROJECT SUPPORT	1304d	01/02/01	12/30/05
CAPITAL WORK	1041d	01/05/04	12/31/07
TITLE DESIGN	521d	01/05/04	01/02/06
PROJECT MANAGEMENT	1041d	01/05/04	12/31/07
CONSTRUCTION MANAGEMENT	389d	01/03/06	06/29/07
CONSTRUCTION	389d	01/03/06	06/29/07
TESTING	131d	07/02/07	12/31/07
OPERATIONS	7305d	01/01/08	12/31/35
OPERATIONS	7305d	01/01/08	12/31/35
D,D&D	523d	01/01/36	12/31/37

Bechtel BWXT Idaho, LLC
Rev. 10-99

COST ESTIMATE SUMMARY

PROJECT NAME: RCRA-COMPLIANT STOR. OF NGLW WM-190 OPT. 2 - OPC
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO: 2502-20
PREPARED BY: R. D. ADAMS
REPORT NAME: Cost Estimate Summary

DATE: 03-Nov-1999
TIME: 12:10:12
CHECKED BY: DR
APPR'D BY: RDA

WBS Element	Cost Estimate Element	Total Unescalated	Escalation		Total Incl Escalation
1.1	CONCEPTUAL DESIGN			>>	$408,633
1.1.1	CONCEPTUAL DESIGN	381,900	26,733		408,633
1.2	MANAGEMENT COSTS			>>	$1,117,160
1.2.1	PROJECT SUPPORT	1,015,600	101,560		1,117,160
1.3	PERMITTING			>>	$2,392,050
1.3.1	PERMITTING	2,155,000	237,050		2,392,050
1.4	SO TEST & STARTUP			>>	$696,960
1.4.1	SO TEST & STARTUP	576,000	120,960		696,960
1.5.2	PROCUREMENT FEES	0	0	>>	$0
	SUBTOTAL INCLUDING ESCALATION	4,128,500	486,303	>>	$4,614,803
	PROJECT CONTINGENCY				
	MANAGEMENT RESERVE			>>	$0
	CONTINGENCY			>>	$1,685,197
	TOTAL ESTIMATED COST			>>	$6,300,000

PROJECT COST PARAMETERS

EDI AS A % OF CONST. + GFE= *13.00%*

CONTINGENCY= *36.52%*

Bechtel BWXT Idaho, LLC
Rev 10-99

DETAILED COST ESTIMATE SHEET

PAGE # 1

PROJECT NAME: RCRA-COMPLIANT STOR. OF NGLW WM-190 OPT. 2 - OPC
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO.: 2502-20
PREPARED BY: R. D. ADAMS

DATE 03-Nov-1999
TIME: 12:09:21
REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.1.1	CONCEPTUAL DESIGN											
	PRE-CONCEPTUAL DESIGN @ 1.5% OF CONSTRUCTION	1	LOT			0.000		94,700				94,700
	CONCEPTUAL DESIGN @ 4% OF CONSTRUCTION	1	LOT			0.000		252,500				252,500
	CONCEPTUAL DESIGN S/T						0	$347,200				$347,200
1.1.1.2	PROJECT SUPPORT DURING CONCEPTUAL DESIGN PROJECT SUPPORT @ 10% OF CONCEPTUAL DESIGN COST	1	LOT			0.000		34,700				34,700
	PROJECT SUPPORT DURING CONCEPTUAL DESIGN S/T						0	$34,700				$34,700
1.2.1	PROJECT SUPPORT											
	ACDC/SOW,CPDS,PEP,DC/SOW & REVIEWS @ 5% OF CONSTRUCTION	1	LOT			0.000		316,800				316,800
	PHA/SAR & SAR	1	LOT			0.000		700,000				700,000
	PROJECT SUPPORT S/T						0	$1,016,800				$1,016,800
1.3.1	PERMITTING											
	Siting Agreement	1	Lot		Z-4170	0.000					25,000	25,000
	AIR PERMITS	1	LOT			0.000					200,000	200,000

DETAILED COST ESTIMATE SHEET

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.1	PERMITTING HWMA / RCRA Permit	1	Lot		Z-4170	0.000					1,750,000	1,750,000
	Permit To Construct	1	Lot		Z-4170	0.000					50,000	50,000
	CWA, Storm Water, Historical, Other Reg. Compliance	1	Lot		Z-4170	0.000					100,000	100,000
	P.E. Certification	1	Lot			0.000					30,000	30,000
	PERMITTING S/T						0				$2,155,000	$2,155,000
1.4.1	SO TEST & STARTUP											
	ORR	1	Lot			0.000		150,000				150,000
	SO Test & Training @ 1% OF TEC	1	Lot			0.000		213,000				213,000
	SO TEST & STARTUP S/T						0	$363,000				$363,000
1.4.1.1	PROJECT SUPPORT Support During Startup - 1% OF TEC	1	Lot			0.000		213,000				213,000
	PROJECT SUPPORT S/T						0	$213,000				$213,000
	PROJECT SUBTOTAL						0	$1,973,500	$0	$0	$2,155,000	$4,128,500

Bechtel BWXT Idaho, LLC

CONTINGENCY ANALYSIS

PROJECT NAME: RCRA-COMPLIANT STOR. OF NGLW WM-190 OPT. 2 - OPC
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO: 2502-2O
PREPARED BY: R. D. ADAMS

DATE: 03-Nov-1999
TIME: 12:10:15

REPORT NAME: Contingency Analysis

PROBABLE % VARIATION									PROJECT CONTINGENCY		SUMMARY
WBS Element	Cost Estimate Element	Total Cost w/o Contingency	% Total Cost	Prob. % Var. From Est. -	Prob. % Var. From Est. +	Wt. % of Prob. -	Wt. % of Prob. +	Contingency	%	Cost	Total Cost by Element
1.1.1	CONCEPTUAL DESIGN	381,900	8.28	0	50	0.00	4.14	3.724%	10.31%	173,711	555,611
1.2.1	PROJECT SUPPORT	1,015,600	22.01	10	40	2.20	8.80	7.703%	21.32%	359,299	1,374,899
1.3.1	PERMITTING	2,155,000	46.70	10	40	4.67	18.68	16.344%	45.24%	762,397	2,917,397
1.4.1	SO TEST & STARTUP	576,000	12.48	0	50	0.00	6.24	5.617%	15.55%	262,000	838,000
1.5.2	PROCUREMENT FEES	0	0.00	10	40	0.00	0.00	0.000%	0.00%	0	0
	ESCALATION	486,303	10.54	10	30	1.05	3.16	2.740%	7.58%	127,790	614,093
	SUBTOTAL	4,614,803	100.00					36.127%			
	CALCULATED CONTINGENCY	1,667,204									
	RESULTANT TEC	6,282,007									
	ROUNDED TEC	6,300,000									
	PROJECT CONTINGENCY	1,685,197						36.52%			
	MANAGEMENT RESERVE	0									
	CONTINGENCY	1,685,197									
	TOTAL ESTIMATED COST	6,300,000								1,685,197	6,300,000

CONFIDENCE LEVEL AND ASSUMED RISKS:
The Bechtel BWXT Idaho, LLC Cost Estimate Contingency Analysis Model is based on the applied contingency and the assumptions upon which the estimate was predicated. The model is applied with a suggested risk level of 18% and a level of confidence of 90% the estimate will fall within the bid range. The Contingency Analysis is based on a weighted average to provide a 90 % probability of underrun and a 10% probability of overrun.

CONTINGENCY ANALYSIS GUIDE BY TYPE OF ESTIMATE
Guidelines established by DOE/FM 50, Cost Estimating Guide, Vol. 6, Cost Guide, and as presented in the INEEL Cost Estimating Guide.

PLANNING	20% – 30%
Experimental/Special Conditions	.....Up to 50%
Conceptual	15% – 25%
Experimental/Special Conditions	.....Up to 40%
TITLE I	10% – 20%
TITLE II	5% – 15%
TITLE II/AFC	Market Conditions

Bechtel BWXT Idaho, LLC
Rev. 10-99

COST ESTIMATE SUMMARY

PROJECT NAME: SEGREGATION & RCRA-COMPLIANT STORAGE OF NGLW - NEW TANKS
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO: 2502-4
PREPARED BY: R. D. ADAMS
REPORT NAME: Cost Estimate Summary

DATE: 03-Nov-1999
TIME: 12:35:54
CHECKED BY:
APPR'D BY:

WBS Element	Cost Estimate Element	Total Unescalated	Escalation		Total Incl Escalation
1.1	ENGINEERING, DESIGN AND INSPECTION			>>	$2,584,556
1.1.1	DESIGN ENGINEERING TITLE I & II	1,491,300	283,347		1,774,647
1.1.2	QUALITY ASSURANCE	632,741	177,168		809,909
1.2	MANAGEMENT COSTS			>>	$3,330,836
1.2.1	PROJECT MANAGEMENT	1,378,540	330,850		1,709,390
1.2.2	CONSTRUCTION MANAGEMENT	1,266,755	354,691		1,621,446
1.3	CONSTRUCTION			>>	$12,726,082
1.3.1	GENERAL CONDITIONS	1,435,586	401,964		1,837,550
1.3.2	SITEWORK	193,100	54,068		247,168
1.3.3	CONCRETE	3,059,137	856,558		3,915,695
1.3.5	METALS	1,533,827	429,472		1,963,299
1.3.7	THERMAL & MOISTURE PROTECTION	27,972	7,832		35,804
1.3.8	DOORS & WINDOWS	10,319	2,889		13,208
1.3.11	EQUIPMENT	1,956,124	547,715		2,503,839
1.3.14	CONVEYING SYSTEMS	44,418	12,437		56,855
1.3.15	MECHANICAL	1,384,008	387,522		1,771,530
1.3.16	ELECTRICAL	297,761	83,373		381,134
1.5	G&A/PIF			>>	$1,260,118
1.5.1	G&A/PIF ADDER	984,467	275,651		1,260,118
1.5.2	PROCUREMENT FEES	347,979	97,434	>>	$445,413
	SUBTOTAL INCLUDING ESCALATION	16,044,034	4,302,971	>>	$20,347,005
	PROJECT CONTINGENCY				
	MANAGEMENT RESERVE			>>	$1,443,161
	CONTINGENCY			>>	$4,409,834
	TOTAL ESTIMATED COST			>>	$26,200,000

PROJECT COST PARAMETERS	
EDI AS A % OF CONST. + GFE=	*20.00%*
CONTINGENCY=	*28.77%*

Bechtel BWXT Idaho, LLC
Rev 10-99

DETAILED COST ESTIMATE SHEET

PROJECT NAME: SEGREGATION & RCRA-COMPLIANT STORAGE OF NGLW - NEW TANKS
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO.: 2502-4
PREPARED BY: R. D. ADAMS

DATE 03-Nov-1999
TIME: 12:35:10
REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.1.1	DESIGN ENGINEERING TITLE I & II											
	TITLE I & II @ 15% OF CONSTRUCTION	1	LOT			0.000		1,491,300				1,491,300
	DESIGN ENGINEERING TITLE I & II S/T						0	$1,491,300				$1,491,300
1.1.2	QUALITY ASSURANCE Quality Assurance @ 6% OF CONSTRUCTION	1	Lot			0.000		596,500				596,500
	PIPE TESTING	2,670	DI	0.15	Z-7250	0.300	801	35,821		401		36,221
	QUALITY ASSURANCE S/T						801	$632,321		$401		$632,721
1.2.1	PROJECT MANAGEMENT											
	PROJECT MANAGEMENT S/T						0					
1.2.1.1	PROJECT MANAGEMENT Project Manager @ 12% OF CONSTRUCTION	1	LOT			0.000		1,193,100				1,193,100
	PROJECT MANAGEMENT S/T						0	$1,193,100				$1,193,100
1.2.1.2	COST ESTIMATING Cost Estimate -	1	Lot		Z-6330	200.000	200	12,284				12,284

Bechtel BWXT Idaho, LLC
Rev 10-99

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1.2.1.2	COST ESTIMATING Cost Estimating Management Support - 14% Of Estimating Total	1	Lot			0.000		1,720				1,720
	COST ESTIMATING S/T						200	$14,004				$14,004
1.2.1.3	RADIOLOGICAL CONTROL TECHNICIANS Radiological Control Technicians	4	Wks		Z-7132	40.000	160	7,155				7,155
	Radiation Control - Management Support - 10% OF RCT Total	1	Lot		Z-7131	0.000						
	RADIOLOGICAL CONTROL TECHNICIANS S/T						160	$7,155				$7,155
1.2.1.4	ENVIRONMENTAL SAFETY & HEALTH Environmental Safety & Health	156	Wks		Z-7120	10.000	1,560	98,236				98,236
	ES&H Management Support - 10% Of ES&H Total	1	Lot			0.000		9,624				9,624
	ENVIRONMENTAL SAFETY & HEALTH S/T						1,560	$105,860				$105,860
1.2.1.5	PM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE Assemble Planning Team	1	Lot		Z-6310	10.000	10	740				740
	ORIGINATE WCF	1	LOT		Z-6310	4.000	4	296				296
	UPDATE WCF	156	WK		Z-6310	4.000	624	46,157				46,157
	INITIATE HAZARDS ANALYSIS PROCESS	1	LOT		Z-6310	40.000	40	2,959				2,959
	PREPARE SUPPORTING HAZARDS PROJECT DOCUMENTATION	1	LOT		Z-6310	30.000	30	2,219				2,219

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1.2.1.5	PM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE											
	POST JOB REVIEW	1	LOT		Z-6310	10.000	10	740				740
	Project Management - Management Support - 10% Of P.M. Total	1	Lot			0.000		5,310				5,310
	PM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE S/T						718	$58,420				$58,420
1.2.2	CONSTRUCTION MANAGEMENT											
00401400	CM @ 10% OF CONSTRUCTION	1	LOT			0.000		994,200				994,200
	CONSTRUCTION MANAGEMENT S/T						0	$994,200				$994,200
1.2.2.1	CM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE											
	Assemble Planning Team	1	Lot		Z-6340	60.000	60	4,438				4,438
	INITIATE HAZARDS ANALYSIS	1	LOT		Z-6340	10.000	10	740				740
	PREPARE SUPPORTING HAZARDS PROJECT DOCUMENTATION	1	LOT		Z-6340	30.000	30	2,219				2,219
	APPROVE WORK ORDER	1	LOT		Z-6340	50.000	50	3,699				3,699
	Develop Initial JSA & Input To Work Plans	1	Lot		Z-6340	60.000	60	4,438				4,438
	SCHEDULE WORK ON POD	156	WKS		Z-6340	4.000	624	46,157				46,157
	OUTAGES	20	EA		Z-6340	20.000	400	29,588				29,588
	SUBSURFACE INVESTIGATION	1	LOT		Z-6340	80.000	80	5,918				5,918

Bechtel BWXT Idaho, LLC
Rev 10-99

DETAILED COST ESTIMATE SHEET

PAGE# 4

PROJECT NAME: SEGREGATION & RCRA-COMPLIANT STORAGE OF NGLW - NEW TANKS
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TYPE OF ESTIMATE: PLANNING
PROJECT NO.: 2502-4
PREPARED BY: R. D. ADAMS

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REPORT NAME: Detail Cost Estimate Sheet

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1.2.2.1	CM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE Project Continuous Surviellance (2 Hours / Day)	156	Wks		Z-6340	8.000	1,248	92,315				92,315
	POST JOB REVIEW	1	LOT		Z-6340	10.000	10	740				740
00401400	Pool Account (CC + CE Direct Hours @ $-- Per Hour)	2,572	Hours		Z-CPP	1.000	2,572	82,304				82,304
	CM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE S/T						5,144	$272,555				$272,555
1.3.1	GENERAL CONDITIONS Supervision - General Contractor @ 10% of construction hours	8,780	hrs		SUPR GEN	1.000	8,780	351,200				351,200
	Training -@ 2% of construction hours	1,760	hrs		SKWK GEN	1.000	1,760	60,755				60,755
	SMALL TOOLS & CONSUMABLES @ 4% OF LABOR COST	1	LOT	126,600.00	GEN	0.000				126,600		126,600
	Mobilization & Demobilization -@ 1.5% of construction hours	1,320	hrs		SKWK GEN	1.000	1,320	45,566				45,566
	GENERAL CONDITIONS S/T						11,860	$457,522		$126,600		$584,122
1.3.1.5	GC - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE ***GENERAL CONTRACTOR***											
	WORKABILITY WALKDOWN - 1 HR/DAY X 16 MEN X 4 DAY/WK	156	Wks		SKWK GEN	64.000	9,984	344,648				344,648

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.1.5	GC - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE											
	CHANGED CONDITIONS - .5 HR/DAY X 16 MEN X 4 DAY/WEEK	156	WKS		SKWK GEN	32.000	4,992	172,324				172,324
	POST JOB REVIEW	1	LOT		CARF GEN	10.000	10	359				359
	GC - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE S/T						14,986	$517,331				$517,331
1.3.2	SITEWORK											
	EXCAVATION	17,736	CY		ENGR DIRT	0.022	390	12,705	12,415			25,120
	BACKFILL	14,771	CY		ENGR DIRT	0.100	1,477	48,094	38,405			86,499
	UTILITY TRENCHING	1,150	CY		ENGR DIRT	0.350	403	13,105	9,200			22,305
	REMOVE & REPLACE PAVING	1,000	SF		ENGR DIRT	0.000					6,000	6,000
	ALLOWANCE FOR CONTAMINATED SOIL NEAR VB TIE-IN	1	LOT		ENGR DIRT	80.000	80	2,605				2,605
	SITEWORK S/T						2,350	$76,509	$60,020		$6,000	$142,529
1.3.3	CONCRETE											
	SLAB-ON-GRADE	697	CY	120.00	SKWK GEN	7.000	4,879	168,423	4,182	83,640		256,245
	WALLS	1,780	CY	200.00	SKWK GEN	12.000	21,360	737,347	17,800	356,000		1,111,147
	ELEVATED SLABS	791	CY	300.00	SKWK GEN	18.000	14,238	491,496	7,910	237,300		736,706
	RISER HATCHES - 1'DIA X 3'	30	EA	1,325.00	SKWK GEN	2.000	60	2,071	1,800	39,750		43,621

DETAILED COST ESTIMATE SHEET

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LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
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PREPARED BY: R. D. ADAMS

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1.3.3	CONCRETE											
	RISER HATCHES - 2'X2'X'2	27	EA	1,325.00	SKWK GEN	2.000	54	1,864	1,620	35,775		39,259
	RISER HATCHES - 2'X2'X1'	25	EA	1,325.00	SKWK GEN	2.000	50	1,726	1,500	33,125		36,351
	MANWAY HATCHES - 2'-6X2'-6X3'	9	EA	2,500.00	SKWK GEN	3.000	27	932	810	22,500		24,242
	MANWAY HATCHES - 2'-6X2'-6X2'	9	EA	2,500.00	SKWK GEN	3.000	27	932	810	22,500		24,242
	MANWAY HATCHES - 2'-6X2'-6X1'	9	EA	2,500.00	SKWK GEN	3.000	27	932	810	22,500		24,242
	SETTLING TANK HATCH	2	EA	4,100.00	SKWK GEN	4.000	8	276	240	8,200		8,716
	SUMP BLOCK-OUTS	1,550	SF	1.25	CARP GEN	0.200	310	10,738		1,938		12,676
	CONCRETE S/T						41,040	$1,416,738	$37,482	$863,228		$2,317,448
1.3.6	METALS											
	STAINLESS STEEL LINER	9,728	SF	20.00	IRON STEEL	2.000	19,456	781,353	48,640	194,560		1,024,553
	MAJOR PIPE SUPPORTS	8	TON	1,200.00	IRON STEEL	20.000	160	6,426	800	9,600		16,826
	STAIRWAY	63	VLF	50.00	IRON STEEL	1.000	63	2,530		3,150		5,680
	UNDER-TANK SUPPORTS	8,160	LBS	2.25	IRON STEEL	0.020	163	6,554	408	18,360		25,322
	UNDER-TANK SUPPORTS - WELDING	2,292	LF		IRON STEEL	0.300	688	27,614	1,719			29,333
	MONORAIL - RAIL & SUPPORTS	6,000	LBS	1.50	IRON STEEL	0.020	120	4,819	300	9,000		14,119
	RAILINGS	228	LF	15.00	IRON STEEL	0.100	23	916	57	3,420		4,393
	METALS S/T						20,673	$830,212	$51,924	$238,090		$1,120,226
1.3.7	THERMAL & MOISTURE PROTECTION											

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.7	THERMAL & MOISTURE PROTECTION											
	MEMBRANE ROOF	4,374	SF	1.20	ROFC ROOF	0.020	87	2,620	437	5,249		8,306
	WATERPROOF VAULT	5,828	SF		ROFC ROOF	0.000					10,199	10,199
	UNDERSLAB MEMBRANE	4,700	SF	0.14	LABR GEN	0.009	42	1,273		658		1,931
	THERMAL & MOISTURE PROTECTION S/T						130	$3,893	$437	$5,907	$10,199	$20,436
1.3.8	DOORS & WINDOWS											
	PERSONNEL DOORS	6	EA	1,000.00	CARP GEN	8.000	48	1,663		6,000		7,663
	DOORS & WINDOWS S/T						48	$1,663		$6,000		$7,663
1.3.11	EQUIPMENT											
	100,000 GALLON SST STORAGE TANKS	3	EA		TANK	0.000					1,350,000	1,350,000
	SOLIDS COLLECTION TANKS	1	EA		TANK	0.000					58,000	58,000
	SAMPLE GLOVE BOX	1	EA	35,000.00	SHEE GEN	20.000	20	710		35,000		35,710
	EQUIPMENT S/T						20	$710		$35,000	$1,408,000	$1,443,710
1.3.14	CONVEYING SYSTEMS											
	MONORAIL HOIST - 5 TON	1	EA	12,000.00	MILL GEN	60.000	60	1,975		12,000		13,975

Bechtel BWXT Idaho, LLC
Rev 10-99
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DETAILED COST ESTIMATE SHEET

TYPE OF ESTIMATE: PLANNING
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PREPARED BY: R. D. ADAMS

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1.3.14	CONVEYING SYSTEMS JIB CRANE - 5 TON	1	EA	15,000.00	MILL GEN	120.000	120	3,950		15,000		18,950
	CONVEYING SYSTEMS S/T						180	$5,926		$27,000		$32,926
1.3.15	MECHANICAL											
	MECHANICAL S/T						0					
1.3.15.1	RISERS 12" SCH 40 304L PIPE	270	LF	225.00	PIPE PIPE	0.350	95	3,551	238	60,750		64,539
	12" WELD NECK FLANGE	27	EA	600.00	PIPE PIPE	0.250	7	254	17	16,200		16,471
	12" BLIND FLANGE	27	EA	500.00	PIPE PIPE	0.250	7	254	17	13,500		13,771
	12" BOLT & GASKET SETS	27	EA	95.00	PIPE PIPE	6.000	162	6,088	405	2,565		9,058
	12" SHOP BW	27	EA		PIPE PIPE	6.400	173	6,494	432			6,926
	12" FIELD BUTTWELDS	27	EA		PIPE PIPE	27.000	729	27,396	1,823			29,218
	SHOP XRAY	3	EA		PIPE	0.000					150	150
	FIELD XRAY	27	EA		PIPE	0.000					8,100	8,100
	RISERS S/T						1,172	$44,036	$2,931	$93,015	$8,250	$148,232
1.3.15.2	SUPPLY/RETURN 3" SCH 40 304L PIPE	640	LF	26.00	PIPE PIPE	0.100	64	2,405	19	16,640		19,064
	3" BW EL	35	EA	32.00	PIPE PIPE	0.220	8	289	19	1,120		1,429
	3" BW TEE	16	EA	45.00	PIPE PIPE	0.330	5	198	13	720		932

DETAILED COST ESTIMATE SHEET

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1.3.15.2	SUPPLY/RETURN 3" TOP-ENTRY BALL VALVE	15	EA	10,000.00	PIPE PIPE	20.000	300	11,274	375	150,000		161,649
	3" BW JETS INSIDE TANK	8	EA	2,000.00	PIPE PIPE	4.000	32	1,203	80	16,000		17,283
	3" SHOP BW	51	EA		PIPE PIPE	1.750	89	3,354	223			3,577
	3" FIELD BW	129	EA		PIPE PIPE	3.000	387	14,543	968			15,511
	3" TIE-IN BW	28	EA		PIPE PIPE	10.000	280	10,522				10,522
	1" SCH 40 304L PIPE	1,260	LF	5.00	PIPE PIPE	0.070	88	3,315	227	6,300		9,841
	1" BW EL	94	EA	7.00	PIPE PIPE	0.200	19	707	47	658		1,412
	1" BW TEE	4	EA	21.00	PIPE PIPE	0.300	1	45	3	84		132
	1" TOP-ENTRY BALL VALVE	8	EA	8,000.00	PIPE PIPE	12.000	96	3,608	120	64,000		67,728
	1" JET	8	EA	1,000.00	PIPE PIPE	2.000	16	601	40	8,000		8,641
	3"X1" REDUCER	4	EA	22.00	PIPE PIPE	0.220	1	33	2	88		123
	1" SHOP BW	98	EA		PIPE PIPE	0.550	54	2,026	135			2,161
	1" FIELD BW	205	EA		PIPE PIPE	0.850	174	6,548	437			6,985
	1" TIE-IN BW	16	EA		PIPE PIPE	3.200	51	1,924	128			2,052
	SHOP XRAY	15	EA		PIPE PIPE	0.000					750	750
	FIELD XRAY	38	EA		PIPE PIPE	0.000					11,400	11,400
	SUPPLY/RETURN S/T						1,666	$62,596	$2,837	$263,610	$12,150	$341,192
1.3.15.2.1	UNDERGROUND SUPPLY/RETURN 3" X 6" DBL ENCASED PIPE SST	380	LF	65.00	PIPE PIPE	0.500	190	7,140	475	24,700		32,315
	ELBOWS	4	EA	130.00	PIPE PIPE	15.000	60	2,255	150	520		2,925

DETAILED COST ESTIMATE SHEET

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1.3.15.2.1	UNDERGROUND SUPPLY/RETURN											
	TIE-INS	2	EA		PIPE PIPE	6.000	12	451	30			481
	HOT CORE DRILL AT VALVE BOX	2	EA		PIPE PIPE	0.000					6,000	6,000
	HOT PIPE SLEEVE @ VALVE BOX	2	EA		PIPE PIPE	40.000	80	3,006				3,006
	UNDERGROUND SUPPLY/RETURN S/T						342	$12,852	$655	$25,220	$6,000	$44,727
1.3.15.3	STEAM											
	3" SCH 40 A53 PIPE	210	LF	5.00	PIPE PIPE	0.100	21	789	53	1,050		1,892
	3" BW EL	10	EA	15.00	PIPE PIPE	0.220	2	83	6	150		238
	3" BW TEE	17	EA	25.00	PIPE PIPE	0.330	6	211	14	425		650
	3" SHOP BW	27	EA		PIPE PIPE	1.750	47	1,776	118			1,894
	3" FIELD BW	71	EA		PIPE PIPE	3.000	213	8,005	533			8,537
	INSULATION ON 3" PIPE	339	ELF	4.00	ASBE INSUL	0.260	85	3,129	214	1,356		4,699
	1" SCH 40 A106 PIPE	80	LF	1.50	PIPE PIPE	0.070	6	210	14	120		345
	1" BW EL	16	EA	15.00	PIPE PIPE	0.650	10	391	26	240		657
	1" BW TEE	48	EA	21.00	PIPE PIPE	0.970	47	1,750	117	1,008		2,874
	1" BALL VALVE	32	EA	130.00	PIPE PIPE	1.200	38	1,443	96	4,160		5,699
	3"X1" REDUCER	16	EA	20.00	PIPE PIPE	1.200	19	722	48	320		1,090
	PRESSURE RELIEF VALVE	8	EA	400.00	PIPE PIPE	2.000	16	601	40	3,200		3,841
	Y-STRAINER	16	EA	40.00	PIPE PIPE	0.970	16	583	39	640		1,262
	RCV	16	EA	2,300.00	PIPE PIPE	6.000	96	3,608	240	36,800		40,648
	INSULATION ON 1" PIPE	512	ELF	3.00	ASBE INSUL	0.210	108	3,970	271	1,536		5,777

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1.3.15.3	STEAM UNIT HEATERS	1	LOT	6,000.00	SHEE HVAC	24.000	24	852		6,000		6,852
	STEAM S/T						753	$28,121	$1,828	$57,005		$86,954
1.3.15.3.1	UNDERGROUND STEAM SUPPLY 3" C. S. PIPE	150	LF	5.00	PIPE PIPE	0.150	23	846	57	750		1,653
	BW TEE	1	EA	25.00	PIPE PIPE	9.000	9	338	23	25		386
	GILSOLATE PIPE INSULATION	150	CF		PIPE PIPE	0.000					3,000	3,000
	UNDERGROUND STEAM SUPPLY S/T						32	$1,184	$80	$775	$3,000	$5,038
1.3.15.4	AIR 3" SCH 40 A53 PIPE	210	LF	5.00	PIPE PIPE	0.100	21	789	53	1,050		1,892
	3" BW EL	16	EA	15.00	PIPE PIPE	0.220	4	132	9	240		381
	3" BW TEE	48	EA	25.00	PIPE PIPE	0.330	16	595	40	1,200		1,835
	3" SHOP BW	33	EA		PIPE PIPE	1.750	58	2,170	145			2,315
	3" FIELD BW	91	EA		PIPE PIPE	3.000	273	10,259	683			10,942
	1" SCH 40 A106 PIPE	80	LF	1.50	PIPE PIPE	0.070	6	210	14	120		345
	1" BW EL	32	EA	15.00	PIPE PIPE	0.200	6	241	16	480		737
	1" STD. BALL VALVE	48	EA	130.00	PIPE PIPE	1.300	62	2,345	156	6,240		8,741
	3"X1" REDUCER	24	EA	20.00	PIPE PIPE	0.220	5	198	13	480		692
	RCV	16	EA	2,300.00	PIPE PIPE	6.000	96	3,608	240	36,800		40,648
	CHECK VALVE	16	EA	100.00	PIPE PIPE	1.300	21	782	52	1,600		2,434

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.15.4	AIR											
	PRESSURE CONTROL VALVE	8	EA	170.00	PIPE PIPE	3.000	24	902	60	1,360		2,322
	AIR S/T						592	$22,232	$1,480	$49,570		$73,282
1.3.15.4.1	UNDERGROUND AIR SUPPLY											
	3" C. S. PIPE	150	LF	5.00	PIPE PIPE	0.150	23	846	57	750		1,653
	BW TEE	1	EA	25.00	PIPE PIPE	9.000	9	338	56	25		419
	UNDERGROUND AIR SUPPLY S/T						32	$1,184	$113	$775		$2,071
1.3.15.5	SAMPLE LINES											
	1/2" SCH 40 304L PIPE	800	LF	3.75	PIPE PIPE	0.060	48	1,804	120	3,000		4,924
	1/2" BW EL	60	EA	7.00	PIPE PIPE	0.200	12	451	30	420		901
	1/2" BLOCK VALVES	24	EA	270.00	PIPE PIPE	1.300	31	1,172	78	6,480		7,730
	1/2" SHOP BW	60	EA		PIPE PIPE	0.450	27	1,015	68			1,082
	1/2" FIELD BW	148	EA		PIPE PIPE	0.700	104	3,893	259			4,152
	1/2" TIE-IN BW	36	EA		PIPE PIPE	2.600	94	3,517	234			3,751
	SHOP XRAY	6	EA		PIPE PIPE	0.000					300	300
	FIELD XRAY	51	EA		PIPE PIPE	0.000					15,300	15,300
	SAMPLE LINES S/T						315	$11,853	$789	$9,800	$15,600	$38,142
1.3.15.6 ****	INSTRUMENT PIPE & TUBING											
	PRESSURE INDICATORS********** **********											

PROJECT NAME: SEGREGATION & RCRA-COMPLIANT STORAGE OF NGLW - NEW TANKS
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO.: 2502-4
PREPARED BY: R. D. ADAMS

DATE 03-Nov-1999
TIME: 12:35:10
REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.15.6	INSTRUMENT PIPE & TUBING											
	1/4" SST TUBING	480	LF	3.00	PIPE PIPE	0.125	60	2,255	149	1,440		3,844
	1/4" MALE CONNECTORS	80	EA	6.00	PIPE PIPE	0.150	12	451	30	480		961
	1/4" SOLENOID OPERATED VALVE	32	EA	185.00	PIPE PIPE	1.500	48	1,804	120	5,920		7,844
	1/4" BLOCK VALVE	32	EA	100.00	PIPE PIPE	0.600	19	722	48	3,200		3,970
	PRESSURE INDICATOR	16	EA	50.00	PIPE PIPE	1.000	16	601	40	800		1,441
****	DP PIPE & TUBING ********** *********											
	1/4" SCH 80 304L PIPE	750	LF	3.50	PIPE PIPE	0.060	45	1,691	113	2,625		4,429
	TIE-IN BW	84	EA		PIPE PIPE	2.200	185	6,945	462			7,407
	1/4" SST TUBING	840	LF	3.00	PIPE PIPE	0.125	105	3,946	260	2,520		6,726
	1/4" MALE CONN.	42	EA	6.00	PIPE PIPE	0.150	6	237	16	252		505
	1/4" FEMALE CONN.	126	EA	9.00	PIPE PIPE	0.150	19	710	48	1,134		1,892
****	TC PIPE ********** **********											
	1/2" SCH 80 304L	525	LF	4.00	PIPE PIPE	0.080	42	1,578	105	2,100		3,783
	INSTRUMENT PIPE & TUBING S/T						557	$20,940	$1,391	$20,471		$42,802
1.3.15.7	VOG											
	EXHAUST STACK	1	EA	1,000.00	SHEE HVAC	24.000	24	852	150	1,000		2,002
Memo:	EXHAUST VOG BLOWER ALLOW 1000CFM CARBON STEEL BLOWER	1	EA	1,000.00	SHEE HVAC	10.000	10	355	25	1,000		1,380
	VOG HEPA FILTER	1	EA	10,000.00	SHEE HVAC	12.000	12	426	30	10,000		10,456

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.15.7	VOG											
	8" SCH 10 304L PIPE	200	LF	52.00	PIPE PIPE	0.200	40	1,503	100	10,400		12,003
	8" BW EL	6	EA	170.00	PIPE PIPE	0.300	2	68	5	1,020		1,092
	8" BW TEE	2	EA	350.00	PIPE PIPE	0.400	1	30	2	700		732
	8" WN FLANGE	4	EA	275.00	PIPE PIPE	0.200	1	30	2	1,100		1,132
	8" BOLT & GASKET SET	4	EA	65.00	PIPE PIPE	4.000	16	601	40	260		901
	8" SHOP BW	12	EA		PIPE PIPE	4.000	48	1,804	120			1,924
	8" FIELD BW	20	EA		PIPE PIPE	13.000	260	9,771	650			10,421
	8" TIE-IN BW	4	EA		PIPE PIPE	19.500	78	2,931	195			3,126
	SHOP XRAY	2	EA		PIPE PIPE	0.000					100	100
	FIELD XRAY	3	EA		PIPE PIPE	0.000					900	900
	VOG S/T						491	$18,370	$1,319	$25,480	$1,000	$46,169
1.3.15.8	PIPE SUPPORTS/HANGERS											
	ALLOWANCE FOR PIPE SUPPORTS	1	LOT	16,600.00	PIPE PIPE	650.000	650	24,427	1,625	16,600		42,652
	PIPING EMBEDS	65	EA	200.00	PIPE PIPE	10.000	650	24,427	1,625	13,000		39,052
	PIPE SUPPORTS/HANGERS S/T						1,300	$48,854	$3,250	$29,600		$81,704
1.3.15.9	POTABLE WATER UNDERGROUND SUPPLY											
	2" C. S. PIPE	200	LF	2.75	PIPE PIPE	0.170	34	1,278	86	550		1,914
	ELBOWS	4	EA	30.00	PIPE PIPE	1.000	4	150	10	120		280
	POTABLE WATER UNDERGROUND SUPPLY S/T						38	$1,428	$96	$670		$2,194

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.16.10	FIREWATER											
	PIPE	15	LF	9.00	SPRI FIRE	0.100	2	55	4	135		194
	HYDRANT	1	EA	1,200.00	SPRI FIRE	12.000	12	443	30	1,200		1,673
	RED. TEE	1	EA	300.00	SPRI FIRE	8.000	8	295	20	300		615
	RETAINER GLANDS	2	EA	100.00	SPRI FIRE	2.000	4	148	10	200		358
	THRUST BLOCK	1	EA		LABR DIRT	0.000					200	200
	FIREWATER S/T						26	$941	$64	$1,835	$200	$3,040
1.3.16.11	PIPE & VALVE CORR. VENTILATION											
	HEPA	2,000	CFM		SHEE HVAC	0.000					14,000	14,000
	BLOWER	2,000	CFM		HVAC	0.000					2,000	2,000
	SST DUCT	2,000	LBS		HVAC	0.000					20,000	20,000
	PIPE & VALVE CORR. VENTILATION S/T						0				$36,000	$36,000
1.3.16	ELECTRICAL											
	LIGHTING, RECEPT., HEAT AS REQ'D	5,242	SF	6.60	ELEC ELEC	0.100	524	17,886		34,597		52,483
	1" RGS CONDUIT	60	LF	1.20	ELEC ELEC	0.100	6	205		72		277
	1" LB	3	EA	10.00	ELEC ELEC	1.000	3	102		30		132
	1" LT	36	EA	12.00	ELEC ELEC	1.000	36	1,228		432		1,660
	LIGHTNING PROTECTION	1	LOT		ELEC ELEC	0.000					20,000	20,000
	VP/EVAC	1	LOT		ELEC ELEC	0.000					3,000	3,000
	UPS	1	EA		ELEC ELEC	0.000					15,000	15,000

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.16	ELECTRICAL											
	PVC CONDUIT INCL. ELS	400	LF		ELEC ELEC	0.056	22	764	740			1,504
	RED CONCRETE	9	CY		ELEC ELEC	0.000					900	900
	POWER CABLE	400	LF		ELEC ELEC	0.000					6,000	6,000
	ELECTRICAL S/T						592	$20,185	$740	$35,131	$44,900	$100,957
1.3.16.1	INSTRUMENTATION											
	COMPUTER	1	EA	10,000.00	ELEC INSTR	6.000	6	205		10,000		10,205
	DP SYSTEM	3	EA	15,000.00	ELEC INSTR	100.000	300	10,236		45,000		55,236
	CONVERTER	3	EA	2,000.00	ELEC INSTR	11.000	33	1,126		6,000		7,126
	RF UNITS	3	EA	5,000.00	ELEC INSTR	12.000	36	1,228		15,000		16,228
	RAM	2	EA	2,800.00	ELEC INSTR	10.000	20	682		5,600		6,282
	CAM	2	EA	3,200.00	ELEC INSTR	8.000	16	546		6,400		6,946
	SEDIMENT TANK HA & HHA	2	EA	350.00	ELEC INSTR	3.000	6	205		700		905
	TC	39	EA	100.00	ELEC INSTR	1.000	39	1,331		3,900		5,231
	TC WIRE	1,710	LF	0.40	ELEC INSTR	0.010	17	583		684		1,267
	INSTRUMENTATION S/T						473	$16,142		$93,284		$109,426
1.5.1	G&A/PIF ADDER											
	Construction G&A For Year One - 27%	1	Lot			0.000					498,954	498,954
	Performance Incentive Factor (PIF) - 4.5%	1	Lot			0.000					485,513	485,513

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.6.1	G&A/PIF ADDER											
	G&A/PIF ADDER S/T						0				$984,467	$984,467
	PROJECT SUBTOTAL						108,248	$8,390,336	$167,433	$2,008,566	$2,536,766	$13,102,101

Bechtel BWXT Idaho, LLC

CONTINGENCY ANALYSIS

PROJECT NAME: SEGREGATION & RCRA-COMPLIANT STORAGE OF NGLW - NEW TANKS
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO: 2502-4
PREPARED BY: R. D. ADAMS

DATE: 03-Nov-1999
TIME: 12:35:56

REPORT NAME: Contingency Analysis

PROBABLE % VARIATION									PROJECT CONTINGENCY		SUMMARY
WBS Element	Cost Estimate Element	Total Cost w/o Contingency	% Total Cost	Prob. % Var. From Est. -	Prob. % Var. From Est. +	Wt. % of Prob. -	Wt. % of Prob. +	Contingency	%	Cost	Total Cost by Element
1.1.1	DESIGN ENGINEERING TITLE I & II	1,491,300	7.33	5	30	0.37	2.20	1.942%	6.72%	393,102	1,884,402
1.1.2	QUALITY ASSURANCE	632,741	3.11	10	25	0.31	0.78	0.669%	2.31%	135,319	768,060
1.2.1	PROJECT MANAGEMENT	1,378,540	6.78	10	35	0.68	2.37	2.066%	7.15%	418,228	1,796,768
1.2.2	CONSTRUCTION MANAGEMENT	1,266,755	6.23	5	40	0.31	2.49	2.210%	7.64%	447,317	1,714,072
1.3.1	GENERAL CONDITIONS	1,435,586	7.06	10	35	0.71	2.47	2.152%	7.44%	435,535	1,871,121
1.3.2	SITEWORK	193,100	0.95	15	35	0.14	0.33	0.285%	0.98%	57,623	250,723
1.3.3	CONCRETE	3,059,137	15.03	10	30	1.50	4.51	3.909%	13.52%	791,164	3,850,301
1.3.5	METALS	1,533,827	7.54	10	35	0.75	2.64	2.299%	7.95%	465,340	1,999,167
1.3.7	THERMAL & MOISTURE PROTECTION	27,972	0.14	10	35	0.01	0.05	0.042%	0.14%	8,486	36,458
1.3.8	DOORS & WINDOWS	10,319	0.05	10	35	0.01	0.02	0.015%	0.05%	3,131	13,450
1.3.11	EQUIPMENT	1,956,124	9.61	20	40	1.92	3.85	3.269%	11.30%	661,561	2,617,685
1.3.14	CONVEYING SYSTEMS	44,418	0.22	10	35	0.02	0.08	0.067%	0.23%	13,476	57,894
1.3.15	MECHANICAL	1,384,008	6.80	15	40	1.02	2.72	2.347%	8.11%	474,955	1,858,963
1.3.16	ELECTRICAL	297,761	1.46	10	35	0.15	0.51	0.446%	1.54%	90,338	388,097
1.5.1	G&A/PIF ADDER	984,467	4.84	10	30	0.48	1.45	1.258%	4.35%	254,606	1,239,073
1.5.2	PROCUREMENT FEES	347,979	1.71	10	30	0.17	0.51	0.445%	1.54%	89,995	437,974
	ESCALATION	4,302,971	21.15	10	30	2.11	6.34	5.498%	19.01%	1,112,821	5,415,792
	SUBTOTAL	20,347,005	100.00					28.919%			
	CALCULATED CONTINGENCY	5,884,180									
	RESULTANT TEC	26,231,185									
	ROUNDED TEC	26,200,000									
	PROJECT CONTINGENCY	5,852,995						28.77%			
	MANAGEMENT RESERVE	1,443,161									
	CONTINGENCY	4,409,834									
	TOTAL ESTIMATED COST	26,200,000								5,852,995	26,200,000

CONFIDENCE LEVEL AND ASSUMED RISKS:
The Bechtel BWXT Idaho, LLC Cost Estimate Contingency Analysis Model is based on the applied contingency and the assumptions upon which the estimate was predicated. The model is applied with a suggested risk level of 18% and a level of confidence of 90% the estimate will fall within the bid range. The Contingency Analysis is based on a weighted average to provide a 90 % probability of underrun and a 10% probability of overrun.

CONTINGENCY ANALYSIS GUIDE BY TYPE OF ESTIMATE
Guidelines established by DOE/FM 50, Cost Estimating Guide, Vol. 6, Cost Guide, and as presented in the INEEL Cost Estimating Guide.

PLANNING	20% – 30%
Experimental/Special Conditions	Up to 50%
Conceptual	15% – 25%
Experimental/Special Conditions	Up to 40%
TITLE I	10% – 20%
TITLE II	5% – 15%
TITLE II/AFC	Market Conditions

Bechtel BWXT Idaho, LLC

CONTRACTOR MARKUP DISTRIBUTION REPORT

PROJECT: SEGREGATION & RCRA-COMPLIANT STORAGE OF NGLW - NEW TANKS
LOCATION: INEEL/INTEC
ESTIMATOR: R. D. ADAMS
CLIENT: R. J. WATERS

DATE: November 3, 1999
ESTTYPE: PLANNING
PROJECT NO: 2502-4

CONTRACTOR		LABOR HOURS	LABOR	MATERIAL	EQUIPMENT	OTHERS	SUBTOTAL	% MARKUP	% DIRECT COST	% TOTAL COST
PRIME CONTRACTOR			$0	$0	$0	$0	$0		0.00%	0.00%
TOTAL FOR PRIME CONTRACTOR		0	*$0*	*$0*	*$0*	*$0*	*$0*	***.**%		
EARTHWORK CONTRACTOR - DIRT			$76,509	$0	$60,020	$6,200	$142,729		1.92%	1.44%
PROFIT	10.00%		$7,651	$0	$6,002	$620	$14,273	10.00%		
OVERHEADS	15.00%		$12,624	$0	$9,903	$1,023	$23,550	16.50%		
TOTAL FOR EARTHWORK CONTRACTOR - DIRT		2,350	*$96,784*	*$0*	*$75,925*	*$7,843*	*$180,552*	26.50%		
ELECTRICAL CONTRACTOR - ELEC			$20,185	$36,888	$740	$44,900	$102,713		1.38%	1.03%
PROFIT	10.00%		$2,019	$3,689	$74	$4,490	$10,271	10.00%		
OVERHEADS	15.00%		$3,331	$6,086	$122	$7,408	$16,948	16.50%		
TOTAL FOR ELECTRICAL CONTRACTOR - ELEC		592	*$25,535*	*$46,663*	*$936*	*$56,799*	*$129,932*	26.50%		
FIRE PROTECTION CONTRACTOR - FIRE			$941	$1,927	$64	$0	$2,932		0.04%	0.03%
PROFIT	10.00%		$94	$193	$6	$0	$293	10.00%		
OVERHEADS	18.00%		$186	$381	$13	$0	$581	19.80%		
TOTAL FOR FIRE PROTECTION CONTRACTOR - FIRE		26	*$1,222*	*$2,501*	*$83*	*$0*	*$3,806*	29.80%		
GENERAL CONTRACTOR - GEN			$2,401,161	$1,111,410	$37,482	$0	$3,550,053		47.66%	35.71%
PROFIT	10.00%		$240,116	$111,141	$3,748	$0	$355,005	10.00%		
OVERHEADS	10.00%		$264,128	$122,255	$4,123	$0	$390,506	11.00%		
TOTAL FOR GENERAL CONTRACTOR - GEN		68,176	*$2,905,405*	*$1,344,806*	*$45,353*	*$0*	*$4,295,564*	21.00%		
HVAC CONTRACTOR - HVAC			$2,484	$18,900	$205	$36,000	$57,589		0.77%	0.58%
PROFIT	10.00%		$248	$1,890	$21	$3,600	$5,759	10.00%		
OVERHEADS	18.00%		$492	$3,742	$41	$7,128	$11,403	19.80%		
TOTAL FOR HVAC CONTRACTOR - HVAC		70	*$3,224*	*$24,532*	*$266*	*$46,728*	*$74,750*	29.80%		
INSTRUMENTATION CONTRACTOR - INSTR			$16,142	$97,948	$0	$0	$114,090		1.53%	1.15%
PROFIT	10.00%		$1,614	$9,795	$0	$0	$11,409	10.00%		
OVERHEADS	18.00%		$3,196	$19,394	$0	$0	$22,590	19.80%		
TOTAL FOR INSTRUMENTATION CONTRACTOR - INSTR		473	*$20,953*	*$127,137*	*$0*	*$0*	*$148,089*	29.80%		

Bechtel BWXT Idaho, LLC

CONTRACTOR MARKUP DISTRIBUTION REPORT

PROJECT: SEGREGATION & RCRA-COMPLIANT STORAGE OF NGLW - NEW TANKS
LOCATION: INEEL/INTEC
ESTIMATOR: R. D. ADAMS
CLIENT: R. J. WATERS

DATE: November 3, 1999
ESTTYPE: PLANNING
PROJECT NO: 2502-4

CONTRACTOR		LABOR HOURS	LABOR	MATERIAL	EQUIPMENT	OTHERS	SUBTOTAL	% MARKUP	% DIRECT COST	% TOTAL COST
INSULATION CONTRACTOR - INSUL			$7,099	$3,037	$485	$0	$10,620		0.14%	0.11%
PROFIT	10.00%		$710	$304	$48	$0	$1,062	10.00%		
OVERHEADS	15.00%		$1,171	$501	$80	$0	$1,752	16.50%		
TOTAL FOR INSULATION CONTRACTOR - INSUL		192	*$8,980*	*$3,841*	*$613*	*$0*	*$13,434*	26.50%		
PIPING CONTRACTOR - PIPE			$264,067	$582,959	$16,077	$46,000	$909,102		12.20%	9.14%
PROFIT	10.00%		$26,407	$58,296	$1,608	$4,600	$90,910	10.00%		
OVERHEADS	20.00%		$58,095	$128,251	$3,537	$10,120	$200,002	22.00%		
TOTAL FOR PIPING CONTRACTOR - PIPE		7,027	*$348,568*	*$769,506*	*$21,221*	*$60,720*	*$1,200,015*	32.00%		
ROOFING - ROOF			$2,620	$5,511	$437	$10,199	$18,768		0.25%	0.19%
PROFIT	10.00%		$262	$551	$44	$1,020	$1,877	10.00%		
OVERHEAD	15.00%		$432	$909	$72	$1,683	$3,097	16.50%		
TOTAL FOR ROOFING - ROOF		87	*$3,314*	*$6,972*	*$553*	*$12,902*	*$23,741*	26.50%		
STRUCTURAL STEEL CONTRACTOR - STEEL			$830,212	$249,995	$51,924	$0	$1,132,130		15.20%	11.39%
PROFIT	10.00%		$83,021	$24,999	$5,192	$0	$113,213	10.00%		
OVERHEADS	15.00%		$136,985	$41,249	$8,567	$0	$186,801	16.50%		
TOTAL FOR STRUCTURAL STEEL CONTRACTOR - STEEL		20,673	*$1,050,218*	*$316,243*	*$65,684*	*$0*	*$1,432,145*	26.50%		
TANK MANUFACTURER - TANK			$0	$0	$0	$1,408,000	$1,408,000		18.90%	14.16%
PROFIT	10.00%		$0	$0	$0	$140,800	$140,800	10.00%		
OVERHEAD	15.00%		$0	$0	$0	$232,320	$232,320	16.50%		
TOTAL FOR TANK MANUFACTURER - TANK		0	*$0*	*$0*	*$0*	*$1,781,120*	*$1,781,120*	26.50%		

Bechtel BWXT Idaho, LLC

CONTRACTOR MARKUP DISTRIBUTION REPORT

PROJECT: SEGREGATION & RCRA-COMPLIANT STORAGE OF NGLW - NEW TANKS
LOCATION: INEEL/INTEC
ESTIMATOR: R. D. ADAMS
CLIENT: R. J. WATERS

DATE: November 3, 1999
ESTTYPE: PLANNING
PROJECT NO: 2502-4

CONTRACTOR		LABOR HOURS	LABOR	MATERIAL	EQUIPMENT	OTHERS	SUBTOTAL	% MARKUP	% DIRECT COST	% TOTAL COST
TOTAL DIRECT COST		99,665	$3,621,420	$2,108,574	$167,433	$1,551,299	$7,448,726		100.00%	
TOTAL SUBCONTRACTOR MARKUPS			$842,782	$533,627	$43,201	$414,812	$1,834,422			18.45%
TOTAL COST TO PRIME			$4,464,202	$2,642,201	$210,635	$1,966,111	$9,283,149			
PRIME CONTRACTOR MARKUP	7.10%		$316,958	$187,596	$14,955	$139,594	$659,104			6.63%
TOTAL PROJECT COST			**$4,781,160**	**$2,829,797**	**$225,590**	**$2,105,705**	**$9,942,252**			

FY-2000 G&A/PIF ADDER CALCULATION SHEET

PROJECT: NGLW TANK OPT. 4

DATE: 11/3/99

PROCUREMENT FEE:

	CONSTRUCTION =	$9,942,252		
	GFE =			
	Subtotal	$9,942,252		
	FEE @ 3.5% =	$9,942,252	* 0.035 =	$347,979

G&A @ 27% (with a ceiling of $500,000 imposed per year)

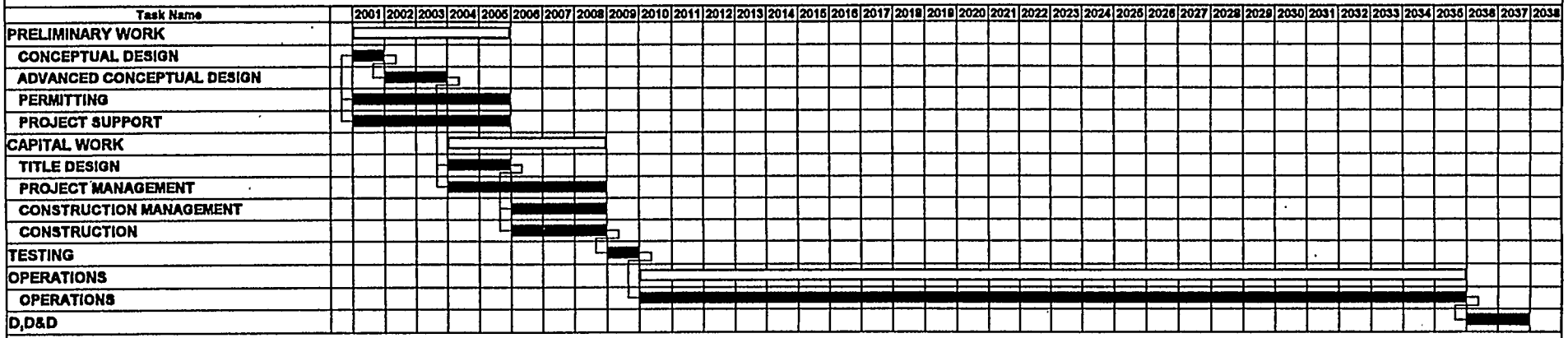
CONSTRUCTION $ OR	CEILING * # OF YEARS			
YEARS OF CONST. =	3	$1,500,000		
	GFE =			
	PROCUREMENT FEE =	$347,979		
	Subtotal	$1,847,979		
	FEE @ 27% =	$1,847,979	* 0.27 =	$498,954

PIF @ 4.5%

	CONSTRUCTION =	$9,942,252		
	GFE =			
	PROCUREMENT FEE =	$347,979		
	G&A =	$498,954		
	Subtotal	$10,789,185		
	FEE @ 4.5% =	$10,789,185	* 0.045 =	$485,513

TOTAL PROCUREMENT FEE:	$347,979
TOTAL G&A FEE:	$498,954
TOTAL PIF:	$485,513

NGLW TANKS - NEW TANKS



Default

Complete | Complete Milestone | Remaining | Remaining Milestone | Free Float | Total Float (+) | Total Float (-) | Delay | Non-Resource | Required Date | % Labor Complete

Critical

Remaining | Remaining Milestone

Parent

NGLW TANKS - NEW TANKS

Task Name	Duration	Schedule Start	Schedule Finish
PRELIMINARY WORK	1304d	01/02/01	12/30/05
CONCEPTUAL DESIGN	261d	01/02/01	01/01/02
ADVANCED CONCEPTUAL DESIGN	523d	01/02/02	01/02/04
PERMITTING	1304d	01/02/01	12/30/05
PROJECT SUPPORT	1304d	01/02/01	12/30/05
CAPITAL WORK	1303d	01/05/04	12/31/08
TITLE DESIGN	521d	01/05/04	01/02/06
PROJECT MANAGEMENT	1303d	01/05/04	12/31/08
CONSTRUCTION MANAGEMENT	782d	01/03/06	12/31/08
CONSTRUCTION	782d	01/03/06	12/31/08
TESTING	262d	01/01/09	01/01/10
OPERATIONS	6781d	01/04/10	12/31/35
OPERATIONS	6781d	01/04/10	12/31/35
D,D&D	523d	01/01/36	12/31/37

Bechtel BWXT Idaho, LLC
Rev. 10-99

COST ESTIMATE SUMMARY

PROJECT NAME: SEGREGATION & RCRA-COMPLIANT STOR. OF NGLW - NEW TANKS-OPC
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO: 2502-4O
PREPARED BY: R. D. ADAMS
REPORT NAME: Cost Estimate Summary

DATE: 03-Nov-1999
TIME: 12:38:48
CHECKED BY: DE
APPR'D BY:

WBS Element	Cost Estimate Element	Total Unescalated	Escalation		Total Incl Escalation
1.1	CONCEPTUAL DESIGN			>>	$643,605
1.1.1	CONCEPTUAL DESIGN	601,500	42,105		643,605
1.2	MANAGEMENT COSTS			>>	$1,328,781
1.2.1	PROJECT SUPPORT	1,197,100	131,681		1,328,781
1.3	PERMITTING			>>	$1,825,950
1.3.1	PERMITTING	1,645,000	180,950		1,825,950
1.4	SO TEST & STARTUP			>>	$734,720
1.4.1	SO TEST & STARTUP	574,000	160,720		734,720
1.5.2	PROCUREMENT FEES	0	0	>>	$0
	SUBTOTAL INCLUDING ESCALATION	4,017,600	515,456	>>	$4,533,056
	PROJECT CONTINGENCY				
	MANAGEMENT RESERVE			>>	$0
	CONTINGENCY			>>	$1,466,944
	TOTAL ESTIMATED COST			>>	$6,000,000

PROJECT COST PARAMETERS

EDI AS A % OF CONST. + GFE= *25.00%*

CONTINGENCY= *32.36%*

Bechtel BWXT Idaho, LLC
Rev 10-99

DETAILED COST ESTIMATE SHEET

PAGE # 1

PROJECT NAME: SEGREGATION & RCRA-COMPLIANT STOR. OF NGLW - NEW TANKS-OPC
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO.: 2502-40
PREPARED BY: R. D. ADAMS

DATE 03-Nov-1999
TIME: 12:38:09
REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.1.1	CONCEPTUAL DESIGN											
	PRE-CONCEPTUAL DESIGN @ 1.5% OF CONSTRUCTION	1	LOT			0.000		149,100				149,100
	CONCEPTUAL DESIGN @ 4% OF CONSTRUCTION	1	LOT			0.000		397,700				397,700
	CONCEPTUAL DESIGN S/T						0	$546,800				$546,800
1.1.1.2	PROJECT SUPPORT DURING CONCEPTUAL DESIGN PROJECT SUPPORT @ 10% OF CONCEPTUAL DESIGN COST	1	LOT			0.000		54,700				54,700
	PROJECT SUPPORT DURING CONCEPTUAL DESIGN S/T						0	$54,700				$54,700
1.2.1	PROJECT SUPPORT											
	ACDC/SOW,CPDS,PEP,DC/SOW & REVIEWS @ 5% OF CONSTRUCTION	1	LOT			0.000		497,100				497,100
	PHA/SAR & SAR	1	LOT			0.000		700,000				700,000
	PROJECT SUPPORT S/T						0	$1,197,100				$1,197,100
1.3.1	PERMITTING											
	Siting Agreement	1	Lot		Z-4170	0.000					25,000	25,000
	AIR PERMITS	1	LOT			0.000					250,000	250,000

Bechtel BWXT Idaho, LLC
Rev 10-99

DETAILED COST ESTIMATE SHEET

PAGE # 2

PROJECT NAME: SEGREGATION & RCRA-COMPLIANT STOR. OF NGLW - NEW TANKS-OPC
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO.: 2502-40
PREPARED BY: R. D. ADAMS

DATE 03-Nov-1999
TIME: 12:38:09
REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	S/C (OTHER 1)	TOTAL COST
1.3.1	PERMITTING											
	HWMA / RCRA Permit	1	Lot		Z-4170	0.000					1,200,000	1,200,000
	Permit To Construct	1	Lot		Z-4170	0.000					50,000	50,000
	CWA, Storm Water, Historical, Other Reg. Compliance	1	Lot		Z-4170	0.000					100,000	100,000
	P.E. Certification	1	Lot			0.000					20,000	20,000
	PERMITTING S/T						0				$1,645,000	$1,645,000
1.4.1	SO TEST & STARTUP											
	ORR	1	Lot			0.000		50,000				50,000
	SO Test & Training @ 1% OF TEC	1	Lot			0.000		262,000				262,000
	SO TEST & STARTUP S/T						0	$312,000				$312,000
1.4.1.1	PROJECT SUPPORT											
	Support During Startup - 1% OF TEC	1	Lot			0.000		262,000				262,000
	PROJECT SUPPORT S/T						0	$262,000				$262,000
	PROJECT SUBTOTAL						0	$2,372,600	$0	$0	$1,645,000	$4,017,600

Bechtel BWXT Idaho, LLC

CONTINGENCY ANALYSIS

PROJECT NAME: SEGREGATION & RCRA-COMPLIANT STOR. OF NGLW - NEW TANKS-OPC
LOCATION 1: INEEL/INTEC
REQUESTOR: R. J. WATERS

TYPE OF ESTIMATE: PLANNING
PROJECT NO: 2502-40
PREPARED BY: R. D. ADAMS

DATE: 03-Nov-1999
TIME: 12:38:50

REPORT NAME: Contingency Analysis

PROBABLE % VARIATION									PROJECT CONTINGENCY		SUMMA
WBS Element	Cost Estimate Element	Total Cost w/o Contingency	% Total Cost	Prob. % Var. From Est. -	Prob. % Var. From Est. +	Wt. % of Prob. -	Wt. % of Prob. +	Contingency	%	Cost	Total Co→ by Elem
1.1.1	CONCEPTUAL DESIGN	601,500	13.27	10	30	1.33	3.98	3.450%	10.88%	159,556	761,056
1.2.1	PROJECT SUPPORT	1,197,100	26.41	10	40	2.64	10.56	9.243%	29.14%	427,466	1,624,566
1.3.1	PERMITTING	1,645,000	36.29	10	35	3.63	12.70	11.068%	34.89%	511,881	2,156 1
1.4.1	SO TEST & STARTUP	574,000	12.66	10	45	1.27	5.70	5.002%	15.77%	231,319	805,.0
1.5.2	PROCUREMENT FEES	0	0.00	10	40	0.00	0.00	0.000%	0.00%	0	0
	ESCALATION	515,456	11.37	10	30	1.14	3.41	2.956%	9.32%	136,722	652 3
	SUBTOTAL	4,533,056	100.00					31.719%			
	CALCULATED CONTINGENCY	1,437,849									
	RESULTANT TEC	5,970,905									
	ROUNDED TEC	6,000,000									
	PROJECT CONTINGENCY	1,466,944						32.36%			
	MANAGEMENT RESERVE	0									
	CONTINGENCY	1,466,944									
	TOTAL ESTIMATED COST	6,000,000								1,466,944	6,000,..0

CONFIDENCE LEVEL AND ASSUMED RISKS:
The Bechtel BWXT Idaho, LLC Cost Estimate Contingency Analysis Model is based on the applied contingency and the assumptions upon which the estimate was predicated. The model is applied with a suggested risk level of 18% and a level of confidence of 90% the estimate will fall within the bid range. The Contingency Analysis is based on a weighted average to provide a 90 % probability of underrun and a 10% probability of overrun.

CONTINGENCY ANALYSIS GUIDE BY TYPE OF ESTIMATE
Guidelines established by DOE/FM 50, Cost Estimating Guide, Vol. 6, Cost Guide, and as presented in the INEEL Cost Estimating Guide.

PLANNING	20% – 30%
Experimental/Special Conditions	Up to 50%
Conceptual	15% – 25%
Experimental/Special Conditions	Up to 40%
TITLE I	10% – 20%
TITLE II	5% – 15%
TITLE II/AFC	Market Conditions

Appendix D

Radiation Fields

COPY

ENGINEERING DESIGN FILE

1. Project File No. INEEL / EXT-99-00980 2. Project/Task NGLW Feasibility Study for INTEC Tank Farm

3. Subtask Dose Rate Calculations for WM-190 Modifications To Meet RCRA Storage Requirements of NGLW

4. Title: Gamma Dose Rate Calculation Tables for WM-190 HLW Storage Tank Proposed Modifications

5. Summary: This summary briefly defines the problem or activity to be addressed in the EDF, gives a summary of the activities performed in addressing the problem and states the conclusions, recommendations, or results arrived at from this task.

Background:

DOE-ID issued directions to cease use and storage of newly generated liquid waste (NGLW) using underground storage tanks WM-187, 188,189 and 190 at the INTEC Tank Farm after September 30, 2005. BBWI has initiated an engineering study for segregation and RCRA compliant storage of INTEC NGLW after 2005. Part of the study focuses on modifications or upgrades to the existing WM-190 tank to bring it up to RCRA storage standards for continued use after 2005.

As part of the WM-190 feasibility study INTEC Radiological Engineering was requested to provide personnel exposure dose rate estimates that can be used to assess work activities associated with the proposed modification plan. A series of calculations using Microshield 5.0.3. were completed for the WM-190 tank in its current configuration. The calculation results are detailed on the attached table.

The modification being studied involves upgrading WM-190 by removing the soil and vault roof panels for access to the WM-190 tank and vault. Project management has suggested that flowing grout be pumped into the tank (not to exceed 30 inches total depth) to provide shielding from residual heel material. If grout installation is feasible prior to the vault roof removal the maximum personnel dose reductions can be achieved. As a minimum the placement of grout may be scheduled to follow the vault roof removal and precede cutting the roof out of the tank to maintain personnel exposures ALARA and aid in contamination control. After the new tank is installed, the original tank roof would be reinstalled, thereby providing double containment. Of concern is the collective occupational radiation exposure required to upgrade WM-190. WM-187, 188, 189 and 190 are arranged in a rectangular pattern separated from one another by a 3 foot 6 inch thick concrete wall. All tanks are covered by a concrete roof with a nominal thickness of 8 inches and covered with up to 10 feet of soil.

Conclusion:

The collective occupational radiation exposure resulting from the proposed modifications to WM-190 (with an estimated volume of 500 gallons) should not be affected by the WM-187, 188 or 189 tanks provided the roofs for these tanks are not removed as noted in EDF # INTEC-99-010; Functional File #6000-65.

The projected collective occupational radiation exposure to upgrade WM-190 as described is dependent on:

1. Total number of individual tasks.
2. The location of the task.
3. Total number of hours and persons required to complete the task, multiplied by the corresponding dose rate in millrem/h.
4. The exposure total from each task is summed providing a total collective dose.

The chart of calculated dose rates shows the potential savings in direct radiation fields when grout is added to WM-190 during the modification process. The chart provides dose rates that simulate the most likely sequence of events and field conditions to be encountered. The proposed maximum depth of grout would be 30 inches as reported by Project Management. The table includes dose rates with the maximum pour depth of 30 inches and includes the dose rates with a 16 inch grout pour to provide a comparison point. Both pour depths require that the grout be added in two separate pours. The 30 inch total pour would be completed in 6 inch and 24 inch pours versus the 16 inch total pour depth using 4 inch and 12 inch pours, respectively. INTEC Radiological Engineering strongly recommends that Project management consider using the 30 inch total pour depth in the interest of ALARA.

1. Project File No. INEEL / EXT-99-00980 2. Project/Task NGLW Feasibility Study for INTEC Tank Farm

SHIELDING CALCULATION INPUT

The calculation input parameters and assumptions include:

1. The radioactivity is uniformally absorbed into the thickness of the first grout pour for each scenario by a 50 foot diameter disc.
2. A total volume of 500 gallons is present per BBWI Tank Farm Operations Home Page.
3. The calculation for the heel material without grout is approximately 0.40 inch thick liquid by 50 foot diameter disc.
4. The default value for water is used for the liquid heel material calculation.
5. A density of 1.6 gm/cm^3 was used for the grout.
6. The WM-190 tank sides and top are 0.25" to 0.313" thick stainless steel.
7. The build-up factor is the shield or transition media provided by Microshield 5.03 or the highest build-up factor noted.
8. The distances/measurements to support the calculations were obtained from the Tank Farm SAR pages 4.2-18 and 4.2-26 which detail the WM-190 tank construction.

ATTACHMENTS:

1. Gamma Dose Rate Calculations Table Supporting Proposed Modifications For WM-190 HLW Storage Tank, 1 page
2. Vessels Descriptive Data, High-Level Liquid Waste System, Page #4.2-18, 1 page
3. High-Level Cooled Waste Storage Tank Diagram, Page #4.2-26, 1 Page
4. WM-190 Storage Tank Radionuclides Estimated Contents Data Sheet; Updated 12-22-97, 1 page
5. Tank Farm Volumes Data Sheet, 1 page
6. WM-190-6.MS5 Calculation Data Sheets From Microshield v5.0.3, 4 pages
7. 190-1A.MS5 Calculation Data Sheets From Microshield v5.0.3, 3 pages
8. 190-1B.MS5 Calculation Data Sheets From Microshield v5.0.3, 4 pages
9. 190-1C.MS5 Calculation Data Sheets From Microshield v5.0.3, 3 pages
10. 190-1D.MS5 Calculation Data Sheets From Microshield v5.0.3, 4 pages
11. 190-1E.MS5 Calculation Data Sheets From Microshield v5.0.3, 3 pages
12. 190-1F.MS5 Calculation Data Sheets From Microshield v5.0.3, 3 pages

cc with attachments 1 through 5:

C. W. Olsen, MS 3211
R. J. Waters, MS 5227
C. R. Wielang, MS 5209
INTEC Radiological Controls Main Files; MS 5209, CPP-630

cc with attachments 1 through 12:

LMITCO Radiological Controls Central EDF Files, MS 4138 (Original Document)
R. W. Kanady Project Files; INTEC, CPP-630

7. Review (R) and Approval (A) Signatures: (Minimum reviews and approvals are listed. Additional reviews/approvals may be added as necessary.)

	R/A	Printed Name	Signature	Date
Author	R	R. W. Kanady		10-27-99
Independent Verification	R	D. E. Fullmer		10-27-99
Requestor	A	R. J. Waters		10-28-99
RadCon Supervisor	A	G. G. Hall		10-27-99

GAMMA DOSE RATE CALCULATIONS TABLE SUPPORTING PROPOSED MODIFICATIONS FOR WM-190 HLW STORAGE TANK

This table is provided for informational purposes only. The dose rates provided are in *millirem/hour* and were calculated using Microshield v5.03. The curie content used for the calculation input is a combination of isotopes that was last updated on 12-22-97.

DOSE POINT DESCRIPTION AND CONDITIONS / MS 5.0.3 CALCULATION ID NO.	DOSE POINT #1 AND DISTANCE FROM SOURCE	DOSE POINT #2 AND DISTANCE FROM SOURCE	DOSE POINT #3 AND DISTANCE FROM SOURCE	DOSE POINT #4 AND DISTANCE FROM SOURCE	DOSE POINT #5 AND DISTANCE FROM SOURCE	DOSE POINT #6 AND DISTANCE FROM SOURCE
DOSE RATES IN THE TANK AT CENTERPOINT WITH 30" OF GROUT TOTAL, ADDED IN 6" AND 24" POURS WM-190-6 M85	0.1 millirem/h @ 1 inch	0.1 millirem/h @ 1 foot	0.1 millirem/h @ 4 feet	0.1 millirem/h @ 10 feet	0.09 millirem/h @ 20 feet	0.09 millirem/h @ 25 feet
DOSE RATES IN TANK AT CENTERPOINT WITH 16" OF GROUT TOTAL, ADDED IN 4" AND 12" POURS 190-1B M85	5.0 millirem/h @ 1 inch	4.9 millirem/h @ 1 foot	4.8 millirem/h @ 3 feet	4.8 millirem/h @ 6 feet	4.7 millirem/h @ 10 feet	4.2 millirem/h @ 20 feet
DOSE RATES ON TANK DOME ROOF AT CENTERPOINT (≈32') WITH NO GROUT ADDED 190-1C M85	41 millirem/h @ 1 inch	39 millirem/h @ 1 foot	36 millirem/h @ 3 feet	34 millirem/h @ 4 feet	N/A	N/A
DOSE RATES ON TANK DOME ROOF AT CENTERPOINT (≈32') WITH 16" OF GROUT TOTAL, ADDED IN 4" AND 12" POURS 190-1A M85	2.4 millirem/h @ 1 inch	2.3 millirem/h @ 1 foot	2.2 millirem/h @ 3 feet	2.1 millirem/h @ 4 feet	N/A	N/A
DOSE RATES ON TANK DOME ROOF PERIMETER (≈21') WITH NO GROUT ADDED 190-1D M85	49 millirem/h @ 1 inch	47 millirem/h @ 1 foot	45 millirem/h @ 2 feet	43 millirem/h @ 3 feet	41 millirem/h @ 4 feet	N/A
DOSE RATES ON TANK VAULT ROOF CENTERPOINT (≈38') WITH NO GROUT ADDED 190-1E M85	3.3 millirem/h @ 1 inch	3.2 millirem/h @ 1 foot	3 millirem/h @ 3 feet	2.9 millirem/h @ 4 feet	N/A	N/A
DOSE RATES ON TANK RISER AT GROUND LEVEL (≈47') WITH NO GROUT ADDED 190-1F M85	2.4 millirem/h @ 1 inch	2.3 millirem/h @ 1 foot	2.1 millirem/h @ 3 feet	2.0 millirem/h @ 4 feet	N/A	N/A

ATTACHMENT #1

Table 4.2-IV. (Contd.) Vessels - High-Level Liquid Waste System

Equipment	WM-180 and WM-181	WM-182 through WM-184	WM-185 through WM-190
Name	Interim waste storage	Interim waste storage	Interim waste storage
Orientation	Vertical	Vertical	Vertical
Length (straight side), ft	23	21 (32 to roof)	21 (32 to roof)
Diameter (OD), ft	50	50	50
Jacket	None	None	None
Full capacity, gal	318.000	300,000	300,000
Operating volume, gal	285,000	285,000	285,000
Design temperature, °F	220	220	220
Design pressure	-2.5 in H_2O to +10 in H_2O	-2.5 in H_2O to +10 in H_2O	-2.5 in H_2O to +10 in H_2O
Operating pressure	0.4-0.7 in. H_2O vacuum	0.4-0.7 in. H_2O vacuum	0.4-0.7 in. H_2O vacuum
Material	SS 347	SS 347	SS 304L
Wall thickness, in.	Floors and lower 8 ft of walls + 5/16; upper 13 ft of walls = 1/4; roof = 3/16	Floors and lower 8 ft of walls = 5/16; upper 13 ft of walls = 1/4; roof = 3/16	Floor and lower 8 ft of walls = 5/16; upper 13 ft of walls = 1/4; roof = 3/16
Agitation	None	None	None

ATTACHMENT #2

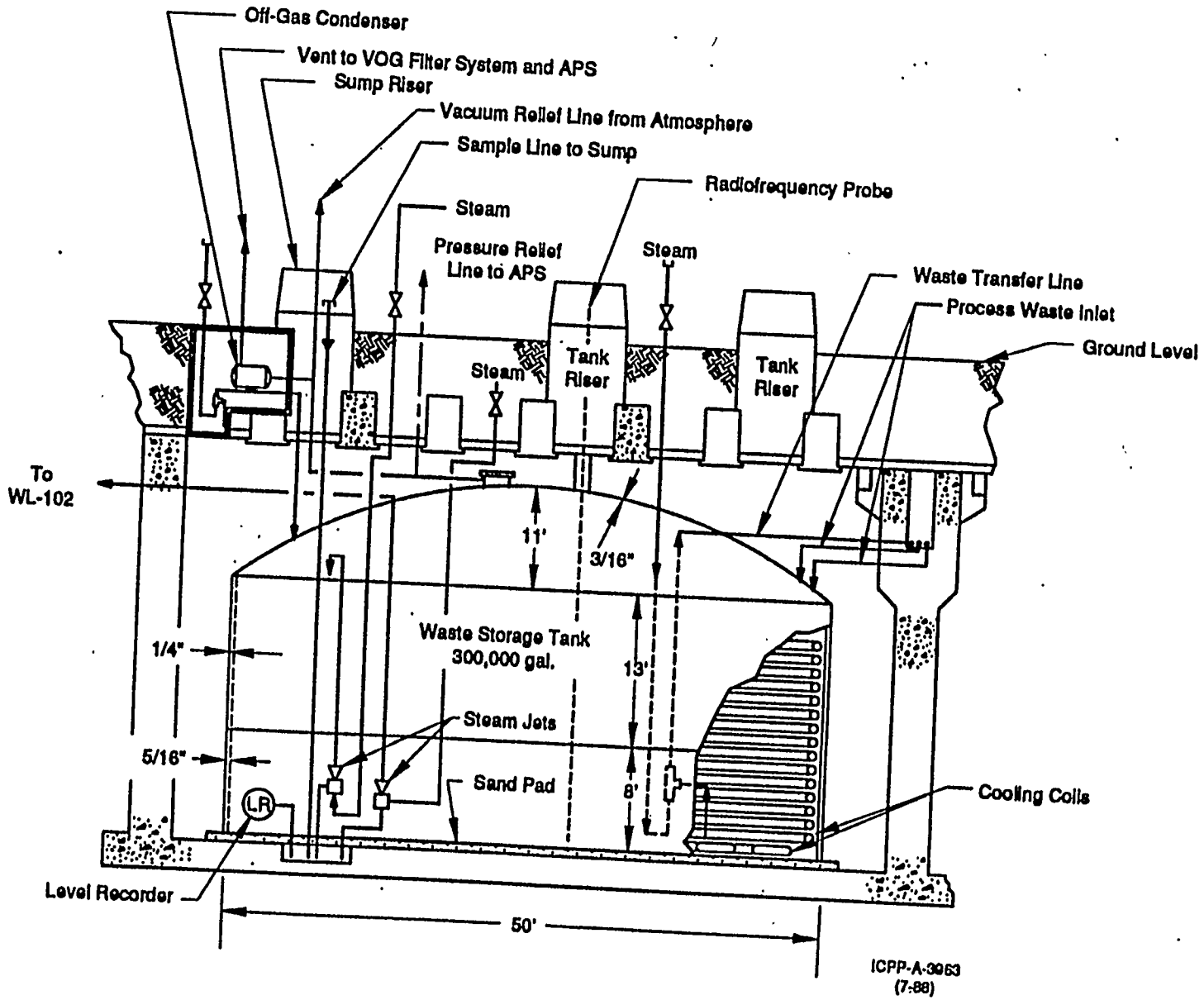


Figure 4.2-5. High-Level Cooled Waste Storage Tank

WM-190

HOME Estimated Contents: (Not all radionuclides may be shown)

GRAPHS

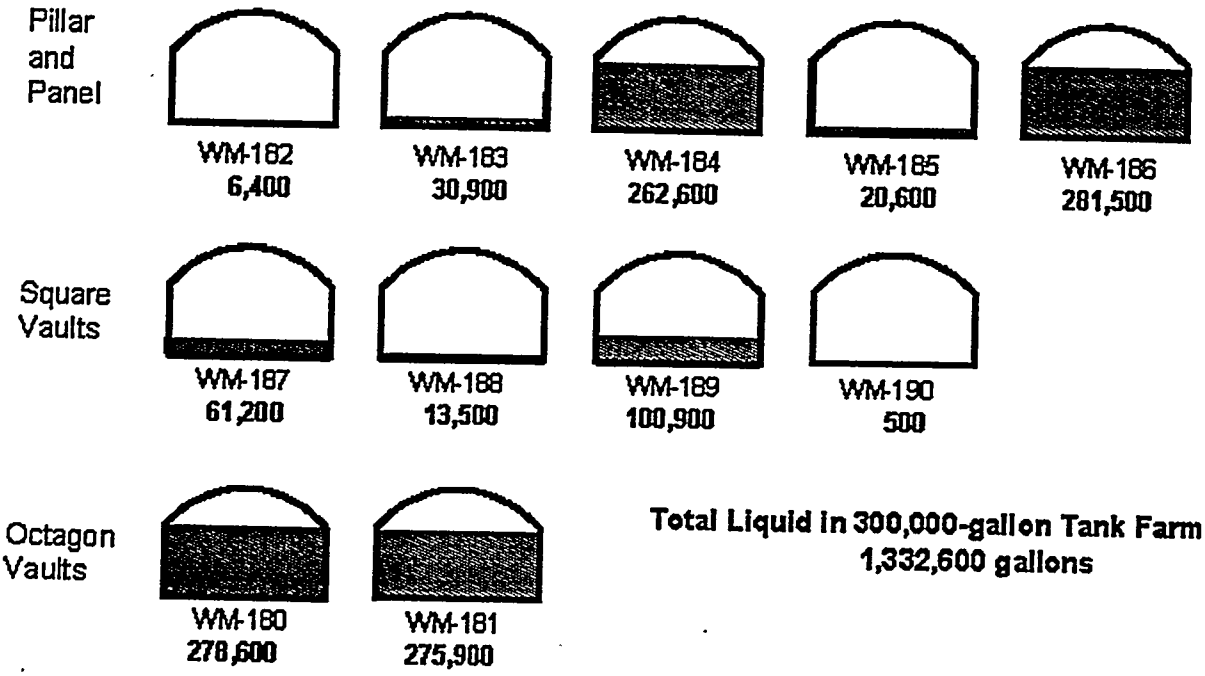
DENSITY	g/ml		NICKEL (Ni)	M		Cs137	Ci/L	1.06E-02
ACID (H+)	M	0.02	PHOSPHATE (PO4)	M		Ce 144	Ci/L	1.52E-11
NITRATE (NO3)	M	0.02	POTASSIUM (K)	M		Eu 154	Ci/L	2.93E-05
ALUMINUM (Al)	M		SODIUM (Na)	M		Eu 155	Ci/L	4.03E-06
BORON (B)	M		SULFATE (SO4)	M		U 234	Ci/L	
CADMIUM (Cd)	M		ZIRCONIUM (Zr)	M		U 235	Ci/L	
CALCIUM (Ca)	M		H 3	Ci/L		U 236	Ci/L	
CHLORIDE (Cl)	M	0.0005	Co 60	Ci/L		U 238	Ci/L	
CHROMIUM (Cr)	M		Sr 90	Ci/L		Np 237	Ci/L	
FLUORIDE (F)	M	0.007	Ni 63	Ci/L		Pu 238	Ci/L	
IRON (Fe)	M		Tc 99	Ci/L		Pu 239	Ci/L	
LEAD (Pb)	M		Ru 106	Ci/L		Pu 240	Ci/L	
MANGANESE (Mn)	M		Sb 125	Ci/L		Pu 241	Ci/L	
MERCURY (Hg)	M		I 129	Ci/L		Pu 242	Ci/L	
MOLYBDENUM (Mo)	M		Cs 134	Ci/L	9.80E-07	Am 241	Ci/L	

Last Updated on 12/22/97
By Dan Staiger
Email: staimd@inel.gov

ATTACHMENT #4

Tank Farm Volumes

(gallons, as of September 30, 1999)



Total Liquid in 300,000-gallon Tank Farm Tanks: 1,332,600 gallons

INEEL

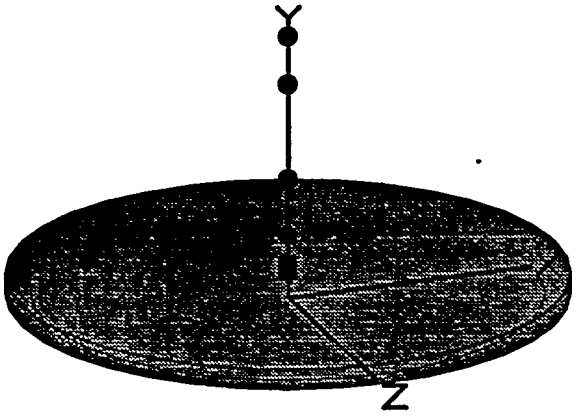
ATTACHMENT #5

MicroShield v5.03 (5.03-00214)
Lockheed Martin Idaho

Page : 1
DOS File: WM-190-6.MS5
Run Date: October 12, 1999
Run Time: 11:58:45 AM
Duration: 00:00:16

File Ref: NGLW
Date: 10-25-99
By: WSP
Checked:

Case Title: wm-190-9
Description: wm-190 w/6" mix/24" grout @ 1", 1, 4, 10, 20, 25 feet on C/L
Geometry: 8 - Cylinder Volume - End Shields



Source Dimensions

Height	15.24 cm	6.0 in
Radius	762.0 cm	25 ft

Dose Points

	X	Y	Z
# 1	0 cm	78.74 cm	0 cm
	0.0 in	2 ft 7.0 in	0.0 in
# 2	0 cm	106.68 cm	0 cm
	0.0 in	3 ft 6.0 in	0.0 in
# 3	0 cm	198.12 cm	0 cm
	0.0 in	6 ft 6.0 in	0.0 in
# 4	0 cm	381 cm	0 cm
	0.0 in	12 ft 6.0 in	0.0 in
# 5	0 cm	685.8 cm	0 cm
	0.0 in	22 ft 6.0 in	0.0 in
# 6	0 cm	838.2 cm	0 cm
	0.0 in	27 ft 6.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.70e+06 in³	Concrete	1.6
Shield 1	24.0 in	Concrete	1.6
Air Gap		Air	0.00122
Wall Clad	.25 in	Iron	7.86

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	1.8100e+001	6.6970e+011	6.5108e-001	2.4090e+004
Ce-144	2.2400e-008	8.2880e+002	8.0576e-010	2.9813e-005
Cs-134	1.0300e-003	3.8110e+007	3.7050e-005	1.3709e+000
Cs-137	1.9370e+001	7.1669e+011	6.9676e-001	2.5780e+004
Eu-154	4.9000e-002	1.8130e+009	1.7626e-003	6.5216e+001
Eu-155	6.1700e-003	2.2829e+008	2.2194e-004	8.2119e+000
Pr-144	2.2080e-008	8.1696e+002	7.9424e-010	2.9387e-005

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

ATTACHMENT #6

DOS File: WM-190-6.MS5
Run Date: October 12, 1999
Run Time: 11:58:45 AM
Duration: 00:00:16

Results - Dose Point # 1 - (0,31,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	4.335e-50	1.305e-23	4.296e-52	1.293e-25
0.04	9.719e+09	1.132e-25	8.898e-24	5.007e-28	3.935e-26
0.05	1.072e+08	1.535e-18	1.406e-17	4.088e-21	3.746e-20
0.06	2.961e+06	5.901e-16	1.026e-14	1.172e-18	2.038e-17
0.08	7.089e+07	4.933e-11	1.810e-09	7.807e-14	2.864e-12
0.1	7.808e+08	1.697e-08	1.039e-06	2.597e-11	1.590e-09
0.15	8.951e+01	8.188e-14	7.602e-12	1.348e-16	1.252e-14
0.2	1.238e+08	7.799e-07	7.386e-05	1.376e-09	1.304e-07
0.3	1.349e+04	9.317e-10	6.585e-08	1.767e-12	1.249e-10
0.4	1.293e+07	4.407e-06	2.222e-04	8.587e-09	4.330e-07
0.5	4.482e+06	5.049e-06	1.891e-04	9.910e-09	3.713e-07
0.6	6.028e+11	1.752e+00	5.110e+01	3.420e-03	9.975e-02
0.8	7.429e+08	9.189e-03	1.800e-01	1.748e-05	3.424e-04
1.0	5.588e+08	2.036e-02	2.937e-01	3.753e-05	5.414e-04
1.5	7.086e+08	1.635e-01	1.426e+00	2.751e-04	2.398e-03
2.0	6.324e+00	4.758e-09	3.060e-08	7.358e-12	4.732e-11
TOTALS:	6.551e+11	1.945e+00	5.300e+01	3.751e-03	1.030e-01

Results - Dose Point # 2 - (0,42,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	4.287e-50	1.125e-23	4.248e-52	1.115e-25
0.04	9.719e+09	1.123e-25	7.722e-24	4.967e-28	3.415e-26
0.05	1.072e+08	1.524e-18	1.397e-17	4.060e-21	3.721e-20
0.06	2.961e+06	5.864e-16	1.020e-14	1.165e-18	2.026e-17
0.08	7.089e+07	4.905e-11	1.800e-09	7.762e-14	2.848e-12
0.1	7.808e+08	1.688e-08	1.034e-06	2.583e-11	1.582e-09
0.15	8.951e+01	8.149e-14	7.569e-12	1.342e-16	1.246e-14
0.2	1.238e+08	7.764e-07	7.357e-05	1.370e-09	1.299e-07
0.3	1.349e+04	9.281e-10	6.563e-08	1.760e-12	1.245e-10
0.4	1.293e+07	4.391e-06	2.215e-04	8.556e-09	4.317e-07
0.5	4.482e+06	5.032e-06	1.886e-04	9.878e-09	3.703e-07
0.6	6.028e+11	1.747e+00	5.097e+01	3.410e-03	9.949e-02
0.8	7.429e+08	9.164e-03	1.796e-01	1.743e-05	3.417e-04
1.0	5.588e+08	2.031e-02	2.931e-01	3.743e-05	5.403e-04
1.5	7.086e+08	1.632e-01	1.423e+00	2.746e-04	2.394e-03
2.0	6.324e+00	4.750e-09	3.055e-08	7.345e-12	4.725e-11
TOTALS:	6.551e+11	1.940e+00	5.287e+01	3.740e-03	1.028e-01

Results - Dose Point # 3 - (0,78,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	4.133e-50	7.782e-24	4.096e-52	7.712e-26
0.04	9.719e+09	1.094e-25	5.446e-24	4.839e-28	2.408e-26

DOS File: WM-190-6.MS5
Run Date: October 12, 1999
Run Time: 11:58:45 AM
Duration: 00:00:16

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.05	1.072e+08	1.490e-18	1.366e-17	3.970e-21	3.639e-20
0.06	2.961e+06	5.744e-16	9.998e-15	1.141e-18	1.986e-17
0.08	7.089e+07	4.813e-11	1.768e-09	7.617e-14	2.798e-12
0.1	7.808e+08	1.658e-08	1.017e-06	2.537e-11	1.556e-09
0.15	8.951e+01	8.020e-14	7.463e-12	1.321e-16	1.229e-14
0.2	1.238e+08	7.651e-07	7.265e-05	1.350e-09	1.282e-07
0.3	1.349e+04	9.162e-10	6.492e-08	1.738e-12	1.231e-10
0.4	1.293e+07	4.341e-06	2.194e-04	8.457e-09	4.274e-07
0.5	4.482e+06	4.979e-06	1.869e-04	9.773e-09	3.669e-07
0.6	6.028e+11	1.730e+00	5.055e+01	3.376e-03	9.866e-02
0.8	7.429e+08	9.083e-03	1.783e-01	1.728e-05	3.391e-04
1.0	5.588e+08	2.015e-02	2.911e-01	3.714e-05	5.367e-04
1.5	7.086e+08	1.621e-01	1.415e+00	2.727e-04	2.381e-03
2.0	6.324e+00	4.722e-09	3.040e-08	7.302e-12	4.701e-11
TOTALS:	6.551e+11	1.921e+00	5.243e+01	3.704e-03	1.019e-01

Results - Dose Point # 4 - (0,150,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	3.841e-50	4.509e-24	3.807e-52	4.469e-26
0.04	9.719e+09	1.038e-25	3.286e-24	4.591e-28	1.453e-26
0.05	1.072e+08	1.425e-18	1.307e-17	3.795e-21	3.481e-20
0.06	2.961e+06	5.511e-16	9.607e-15	1.095e-18	1.908e-17
0.08	7.089e+07	4.635e-11	1.706e-09	7.335e-14	2.700e-12
0.1	7.808e+08	1.601e-08	9.844e-07	2.449e-11	1.506e-09
0.15	8.951e+01	7.768e-14	7.255e-12	1.279e-16	1.195e-14
0.2	1.238e+08	7.430e-07	7.083e-05	1.311e-09	1.250e-07
0.3	1.349e+04	8.930e-10	6.351e-08	1.694e-12	1.205e-10
0.4	1.293e+07	4.241e-06	2.151e-04	8.263e-09	4.191e-07
0.5	4.482e+06	4.874e-06	1.836e-04	9.567e-09	3.604e-07
0.6	6.028e+11	1.696e+00	4.970e+01	3.310e-03	9.702e-02
0.8	7.429e+08	8.924e-03	1.756e-01	1.697e-05	3.341e-04
1.0	5.588e+08	1.982e-02	2.872e-01	3.654e-05	5.293e-04
1.5	7.086e+08	1.599e-01	1.398e+00	2.690e-04	2.352e-03
2.0	6.324e+00	4.662e-09	3.003e-08	7.210e-12	4.644e-11
TOTALS:	6.551e+11	1.884e+00	5.157e+01	3.633e-03	1.002e-01

Results - Dose Point # 5 - (0,270,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	3.401e-50	2.240e-24	3.370e-52	2.220e-26
0.04	9.719e+09	9.512e-26	1.771e-24	4.207e-28	7.832e-27
0.05	1.072e+08	1.322e-18	1.213e-17	3.521e-21	3.233e-20
0.06	2.961e+06	5.144e-16	8.989e-15	1.022e-18	1.785e-17
0.08	7.089e+07	4.353e-11	1.608e-09	6.889e-14	2.544e-12

DOS File: WM-190-6.MS5
Run Date: October 12, 1999
Run Time: 11:58:45 AM
Duration: 00:00:16

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.1	7.808e+08	1.509e-08	9.319e-07	2.308e-11	1.426e-09
0.15	8.951e+01	7.363e-14	6.916e-12	1.213e-16	1.139e-14
0.2	1.238e+08	7.070e-07	6.776e-05	1.248e-09	1.196e-07
0.3	1.349e+04	8.537e-10	6.094e-08	1.619e-12	1.156e-10
0.4	1.293e+07	4.063e-06	2.064e-04	7.917e-09	4.022e-07
0.5	4.482e+06	4.674e-06	1.760e-04	9.174e-09	3.454e-07
0.6	6.028e+11	1.626e+00	4.753e+01	3.173e-03	9.277e-02
0.8	7.429e+08	8.535e-03	1.669e-01	1.623e-05	3.174e-04
1.0	5.588e+08	1.888e-02	2.705e-01	3.479e-05	4.987e-04
1.5	7.086e+08	1.499e-01	1.286e+00	2.522e-04	2.164e-03
2.0	6.324e+00	4.297e-09	2.699e-08	6.645e-12	4.174e-11
TOTALS:	6.551e+11	1.803e+00	4.925e+01	3.477e-03	9.575e-02

Results - Dose Point # 6 - (0,330,0) in

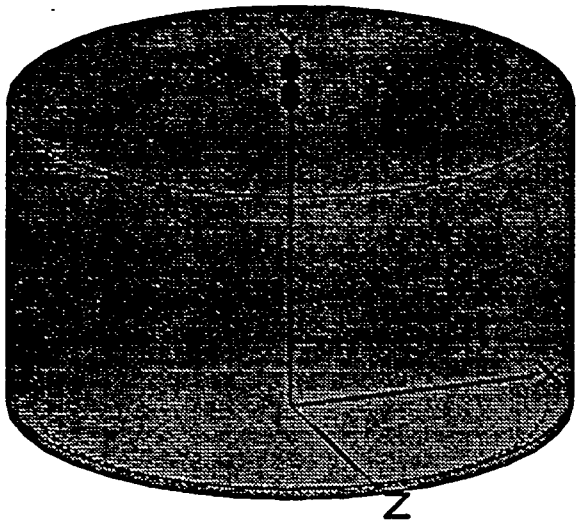
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	3.200e-50	1.674e-24	3.171e-52	1.659e-26
0.04	9.719e+09	9.105e-26	1.386e-24	4.027e-28	6.130e-27
0.05	1.072e+08	1.273e-18	1.169e-17	3.391e-21	3.115e-20
0.06	2.961e+06	4.970e-16	8.695e-15	9.871e-19	1.727e-17
0.08	7.089e+07	4.217e-11	1.560e-09	6.673e-14	2.468e-12
0.1	7.808e+08	1.463e-08	9.051e-07	2.238e-11	1.385e-09
0.15	8.951e+01	7.145e-14	6.714e-12	1.177e-16	1.106e-14
0.2	1.238e+08	6.858e-07	6.566e-05	1.210e-09	1.159e-07
0.3	1.349e+04	8.265e-10	5.875e-08	1.568e-12	1.114e-10
0.4	1.293e+07	3.922e-06	1.979e-04	7.642e-09	3.856e-07
0.5	4.482e+06	4.495e-06	1.677e-04	8.823e-09	3.292e-07
0.6	6.028e+11	1.557e+00	4.504e+01	3.040e-03	8.791e-02
0.8	7.429e+08	8.108e-03	1.564e-01	1.542e-05	2.975e-04
1.0	5.588e+08	1.779e-02	2.510e-01	3.279e-05	4.627e-04
1.5	7.086e+08	1.387e-01	1.169e+00	2.333e-04	1.966e-03
2.0	6.324e+00	3.916e-09	2.413e-08	6.056e-12	3.731e-11
TOTALS:	6.551e+11	1.722e+00	4.661e+01	3.321e-03	9.064e-02

MicroShield v5.03 (5.03-00214)
Lockheed Martin Idaho

Page : 1
DOS File: 190-1A.MS5
Run Date: October 14, 1999
Run Time: 9:27:22 AM
Duration: 00:00:10

File Ref: NGLW
Date: 10-25-99
By:
Checked:

Case Title: WM-190 DOSE ON ROOF
Description: WM-190 / 4" MIX / 12" ADD / 1", 12", 3', 4' / C/L ON ROOF
Geometry: 8 - Cylinder Volume - End Shields



Source Dimensions

Height	10.16 cm	4.0 in
Radius	762.0 cm	25 ft

Dose Points

	X	Y	Z
# 1	0 cm	9.78e+02 cm	0 cm
	0.0 in	32 ft 1.2 in	0.0 in
# 2	0 cm	1.01e+03 cm	0 cm
	0.0 in	33 ft 0.2 in	0.0 in
# 3	0 cm	1.07e+03 cm	0 cm
	0.0 in	35 ft 0.2 in	0.0 in
# 4	0 cm	1.10e+03 cm	0 cm
	0.0 in	36 ft 0.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+06 in³	Concrete	1.6
Shield 1	12.0 in	Concrete	1.6
Shield 2	368.0 in	Air	0.00122
Shield 3	.188 in	Iron	7.86
Air Gap		Air	0.00122
Wall Clad	.313 in	Iron	7.86

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	1.8100e+001	6.6970e+011	9.7662e-001	3.6135e+004
Ce-144	2.2400e-008	8.2880e+002	1.2086e-009	4.4719e-005
Cs-134	1.0300e-003	3.8110e+007	5.5576e-005	2.0563e+000
Cs-137	1.9370e+001	7.1669e+011	1.0451e+000	3.8670e+004
Eu-154	4.9000e-002	1.8130e+009	2.6439e-003	9.7824e+001
Eu-155	6.1700e-003	2.2829e+008	3.3291e-004	1.2318e+001
Pr-144	2.2080e-008	8.1696e+002	1.1914e-009	4.4081e-005

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results - Dose Point # 1 - (0,385.1875,0) in

ATTACHMENT #7

DOS File: 190-1A.MS5
Run Date: October 14, 1999
Run Time: 9:27:22 AM
Duration: 00:00:10

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	1.145e-38	1.308e-24	1.135e-40	1.296e-26
0.04	9.719e+09	4.203e-19	1.710e-18	1.859e-21	7.562e-21
0.05	1.072e+08	1.327e-13	1.020e-12	3.535e-16	2.717e-15
0.06	2.961e+06	9.832e-12	1.233e-10	1.953e-14	2.449e-13
0.08	7.089e+07	1.987e-07	4.371e-06	3.145e-10	6.918e-09
0.1	7.808e+08	3.500e-05	1.062e-03	5.354e-08	1.624e-06
0.15	8.951e+01	6.833e-11	2.494e-09	1.125e-13	4.107e-12
0.2	1.238e+08	3.650e-04	1.247e-02	6.442e-07	2.202e-05
0.3	1.349e+04	1.978e-07	5.043e-06	3.752e-10	9.567e-09
0.4	1.293e+07	5.400e-04	1.029e-02	1.052e-06	2.005e-05
0.5	4.482e+06	4.078e-04	6.066e-03	8.004e-07	1.191e-05
0.6	6.028e+11	1.015e+02	1.227e+03	1.982e-01	2.394e+00
0.8	7.429e+08	3.198e-01	2.797e+00	6.084e-04	5.320e-03
1.0	5.588e+08	4.840e-01	3.320e+00	8.921e-04	6.119e-03
1.5	7.086e+08	2.023e+00	9.274e+00	3.403e-03	1.560e-02
2.0	6.324e+00	3.880e-08	1.402e-07	6.000e-11	2.168e-10
TOTALS:	6.551e+11	1.044e+02	1.242e+03	2.031e-01	2.421e+00

Results - Dose Point # 2 - (0,396.1875,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	1.132e-38	1.250e-24	1.122e-40	1.239e-26
0.04	9.719e+09	4.170e-19	1.696e-18	1.844e-21	7.501e-21
0.05	1.072e+08	1.318e-13	1.013e-12	3.510e-16	2.698e-15
0.06	2.961e+06	9.755e-12	1.223e-10	1.938e-14	2.430e-13
0.08	7.089e+07	1.966e-07	4.321e-06	3.111e-10	6.838e-09
0.1	7.808e+08	3.453e-05	1.046e-03	5.283e-08	1.601e-06
0.15	8.951e+01	6.719e-11	2.446e-09	1.106e-13	4.028e-12
0.2	1.238e+08	3.583e-04	1.221e-02	6.323e-07	2.154e-05
0.3	1.349e+04	1.937e-07	4.921e-06	3.674e-10	9.335e-09
0.4	1.293e+07	5.280e-04	1.002e-02	1.029e-06	1.953e-05
0.5	4.482e+06	3.981e-04	5.901e-03	7.815e-07	1.158e-05
0.6	6.028e+11	9.902e+01	1.192e+03	1.933e-01	2.326e+00
0.8	7.429e+08	3.114e-01	2.713e+00	5.923e-04	5.161e-03
1.0	5.588e+08	4.705e-01	3.216e+00	8.674e-04	5.928e-03
1.5	7.086e+08	1.962e+00	8.965e+00	3.300e-03	1.508e-02
2.0	6.324e+00	3.757e-08	1.354e-07	5.810e-11	2.093e-10
TOTALS:	6.551e+11	1.018e+02	1.207e+03	1.980e-01	2.353e+00

Results - Dose Point # 3 - (0,420.1875,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	1.105e-38	1.136e-24	1.095e-40	1.126e-26
0.04	9.719e+09	4.097e-19	1.666e-18	1.812e-21	7.370e-21
0.05	1.072e+08	1.296e-13	9.967e-13	3.454e-16	2.655e-15

DOS File: 190-1A.MS5
Run Date: October 14, 1999
Run Time: 9:27:22 AM
Duration: 00:00:10

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	2.961e+06	9.578e-12	1.201e-10	1.902e-14	2.385e-13
0.08	7.089e+07	1.916e-07	4.205e-06	3.032e-10	6.655e-09
0.1	7.808e+08	3.345e-05	1.011e-03	5.118e-08	1.546e-06
0.15	8.951e+01	6.462e-11	2.340e-09	1.064e-13	3.854e-12
0.2	1.238e+08	3.433e-04	1.162e-02	6.058e-07	2.051e-05
0.3	1.349e+04	1.847e-07	4.657e-06	3.503e-10	8.835e-09
0.4	1.293e+07	5.018e-04	9.451e-03	9.777e-07	1.841e-05
0.5	4.482e+06	3.773e-04	5.549e-03	7.407e-07	1.089e-05
0.6	6.028e+11	9.364e+01	1.119e+03	1.828e-01	2.183e+00
0.8	7.429e+08	2.934e-01	2.538e+00	5.581e-04	4.827e-03
1.0	5.588e+08	4.421e-01	3.000e+00	8.150e-04	5.531e-03
1.5	7.086e+08	1.834e+00	8.328e+00	3.085e-03	1.401e-02
2.0	6.324e+00	3.501e-08	1.254e-07	5.414e-11	1.939e-10
TOTALS:	6.551e+11	9.621e+01	1.132e+03	1.872e-01	2.208e+00

Results - Dose Point # 4 - (0,432.1875,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	1.092e-38	1.085e-24	1.082e-40	1.075e-26
0.04	9.719e+09	4.061e-19	1.652e-18	1.796e-21	7.306e-21
0.05	1.072e+08	1.286e-13	9.885e-13	3.425e-16	2.633e-15
0.06	2.961e+06	9.486e-12	1.189e-10	1.884e-14	2.362e-13
0.08	7.089e+07	1.889e-07	4.144e-06	2.990e-10	6.558e-09
0.1	7.808e+08	3.289e-05	9.924e-04	5.032e-08	1.518e-06
0.15	8.951e+01	6.330e-11	2.287e-09	1.042e-13	3.766e-12
0.2	1.238e+08	3.356e-04	1.133e-02	5.924e-07	1.999e-05
0.3	1.349e+04	1.802e-07	4.528e-06	3.418e-10	8.589e-09
0.4	1.293e+07	4.888e-04	9.172e-03	9.523e-07	1.787e-05
0.5	4.482e+06	3.671e-04	5.379e-03	7.206e-07	1.056e-05
0.6	6.028e+11	9.100e+01	1.083e+03	1.776e-01	2.114e+00
0.8	7.429e+08	2.847e-01	2.454e+00	5.415e-04	4.667e-03
1.0	5.588e+08	4.284e-01	2.898e+00	7.897e-04	5.342e-03
1.5	7.086e+08	1.773e+00	8.028e+00	2.983e-03	1.351e-02
2.0	6.324e+00	3.380e-08	1.207e-07	5.227e-11	1.867e-10
TOTALS:	6.551e+11	9.349e+01	1.097e+03	1.819e-01	2.138e+00

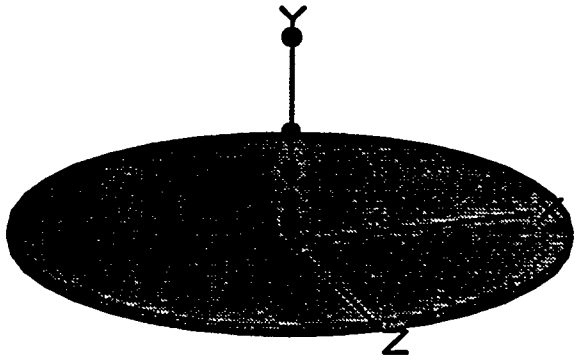
MicroShield v5.03 (5.03-00214)
Lockheed Martin Idaho

Page : 1
DOS File: 190-1B.MS5
Run Date: October 12, 1999
Run Time: 3:25:02 PM
Duration: 00:00:15

COPY

File Ref: NGLW
Date: 10-15-99
By:
Checked:

Case Title: WM-190 DOSE IN TANK
Description: WM-190 / 4" MIX / 12" ADD / 1", 12", 3', 6', 10', 20' / C\L
Geometry: 8 - Cylinder Volume - End Shields



Source Dimensions

Height	10.16 cm	4.0 in
Radius	762.0 cm	25 ft

Dose Points

	X	Y	Z
# 1	0 cm	43.18 cm	0 cm
	0.0 in	1 ft 5.0 in	0.0 in
# 2	0 cm	71.12 cm	0 cm
	0.0 in	2 ft 4.0 in	0.0 in
# 3	0 cm	132.08 cm	0 cm
	0.0 in	4 ft 4.0 in	0.0 in
# 4	0 cm	223.52 cm	0 cm
	0.0 in	7 ft 4.0 in	0.0 in
# 5	0 cm	345.44 cm	0 cm
	0.0 in	11 ft 4.0 in	0.0 in
# 6	0 cm	650.24 cm	0 cm
	0.0 in	21 ft 4.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+06 in³	Concrete	1.6
Shield 1	12.0 in	Concrete	1.6
Air Gap		Air	0.00122
Wall Clad	.313 in	Iron	7.86

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	1.8100e+001	6.6970e+011	9.7662e-001	3.6135e+004
Ce-144	2.2400e-008	8.2880e+002	1.2086e-009	4.4719e-005
Cs-134	1.0300e-003	3.8110e+007	5.5576e-005	2.0563e+000
Cs-137	1.9370e+001	7.1669e+011	1.0451e+000	3.8670e+004
Eu-154	4.9000e-002	1.8130e+009	2.6439e-003	9.7824e+001
Eu-155	6.1700e-003	2.2829e+008	3.3291e-004	1.2318e+001
Pr-144	2.2080e-008	8.1696e+002	1.1914e-009	4.4081e-005

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

ATTACHMENT #8

DOS File: 190-1B.MS5
Run Date: October 12, 1999
Run Time: 3:25:02 PM
Duration: 00:00:15

Results - Dose Point # 1 - (0,17,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	1.967e-25	1.662e-23	1.950e-27	1.647e-25
0.04	9.719e+09	3.574e-13	1.328e-12	1.581e-15	5.871e-15
0.05	1.072e+08	2.342e-10	1.513e-09	6.240e-13	4.032e-12
0.06	2.961e+06	1.081e-09	1.115e-08	2.147e-12	2.214e-11
0.08	7.089e+07	2.306e-06	4.208e-05	3.650e-09	6.659e-08
0.1	7.808e+08	1.802e-04	4.628e-03	2.758e-07	7.081e-06
0.15	8.951e+01	1.898e-10	6.181e-09	3.126e-13	1.018e-11
0.2	1.238e+08	8.596e-04	2.700e-02	1.517e-06	4.765e-05
0.3	1.349e+04	4.199e-07	1.020e-05	7.964e-10	1.935e-08
0.4	1.293e+07	1.108e-03	2.058e-02	2.158e-06	4.011e-05
0.5	4.482e+06	8.243e-04	1.217e-02	1.618e-06	2.389e-05
0.6	6.028e+11	2.041e+02	2.481e+03	3.984e-01	4.842e+00
0.8	7.429e+08	6.437e-01	5.777e+00	1.224e-03	1.099e-02
1.0	5.588e+08	9.828e-01	7.018e+00	1.812e-03	1.294e-02
1.5	7.086e+08	4.253e+00	2.078e+01	7.156e-03	3.496e-02
2.0	6.324e+00	8.479e-08	3.306e-07	1.311e-10	5.112e-10
TOTALS:	6.551e+11	2.100e+02	2.514e+03	4.086e-01	4.901e+00

Results - Dose Point # 2 - (0,28,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	1.945e-25	1.366e-23	1.928e-27	1.354e-25
0.04	9.719e+09	3.545e-13	1.317e-12	1.568e-15	5.824e-15
0.05	1.072e+08	2.326e-10	1.503e-09	6.196e-13	4.004e-12
0.06	2.961e+06	1.074e-09	1.108e-08	2.133e-12	2.200e-11
0.08	7.089e+07	2.293e-06	4.185e-05	3.628e-09	6.622e-08
0.1	7.808e+08	1.792e-04	4.605e-03	2.742e-07	7.046e-06
0.15	8.951e+01	1.888e-10	6.155e-09	3.110e-13	1.014e-11
0.2	1.238e+08	8.555e-04	2.689e-02	1.510e-06	4.747e-05
0.3	1.349e+04	4.181e-07	1.017e-05	7.931e-10	1.929e-08
0.4	1.293e+07	1.103e-03	2.052e-02	2.150e-06	3.999e-05
0.5	4.482e+06	8.215e-04	1.214e-02	1.612e-06	2.383e-05
0.6	6.028e+11	2.034e+02	2.475e+03	3.971e-01	4.830e+00
0.8	7.429e+08	6.418e-01	5.764e+00	1.221e-03	1.096e-02
1.0	5.588e+08	9.802e-01	7.003e+00	1.807e-03	1.291e-02
1.5	7.086e+08	4.244e+00	2.074e+01	7.140e-03	3.490e-02
2.0	6.324e+00	8.462e-08	3.300e-07	1.309e-10	5.104e-10
TOTALS:	6.551e+11	2.093e+02	2.508e+03	4.073e-01	4.889e+00

Results - Dose Point # 3 - (0,52,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	1.898e-25	1.016e-23	1.881e-27	1.007e-25
0.04	9.719e+09	3.483e-13	1.294e-12	1.540e-15	5.723e-15

DOS File: 190-1B.MS5
Run Date: October 12, 1999
Run Time: 3:25:02 PM
Duration: 00:00:15

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.05	1.072e+08	2.291e-10	1.481e-09	6.102e-13	3.945e-12
0.06	2.961e+06	1.059e-09	1.093e-08	2.103e-12	2.171e-11
0.08	7.089e+07	2.263e-06	4.135e-05	3.581e-09	6.544e-08
0.1	7.808e+08	1.770e-04	4.556e-03	2.708e-07	6.970e-06
0.15	8.951e+01	1.867e-10	6.098e-09	3.075e-13	1.004e-11
0.2	1.238e+08	8.468e-04	2.667e-02	1.494e-06	4.707e-05
0.3	1.349e+04	4.143e-07	1.010e-05	7.859e-10	1.915e-08
0.4	1.293e+07	1.094e-03	2.039e-02	2.132e-06	3.973e-05
0.5	4.482e+06	8.152e-04	1.207e-02	1.600e-06	2.369e-05
0.6	6.028e+11	2.020e+02	2.461e+03	3.943e-01	4.803e+00
0.8	7.429e+08	6.377e-01	5.735e+00	1.213e-03	1.091e-02
1.0	5.588e+08	9.745e-01	6.971e+00	1.796e-03	1.285e-02
1.5	7.086e+08	4.223e+00	2.066e+01	7.105e-03	3.477e-02
2.0	6.324e+00	8.425e-08	3.289e-07	1.303e-10	5.086e-10
TOTALS:	6.551e+11	2.078e+02	2.494e+03	4.044e-01	4.862e+00

Results - Dose Point # 4 - (0,88,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	1.829e-25	7.337e-24	1.813e-27	7.271e-26
0.04	9.719e+09	3.391e-13	1.260e-12	1.500e-15	5.574e-15
0.05	1.072e+08	2.238e-10	1.448e-09	5.963e-13	3.857e-12
0.06	2.961e+06	1.036e-09	1.071e-08	2.058e-12	2.127e-11
0.08	7.089e+07	2.219e-06	4.062e-05	3.512e-09	6.428e-08
0.1	7.808e+08	1.738e-04	4.482e-03	2.659e-07	6.857e-06
0.15	8.951e+01	1.836e-10	6.014e-09	3.024e-13	9.903e-12
0.2	1.238e+08	8.338e-04	2.634e-02	1.472e-06	4.649e-05
0.3	1.349e+04	4.087e-07	9.989e-06	7.753e-10	1.895e-08
0.4	1.293e+07	1.081e-03	2.020e-02	2.106e-06	3.935e-05
0.5	4.482e+06	8.059e-04	1.196e-02	1.582e-06	2.348e-05
0.6	6.028e+11	1.998e+02	2.440e+03	3.901e-01	4.763e+00
0.8	7.429e+08	6.316e-01	5.692e+00	1.201e-03	1.083e-02
1.0	5.588e+08	9.659e-01	6.923e+00	1.780e-03	1.276e-02
1.5	7.086e+08	4.191e+00	2.053e+01	7.051e-03	3.454e-02
2.0	6.324e+00	8.366e-08	3.267e-07	1.294e-10	5.052e-10
TOTALS:	6.551e+11	2.056e+02	2.474e+03	4.001e-01	4.822e+00

Results - Dose Point # 5 - (0,136,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	1.742e-25	5.179e-24	1.726e-27	5.133e-26
0.04	9.719e+09	3.273e-13	1.217e-12	1.448e-15	5.381e-15
0.05	1.072e+08	2.171e-10	1.405e-09	5.783e-13	3.744e-12
0.06	2.961e+06	1.007e-09	1.042e-08	2.001e-12	2.070e-11
0.08	7.089e+07	2.162e-06	3.966e-05	3.421e-09	6.276e-08

DOS File: 190-1B.MS5
Run Date: October 12, 1999
Run Time: 3:25:02 PM
Duration: 00:00:15

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.1	7.808e+08	1.695e-04	4.386e-03	2.594e-07	6.710e-06
0.15	8.951e+01	1.796e-10	5.903e-09	2.957e-13	9.721e-12
0.2	1.238e+08	8.167e-04	2.590e-02	1.441e-06	4.572e-05
0.3	1.349e+04	4.013e-07	9.843e-06	7.612e-10	1.867e-08
0.4	1.293e+07	1.063e-03	1.992e-02	2.071e-06	3.881e-05
0.5	4.482e+06	7.934e-04	1.180e-02	1.557e-06	2.316e-05
0.6	6.028e+11	1.969e+02	2.408e+03	3.842e-01	4.699e+00
0.8	7.429e+08	6.226e-01	5.610e+00	1.184e-03	1.067e-02
1.0	5.588e+08	9.521e-01	6.810e+00	1.755e-03	1.255e-02
1.5	7.086e+08	4.121e+00	2.006e+01	6.933e-03	3.375e-02
2.0	6.324e+00	8.192e-08	3.166e-07	1.267e-10	4.895e-10
TOTALS:	6.551e+11	2.026e+02	2.440e+03	3.941e-01	4.757e+00

Results - Dose Point # 6 - (0,256,0) in

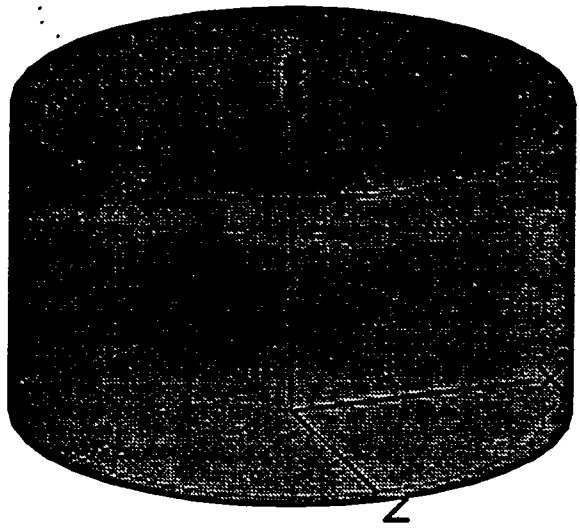
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	1.540e-25	2.625e-24	1.526e-27	2.602e-26
0.04	9.719e+09	2.995e-13	1.114e-12	1.325e-15	4.929e-15
0.05	1.072e+08	2.010e-10	1.304e-09	5.355e-13	3.474e-12
0.06	2.961e+06	9.380e-10	9.739e-09	1.863e-12	1.934e-11
0.08	7.089e+07	2.021e-06	3.725e-05	3.199e-09	5.895e-08
0.1	7.808e+08	1.587e-04	4.122e-03	2.428e-07	6.307e-06
0.15	8.951e+01	1.680e-10	5.522e-09	2.767e-13	9.094e-12
0.2	1.238e+08	7.632e-04	2.406e-02	1.347e-06	4.246e-05
0.3	1.349e+04	3.732e-07	9.003e-06	7.078e-10	1.708e-08
0.4	1.293e+07	9.816e-04	1.795e-02	1.913e-06	3.497e-05
0.5	4.482e+06	7.269e-04	1.048e-02	1.427e-06	2.057e-05
0.6	6.028e+11	1.789e+02	2.108e+03	3.492e-01	4.114e+00
0.8	7.429e+08	5.561e-01	4.787e+00	1.058e-03	9.104e-03
1.0	5.588e+08	8.359e-01	5.678e+00	1.541e-03	1.047e-02
1.5	7.086e+08	3.476e+00	1.592e+01	5.849e-03	2.678e-02
2.0	6.324e+00	6.684e-08	2.420e-07	1.034e-10	3.742e-10
TOTALS:	6.551e+11	1.838e+02	2.134e+03	3.576e-01	4.161e+00

MicroShield v5.03 (5.03-00214)
Lockheed Martin Idaho

Page : 1
DOS File: 190-1C.MS5
Run Date: October 12, 1999
Run Time: 3:46:52 PM
Duration: 00:00:10

File Ref: NCLW
Date: 10-15-99
By:
Checked:

Case Title: WM-190 ON ROOF- C\L
Description: WM-190 ON ROOF / NO GROUT ADDED / DOSE @ 1", 1, 2,3,4 FT
Geometry: 8 - Cylinder Volume - End Shields



Source Dimensions

Height	1.036 cm	0.4 in
Radius	762.0 cm	25 ft

Dose Points

	X	Y	Z
# 1	0 cm	9.78e+02 cm	0 cm
	0.0 in	32 ft 1.2 in	0.0 in
# 2	0 cm	1.01e+03 cm	0 cm
	0.0 in	33 ft 0.2 in	0.0 in
# 3	0 cm	1.07e+03 cm	0 cm
	0.0 in	35 ft 0.2 in	0.0 in
# 4	0 cm	1.10e+03 cm	0 cm
	0.0 in	36 ft 0.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.15e+05 in³	Water	1
Shield 1	383.592 in	Air	0.00122
Shield 2	.188 in	Iron	7.86
Air Gap		Air	0.00122
Wall Clad	.25 in	Iron	7.86

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	1.8100e+001	6.6970e+011	9.5747e+000	3.5426e+005
Ce-144	2.2400e-008	8.2880e+002	1.1849e-008	4.3843e-004
Cs-134	1.0300e-003	3.8110e+007	5.4486e-004	2.0160e+001
Cs-137	1.9370e+001	7.1669e+011	1.0247e+001	3.7912e+005
Eu-154	4.9000e-002	1.8130e+009	2.5920e-002	9.5906e+002
Eu-155	6.1700e-003	2.2829e+008	3.2639e-003	1.2076e+002
Pr-144	2.2080e-008	8.1696e+002	1.1680e-008	4.3216e-004

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results - Dose Point # 1 - (0,385.1875,0) in

ATTACHMENT #9

DOS File: 190-1C.MS5
Run Date: October 12, 1999
Run Time: 3:46:52 PM
Duration: 00:00:10

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	7.608e-13	8.299e-13	7.540e-15	8.225e-15
0.04	9.719e+09	1.077e-05	1.247e-05	4.761e-08	5.514e-08
0.05	1.072e+08	1.092e-04	1.353e-04	2.909e-07	3.605e-07
0.06	2.961e+06	7.248e-05	9.563e-05	1.440e-07	1.900e-07
0.08	7.089e+07	2.657e-02	3.859e-02	4.204e-05	6.108e-05
0.1	7.808e+08	8.926e-01	1.393e+00	1.366e-03	2.131e-03
0.15	8.951e+01	3.100e-07	5.260e-07	5.104e-10	8.663e-10
0.2	1.238e+08	7.056e-01	1.213e+00	1.245e-03	2.141e-03
0.3	1.349e+04	1.362e-04	2.252e-04	2.583e-07	4.271e-07
0.4	1.293e+07	1.891e-01	2.970e-01	3.684e-04	5.788e-04
0.5	4.482e+06	8.652e-02	1.296e-01	1.698e-04	2.543e-04
0.6	6.028e+11	1.455e+04	2.091e+04	2.840e+01	4.081e+01
0.8	7.429e+08	2.539e+01	3.431e+01	4.830e-02	6.526e-02
1.0	5.588e+08	2.493e+01	3.231e+01	4.595e-02	5.956e-02
1.5	7.086e+08	5.083e+01	6.171e+01	8.553e-02	1.038e-01
2.0	6.324e+00	6.298e-07	7.395e-07	9.739e-10	1.144e-09
TOTALS:	6.551e+11	1.465e+04	2.104e+04	2.859e+01	4.104e+01

Results - Dose Point # 2 - (0,396.1875,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	7.520e-13	8.204e-13	7.453e-15	8.130e-15
0.04	9.719e+09	1.063e-05	1.231e-05	4.700e-08	5.443e-08
0.05	1.072e+08	1.068e-04	1.324e-04	2.846e-07	3.527e-07
0.06	2.961e+06	7.036e-05	9.282e-05	1.397e-07	1.844e-07
0.08	7.089e+07	2.556e-02	3.713e-02	4.045e-05	5.875e-05
0.1	7.808e+08	8.559e-01	1.336e+00	1.309e-03	2.043e-03
0.15	8.951e+01	2.964e-07	5.030e-07	4.881e-10	8.283e-10
0.2	1.238e+08	6.742e-01	1.159e+00	1.190e-03	2.046e-03
0.3	1.349e+04	1.301e-04	2.152e-04	2.468e-07	4.082e-07
0.4	1.293e+07	1.806e-01	2.839e-01	3.519e-04	5.531e-04
0.5	4.482e+06	8.266e-02	1.238e-01	1.623e-04	2.431e-04
0.6	6.028e+11	1.390e+04	1.998e+04	2.714e+01	3.900e+01
0.8	7.429e+08	2.426e+01	3.279e+01	4.615e-02	6.237e-02
1.0	5.588e+08	2.382e+01	3.088e+01	4.391e-02	5.693e-02
1.5	7.086e+08	4.858e+01	5.898e+01	8.173e-02	9.924e-02
2.0	6.324e+00	6.018e-07	7.069e-07	9.307e-10	1.093e-09
TOTALS:	6.551e+11	1.400e+04	2.011e+04	2.731e+01	3.923e+01

Results - Dose Point # 3 - (0,420.1875,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	7.332e-13	7.998e-13	7.267e-15	7.927e-15
0.04	9.719e+09	1.031e-05	1.194e-05	4.560e-08	5.281e-08
0.05	1.072e+08	1.017e-04	1.260e-04	2.708e-07	3.355e-07

DOS File: 190-1C.MS5
Run Date: October 12, 1999
Run Time: 3:46:52 PM
Duration: 00:00:10

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	2.961e+06	6.586e-05	8.687e-05	1.308e-07	1.726e-07
0.08	7.089e+07	2.352e-02	3.413e-02	3.721e-05	5.402e-05
0.1	7.808e+08	7.817e-01	1.219e+00	1.196e-03	1.865e-03
0.15	8.951e+01	2.693e-07	4.571e-07	4.434e-10	7.527e-10
0.2	1.238e+08	6.118e-01	1.053e+00	1.080e-03	1.858e-03
0.3	1.349e+04	1.180e-04	1.954e-04	2.238e-07	3.707e-07
0.4	1.293e+07	1.638e-01	2.579e-01	3.193e-04	5.024e-04
0.5	4.482e+06	7.500e-02	1.125e-01	1.472e-04	2.208e-04
0.6	6.028e+11	1.262e+04	1.816e+04	2.462e+01	3.544e+01
0.8	7.429e+08	2.202e+01	2.979e+01	4.188e-02	5.666e-02
1.0	5.588e+08	2.162e+01	2.806e+01	3.985e-02	5.172e-02
1.5	7.086e+08	4.410e+01	5.359e+01	7.421e-02	9.016e-02
2.0	6.324e+00	5.465e-07	6.422e-07	8.451e-10	9.931e-10
TOTALS:	6.551e+11	1.270e+04	1.827e+04	2.478e+01	3.564e+01

Results - Dose Point # 4 - (0,432.1875,0) in

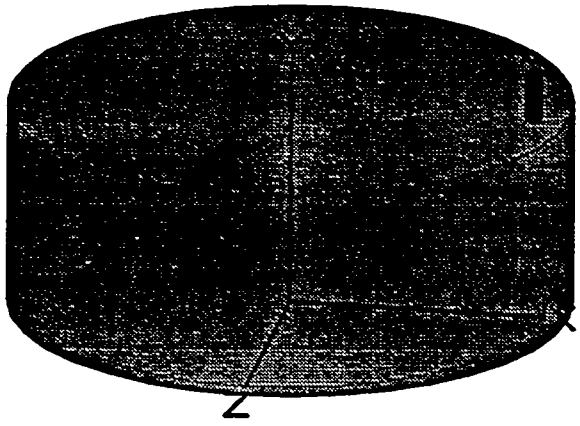
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	7.239e-13	7.896e-13	7.174e-15	7.826e-15
0.04	9.719e+09	1.015e-05	1.175e-05	4.487e-08	5.196e-08
0.05	1.072e+08	9.908e-05	1.227e-04	2.639e-07	3.269e-07
0.06	2.961e+06	6.369e-05	8.400e-05	1.265e-07	1.668e-07
0.08	7.089e+07	2.256e-02	3.274e-02	3.570e-05	5.181e-05
0.1	7.808e+08	7.476e-01	1.166e+00	1.144e-03	1.784e-03
0.15	8.951e+01	2.569e-07	4.362e-07	4.230e-10	7.183e-10
0.2	1.238e+08	5.834e-01	1.005e+00	1.030e-03	1.773e-03
0.3	1.349e+04	1.125e-04	1.865e-04	2.134e-07	3.537e-07
0.4	1.293e+07	1.562e-01	2.461e-01	3.044e-04	4.794e-04
0.5	4.482e+06	7.152e-02	1.074e-01	1.404e-04	2.107e-04
0.6	6.028e+11	1.203e+04	1.733e+04	2.348e+01	3.382e+01
0.8	7.429e+08	2.100e+01	2.843e+01	3.995e-02	5.408e-02
1.0	5.588e+08	2.062e+01	2.678e+01	3.802e-02	4.936e-02
1.5	7.086e+08	4.208e+01	5.115e+01	7.080e-02	8.605e-02
2.0	6.324e+00	5.215e-07	6.130e-07	8.064e-10	9.479e-10
TOTALS:	6.551e+11	1.212e+04	1.744e+04	2.364e+01	3.402e+01

MicroShield v5.03 (5.03-00214)
Lockheed Martin Idaho

Page : 1
DOS File: 190-1D.MS5
Run Date: October 12, 1999
Run Time: 4:13:44 PM
Duration: 00:03:42

File Ref: NGLW
Date: 10-25-99
By: CWP
Checked:

Case Title: WM-190 ON ROOF- SIDE
Description: WM-190 ON ROOF PERIM./ NO GROUT/DOSE @ 1", 1, 2, 3, 4 FT
Geometry: 8 - Cylinder Volume - End Shields



Source Dimensions

Height	1.036 cm	0.4 in
Radius	762.0 cm	25 ft

Dose Points

	X	Y	Z
# 1	731.52 cm	6.48e+02 cm	0 cm
	24 ft	21 ft 3.2 in	0.0 in
# 2	731.52 cm	6.76e+02 cm	0 cm
	24 ft	22 ft 2.2 in	0.0 in
# 3	731.52 cm	7.07e+02 cm	0 cm
	24 ft	23 ft 2.2 in	0.0 in
# 4	731.52 cm	7.37e+02 cm	0 cm
	24 ft	24 ft 2.2 in	0.0 in
# 5	731.52 cm	7.68e+02 cm	0 cm
	24 ft	25 ft 2.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.15e+05 in³	Water	1
Shield 1	253.592 in	Air	0.00122
Shield 2	.188 in	Iron	7.86
Air Gap		Air	0.00122
Wall Clad	.25 in	Iron	7.86

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	1.8100e+001	6.6970e+011	9.5747e+000	3.5426e+005
Ce-144	2.2400e-008	8.2880e+002	1.1849e-008	4.3843e-004
Cs-134	1.0300e-003	3.8110e+007	5.4486e-004	2.0160e+001
Cs-137	1.9370e+001	7.1669e+011	1.0247e+001	3.7912e+005
Eu-154	4.9000e-002	1.8130e+009	2.5920e-002	9.5906e+002
Eu-155	6.1700e-003	2.2829e+008	3.2639e-003	1.2076e+002
Pr-144	2.2080e-008	8.1696e+002	1.1680e-008	4.3216e-004

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

ATTACHMENT #10

DOS File: 190-1D.MS5
Run Date: October 12, 1999
Run Time: 4:13:44 PM
Duration: 00:03:42

Results - Dose Point # 1 - (288,255.1875,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	4.984e-13	5.436e-13	4.940e-15	5.388e-15
0.04	9.719e+09	6.356e-06	7.359e-06	2.811e-08	3.255e-08
0.05	1.072e+08	6.572e-05	8.147e-05	1.751e-07	2.170e-07
0.06	2.961e+06	4.771e-05	6.314e-05	9.476e-08	1.254e-07
0.08	7.089e+07	2.123e-02	3.128e-02	3.360e-05	4.951e-05
0.1	7.808e+08	8.088e-01	1.293e+00	1.237e-03	1.978e-03
0.15	8.951e+01	3.192e-07	5.654e-07	5.256e-10	9.311e-10
0.2	1.238e+08	7.575e-01	1.377e+00	1.337e-03	2.429e-03
0.3	1.349e+04	1.508e-04	2.650e-04	2.861e-07	5.027e-07
0.4	1.293e+07	2.125e-01	3.542e-01	4.141e-04	6.902e-04
0.5	4.482e+06	9.820e-02	1.555e-01	1.927e-04	3.052e-04
0.6	6.028e+11	1.663e+04	2.520e+04	3.246e+01	4.919e+01
0.8	7.429e+08	2.933e+01	4.161e+01	5.579e-02	7.914e-02
1.0	5.588e+08	2.902e+01	3.933e+01	5.348e-02	7.250e-02
1.5	7.086e+08	5.991e+01	7.542e+01	1.008e-01	1.269e-01
2.0	6.324e+00	7.475e-07	9.056e-07	1.156e-09	1.400e-09
TOTALS:	6.551e+11	1.675e+04	2.536e+04	3.268e+01	4.947e+01

Results - Dose Point # 2 - (288,266.1875,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	4.880e-13	5.322e-13	4.836e-15	5.275e-15
0.04	9.719e+09	6.243e-06	7.228e-06	2.761e-08	3.197e-08
0.05	1.072e+08	6.455e-05	8.002e-05	1.719e-07	2.132e-07
0.06	2.961e+06	4.679e-05	6.193e-05	9.293e-08	1.230e-07
0.08	7.089e+07	2.071e-02	3.051e-02	3.278e-05	4.828e-05
0.1	7.808e+08	7.849e-01	1.254e+00	1.201e-03	1.918e-03
0.15	8.951e+01	3.078e-07	5.444e-07	5.068e-10	8.965e-10
0.2	1.238e+08	7.288e-01	1.322e+00	1.286e-03	2.333e-03
0.3	1.349e+04	1.449e-04	2.539e-04	2.749e-07	4.817e-07
0.4	1.293e+07	2.040e-01	3.391e-01	3.975e-04	6.608e-04
0.5	4.482e+06	9.422e-02	1.488e-01	1.849e-04	2.921e-04
0.6	6.028e+11	1.595e+04	2.411e+04	3.114e+01	4.707e+01
0.8	7.429e+08	2.812e+01	3.980e+01	5.348e-02	7.570e-02
1.0	5.588e+08	2.781e+01	3.762e+01	5.126e-02	6.934e-02
1.5	7.086e+08	5.738e+01	7.211e+01	9.654e-02	1.213e-01
2.0	6.324e+00	7.157e-07	8.657e-07	1.107e-09	1.339e-09
TOTALS:	6.551e+11	1.607e+04	2.427e+04	3.134e+01	4.734e+01

Results - Dose Point # 3 - (288,278.1875,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	4.771e-13	5.204e-13	4.728e-15	5.157e-15
0.04	9.719e+09	6.124e-06	7.090e-06	2.708e-08	3.136e-08

DOS File: 190-1D.MS5
Run Date: October 12, 1999
Run Time: 4:13:44 PM
Duration: 00:03:42

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.05	1.072e+08	6.331e-05	7.849e-05	1.687e-07	2.091e-07
0.06	2.961e+06	4.581e-05	6.063e-05	9.099e-08	1.204e-07
0.08	7.089e+07	2.015e-02	2.968e-02	3.189e-05	4.697e-05
0.1	7.808e+08	7.595e-01	1.212e+00	1.162e-03	1.854e-03
0.15	8.951e+01	2.958e-07	5.225e-07	4.872e-10	8.604e-10
0.2	1.238e+08	6.989e-01	1.265e+00	1.234e-03	2.232e-03
0.3	1.349e+04	1.387e-04	2.425e-04	2.632e-07	4.600e-07
0.4	1.293e+07	1.952e-01	3.237e-01	3.803e-04	6.306e-04
0.5	4.482e+06	9.011e-02	1.420e-01	1.769e-04	2.786e-04
0.6	6.028e+11	1.525e+04	2.300e+04	2.977e+01	4.489e+01
0.8	7.429e+08	2.687e+01	3.795e+01	5.111e-02	7.218e-02
1.0	5.588e+08	2.656e+01	3.586e+01	4.896e-02	6.610e-02
1.5	7.086e+08	5.478e+01	6.873e+01	9.217e-02	1.156e-01
2.0	6.324e+00	6.831e-07	8.249e-07	1.056e-09	1.276e-09
TOTALS:	6.551e+11	1.536e+04	2.314e+04	2.997e+01	4.515e+01

Results - Dose Point # 4 - (288,290.1875,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	4.667e-13	5.090e-13	4.625e-15	5.045e-15
0.04	9.719e+09	6.009e-06	6.958e-06	2.658e-08	3.077e-08
0.05	1.072e+08	6.211e-05	7.701e-05	1.655e-07	2.052e-07
0.06	2.961e+06	4.485e-05	5.937e-05	8.909e-08	1.179e-07
0.08	7.089e+07	1.961e-02	2.887e-02	3.103e-05	4.568e-05
0.1	7.808e+08	7.348e-01	1.172e+00	1.124e-03	1.793e-03
0.15	8.951e+01	2.844e-07	5.016e-07	4.683e-10	8.260e-10
0.2	1.238e+08	6.705e-01	1.211e+00	1.183e-03	2.137e-03
0.3	1.349e+04	1.329e-04	2.318e-04	2.521e-07	4.396e-07
0.4	1.293e+07	1.868e-01	3.091e-01	3.641e-04	6.023e-04
0.5	4.482e+06	8.622e-02	1.355e-01	1.692e-04	2.660e-04
0.6	6.028e+11	1.459e+04	2.196e+04	2.848e+01	4.285e+01
0.8	7.429e+08	2.569e+01	3.622e+01	4.887e-02	6.889e-02
1.0	5.588e+08	2.539e+01	3.422e+01	4.680e-02	6.308e-02
1.5	7.086e+08	5.234e+01	6.556e+01	8.806e-02	1.103e-01
2.0	6.324e+00	6.524e-07	7.868e-07	1.009e-09	1.217e-09
TOTALS:	6.551e+11	1.470e+04	2.209e+04	2.867e+01	4.310e+01

Results - Dose Point # 5 - (288,302.1875,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	4.567e-13	4.981e-13	4.526e-15	4.937e-15
0.04	9.719e+09	5.899e-06	6.830e-06	2.609e-08	3.021e-08
0.05	1.072e+08	6.095e-05	7.557e-05	1.624e-07	2.013e-07
0.06	2.961e+06	4.392e-05	5.813e-05	8.723e-08	1.155e-07
0.08	7.089e+07	1.907e-02	2.807e-02	3.018e-05	4.442e-05

DOS File: 190-1D.MS5
Run Date: October 12, 1999
Run Time: 4:13:44 PM
Duration: 00:03:42

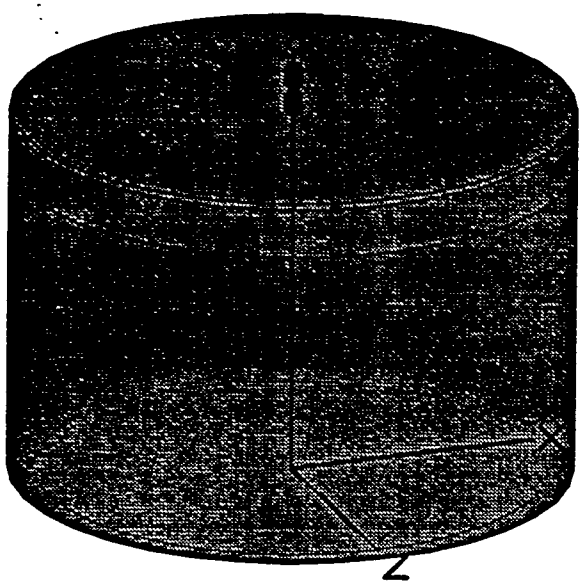
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.1	7.808e+08	7.109e-01	1.133e+00	1.088e-03	1.733e-03
0.15	8.951e+01	2.735e-07	4.817e-07	4.503e-10	7.932e-10
0.2	1.238e+08	6.434e-01	1.160e+00	1.136e-03	2.048e-03
0.3	1.349e+04	1.273e-04	2.217e-04	2.416e-07	4.205e-07
0.4	1.293e+07	1.790e-01	2.955e-01	3.487e-04	5.757e-04
0.5	4.482e+06	8.255e-02	1.295e-01	1.620e-04	2.542e-04
0.6	6.028e+11	1.397e+04	2.098e+04	2.726e+01	4.094e+01
0.8	7.429e+08	2.458e+01	3.460e+01	4.676e-02	6.580e-02
1.0	5.588e+08	2.429e+01	3.268e+01	4.477e-02	6.024e-02
1.5	7.086e+08	5.004e+01	6.260e+01	8.419e-02	1.053e-01
2.0	6.324e+00	6.236e-07	7.512e-07	9.644e-10	1.162e-09
TOTALS:	6.551e+11	1.407e+04	2.111e+04	2.744e+01	4.118e+01

MicroShield v5.03 (5.03-00214)
Lockheed Martin Idaho

Page : 1
DOS File: 190-E.MS5
Run Date: October 12, 1999
Run Time: 5:23:07 PM
Duration: 00:00:10

File Ref: NGLW
Date: 10-15-99
By:
Checked:

Case Title: WM-190 @ VLT. ROOF
Description: WM-190 VLT. ROOF / NO GROUT ADDED / DOSE @ 1", 1, 2,3,4 FT
Geometry: 8 - Cylinder Volume - End Shields



Source Dimensions

Height	1.036 cm	0.4 in
Radius	762.0 cm	25 ft

Dose Points

	X	Y	Z
# 1	0 cm	1.15e+03 cm	0 cm
	0.0 in	37 ft 9.2 in	0.0 in
# 2	0 cm	1.18e+03 cm	0 cm
	0.0 in	38 ft 8.2 in	0.0 in
# 3	.0 cm	1.24e+03 cm	0 cm
	0.0 in	40 ft 8.2 in	0.0 in
# 4	0 cm	1.27e+03 cm	0 cm
	0.0 in	41 ft 8.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.15e+05 in³	Water	1
Shield 1	383.592 in	Air	0.00122
Shield 2	.188 in	Iron	7.86
Shield 3	60.0 in	Air	0.00122
Shield 4	8.0 in	Concrete	2.35
Air Gap		Air	0.00122
Wall Clad	.25 in	Iron	7.86

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	1.8100e+001	6.6970e+011	9.5747e+000	3.5426e+005
Ce-144	2.2400e-008	8.2880e+002	1.1849e-008	4.3843e-004
Cs-134	1.0300e-003	3.8110e+007	5.4486e-004	2.0160e+001
Cs-137	1.9370e+001	7.1669e+011	1.0247e+001	3.7912e+005
Eu-154	4.9000e-002	1.8130e+009	2.5920e-002	9.5906e+002
Eu-155	6.1700e-003	2.2829e+008	3.2639e-003	1.2076e+002
Pr-144	2.2080e-008	8.1696e+002	1.1680e-008	4.3216e-004

Buildup
The material reference is : Shield 4

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

ATTACHMENT # 11

DOS File: 190-E.MS5
Run Date: October 12, 1999
Run Time: 5:23:07 PM
Duration: 00:00:10

Results - Dose Point # 1 - (0,453.1875,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	5.402e-37	9.982e-25	5.354e-39	9.892e-27
0.04	9.719e+09	5.963e-18	2.417e-17	2.637e-20	1.069e-19
0.05	1.072e+08	1.018e-12	7.628e-12	2.713e-15	2.032e-14
0.06	2.961e+06	5.271e-11	6.321e-10	1.047e-13	1.255e-12
0.08	7.089e+07	7.334e-07	1.481e-05	1.161e-09	2.344e-08
0.1	7.808e+08	1.081e-04	2.901e-03	1.654e-07	4.438e-06
0.15	8.951e+01	1.732e-10	5.328e-09	2.853e-13	8.773e-12
0.2	1.238e+08	8.366e-04	2.359e-02	1.477e-06	4.163e-05
0.3	1.349e+04	3.996e-07	8.337e-06	7.580e-10	1.582e-08
0.4	1.293e+07	1.001e-03	1.566e-02	1.951e-06	3.051e-05
0.5	4.482e+06	7.082e-04	8.715e-03	1.390e-06	1.711e-05
0.6	6.028e+11	1.673e+02	1.685e+03	3.265e-01	3.289e+00
0.8	7.429e+08	4.859e-01	3.584e+00	9.241e-04	6.817e-03
1.0	5.588e+08	6.915e-01	4.047e+00	1.275e-03	7.459e-03
1.5	7.086e+08	2.602e+00	1.042e+01	4.378e-03	1.753e-02
2.0	6.324e+00	4.675e-08	1.499e-07	7.229e-11	2.317e-10
TOTALS:	6.551e+11	1.711e+02	1.703e+03	3.331e-01	3.321e+00

Results - Dose Point # 2 - (0,464.1875,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	5.342e-37	9.586e-25	5.294e-39	9.501e-27
0.04	9.719e+09	5.914e-18	2.397e-17	2.616e-20	1.060e-19
0.05	1.072e+08	1.010e-12	7.564e-12	2.690e-15	2.015e-14
0.06	2.961e+06	5.214e-11	6.252e-10	1.036e-13	1.242e-12
0.08	7.089e+07	7.220e-07	1.457e-05	1.143e-09	2.306e-08
0.1	7.808e+08	1.061e-04	2.843e-03	1.624e-07	4.349e-06
0.15	8.951e+01	1.695e-10	5.199e-09	2.791e-13	8.562e-12
0.2	1.238e+08	8.170e-04	2.297e-02	1.442e-06	4.055e-05
0.3	1.349e+04	3.896e-07	8.104e-06	7.390e-10	1.537e-08
0.4	1.293e+07	9.750e-04	1.520e-02	1.900e-06	2.961e-05
0.5	4.482e+06	6.889e-04	8.453e-03	1.352e-06	1.659e-05
0.6	6.028e+11	1.626e+02	1.633e+03	3.174e-01	3.187e+00
0.8	7.429e+08	4.717e-01	3.470e+00	8.971e-04	6.600e-03
1.0	5.588e+08	6.707e-01	3.915e+00	1.236e-03	7.217e-03
1.5	7.086e+08	2.520e+00	1.007e+01	4.240e-03	1.694e-02
2.0	6.324e+00	4.523e-08	1.447e-07	6.994e-11	2.237e-10
TOTALS:	6.551e+11	1.663e+02	1.651e+03	3.238e-01	3.218e+00

Results - Dose Point # 3 - (0,488.1875,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	5.213e-37	8.799e-25	5.166e-39	8.720e-27
0.04	9.719e+09	5.809e-18	2.354e-17	2.569e-20	1.041e-19

DOS File: 190-E.MS5
Run Date: October 12, 1999
Run Time: 5:23:07 PM
Duration: 00:00:10

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.05	1.072e+08	9.904e-13	7.420e-12	2.638e-15	1.977e-14
0.06	2.961e+06	5.086e-11	6.095e-10	1.010e-13	1.211e-12
0.08	7.089e+07	6.966e-07	1.403e-05	1.102e-09	2.220e-08
0.1	7.808e+08	1.017e-04	2.716e-03	1.556e-07	4.156e-06
0.15	8.951e+01	1.613e-10	4.925e-09	2.656e-13	8.110e-12
0.2	1.238e+08	7.751e-04	2.168e-02	1.368e-06	3.826e-05
0.3	1.349e+04	3.682e-07	7.614e-06	6.984e-10	1.444e-08
0.4	1.293e+07	9.193e-04	1.424e-02	1.791e-06	2.776e-05
0.5	4.482e+06	6.482e-04	7.908e-03	1.272e-06	1.552e-05
0.6	6.028e+11	1.528e+02	1.526e+03	2.982e-01	2.978e+00
0.8	7.429e+08	4.421e-01	3.235e+00	8.409e-04	6.154e-03
1.0	5.588e+08	6.275e-01	3.645e+00	1.157e-03	6.719e-03
1.5	7.086e+08	2.350e+00	9.348e+00	3.955e-03	1.573e-02
2.0	6.324e+00	4.210e-08	1.342e-07	6.510e-11	2.075e-10
TOTALS:	6.551e+11	1.562e+02	1.542e+03	3.042e-01	3.007e+00

Results - Dose Point # 4 - (0,500.1875,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	5.149e-37	8.439e-25	5.103e-39	8.364e-27
0.04	9.719e+09	5.756e-18	2.333e-17	2.546e-20	1.032e-19
0.05	1.072e+08	9.805e-13	7.345e-12	2.612e-15	1.957e-14
0.06	2.961e+06	5.019e-11	6.013e-10	9.969e-14	1.194e-12
0.08	7.089e+07	6.836e-07	1.376e-05	1.082e-09	2.177e-08
0.1	7.808e+08	9.952e-05	2.653e-03	1.523e-07	4.059e-06
0.15	8.951e+01	1.573e-10	4.791e-09	2.590e-13	7.890e-12
0.2	1.238e+08	7.546e-04	2.105e-02	1.332e-06	3.715e-05
0.3	1.349e+04	3.578e-07	7.380e-06	6.788e-10	1.400e-08
0.4	1.293e+07	8.924e-04	1.379e-02	1.739e-06	2.687e-05
0.5	4.482e+06	6.288e-04	7.651e-03	1.234e-06	1.502e-05
0.6	6.028e+11	1.481e+02	1.475e+03	2.890e-01	2.879e+00
0.8	7.429e+08	4.281e-01	3.125e+00	8.142e-04	5.944e-03
1.0	5.588e+08	6.071e-01	3.518e+00	1.119e-03	6.485e-03
1.5	7.086e+08	2.271e+00	9.013e+00	3.820e-03	1.516e-02
2.0	6.324e+00	4.064e-08	1.293e-07	6.284e-11	1.999e-10
TOTALS:	6.551e+11	1.514e+02	1.491e+03	2.948e-01	2.907e+00

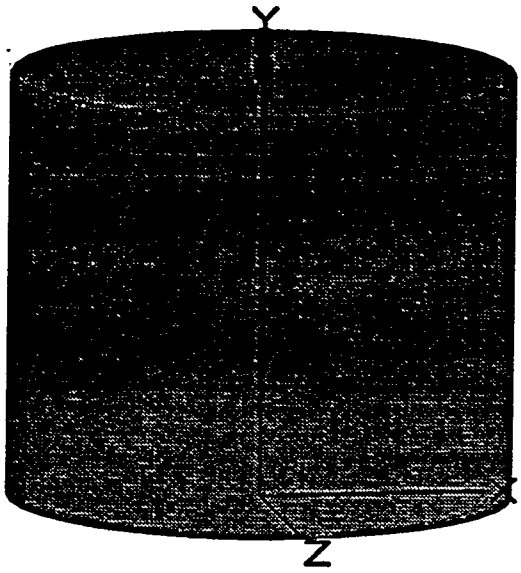
MicroShield v5.03 (5.03-00214)
Lockheed Martin Idaho

Page : 1
DOS File: 190-1F.MS5
Run Date: October 13, 1999
Run Time: 3:33:40 PM
Duration: 00:00:09

File Ref: NCLW
Date: 10-25-99
By: WH
Checked: [illegible]

Case Title: WM-190 TANK RISER
Description: TANK RISER WM-190 / NO GROUT ADDED / DOSE @ 1", 1, 2,3,4 FT
Geometry: 8 - Cylinder Volume - End Shields

N/A



Source Dimensions

Height	1.036 cm	0.4 in
Radius	762.0 cm	25 ft

Dose Points

	X	Y	Z
# 1	0 cm	1435.1 cm	0 cm
	0.0 in	47 ft 1.0 in	0.0 in
# 2	0 cm	1463.04 cm	0 cm
	0.0 in	48 ft	0.0 in
# 3	0 cm	1524 cm	0 cm
	0.0 in	50 ft	0.0 in
# 4	0 cm	1554.48 cm	0 cm
	0.0 in	51 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.15e+05 in³	Water	1
Shield 1	563.592 in	Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.25 in	Iron	7.86

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	1.8100e+001	6.6970e+011	9.5747e+000	3.5426e+005
Ce-144	2.2400e-008	8.2880e+002	1.1849e-008	4.3843e-004
Cs-134	1.0300e-003	3.8110e+007	5.4486e-004	2.0160e+001
Cs-137	1.9370e+001	7.1669e+011	1.0247e+001	3.7912e+005
Eu-154	4.9000e-002	1.8130e+009	2.5920e-002	9.5906e+002
Eu-155	6.1700e-003	2.2829e+008	3.2639e-003	1.2076e+002
Pr-144	2.2080e-008	8.1696e+002	1.1680e-008	4.3216e-004

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results - Dose Point # 1 - (0,565,0) in

ATTACHMENT #12

DOS File: 190-1F.MS5
Run Date: October 13, 1999
Run Time: 3:33:40 PM
Duration: 00:00:09

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	1.832e+01	3.787e+01	1.815e-01	3.754e-01
0.04	9.719e+09	7.529e+00	1.745e+01	3.330e-02	7.720e-02
0.05	1.072e+08	1.128e-01	2.673e-01	3.005e-04	7.122e-04
0.06	2.961e+06	3.898e-03	8.974e-03	7.742e-06	1.782e-05
0.08	7.089e+07	1.299e-01	2.715e-01	2.055e-04	4.296e-04
0.1	7.808e+08	1.835e+00	3.470e+00	2.807e-03	5.309e-03
0.15	8.951e+01	3.287e-07	5.477e-07	5.413e-10	9.019e-10
0.2	1.238e+08	6.238e-01	9.199e-01	1.101e-03	1.624e-03
0.3	1.349e+04	1.061e-04	1.423e-04	2.012e-07	2.700e-07
0.4	1.293e+07	1.394e-01	1.769e-01	2.716e-04	3.447e-04
0.5	4.482e+06	6.161e-02	7.540e-02	1.209e-04	1.480e-04
0.6	6.028e+11	1.011e+04	1.206e+04	1.972e+01	2.354e+01
0.8	7.429e+08	1.701e+01	1.960e+01	3.235e-02	3.727e-02
1.0	5.588e+08	1.628e+01	1.837e+01	3.001e-02	3.386e-02
1.5	7.086e+08	3.188e+01	3.487e+01	5.364e-02	5.866e-02
2.0	6.324e+00	3.862e-07	4.145e-07	5.973e-10	6.410e-10
TOTALS:	6.551e+11	1.020e+04	1.219e+04	2.006e+01	2.413e+01

Results - Dose Point # 2 - (0,576,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	1.752e+01	3.643e+01	1.737e-01	3.610e-01
0.04	9.719e+09	7.224e+00	1.688e+01	3.195e-02	7.464e-02
0.05	1.072e+08	1.083e-01	2.592e-01	2.886e-04	6.904e-04
0.06	2.961e+06	3.746e-03	8.708e-03	7.440e-06	1.730e-05
0.08	7.089e+07	1.249e-01	2.635e-01	1.976e-04	4.169e-04
0.1	7.808e+08	1.765e+00	3.365e+00	2.700e-03	5.148e-03
0.15	8.951e+01	3.163e-07	5.305e-07	5.209e-10	8.735e-10
0.2	1.238e+08	6.005e-01	8.899e-01	1.060e-03	1.571e-03
0.3	1.349e+04	1.022e-04	1.376e-04	1.938e-07	2.610e-07
0.4	1.293e+07	1.343e-01	1.710e-01	2.616e-04	3.331e-04
0.5	4.482e+06	5.938e-02	7.285e-02	1.166e-04	1.430e-04
0.6	6.028e+11	9.741e+03	1.165e+04	1.901e+01	2.274e+01
0.8	7.429e+08	1.640e+01	1.893e+01	3.120e-02	3.600e-02
1.0	5.588e+08	1.570e+01	1.774e+01	2.894e-02	3.271e-02
1.5	7.086e+08	3.076e+01	3.368e+01	5.175e-02	5.666e-02
2.0	6.324e+00	3.727e-07	4.004e-07	5.764e-10	6.191e-10
TOTALS:	6.551e+11	9.831e+03	1.178e+04	1.934e+01	2.331e+01

Results - Dose Point # 3 - (0,600,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	1.593e+01	3.352e+01	1.579e-01	3.322e-01
0.04	9.719e+09	6.611e+00	1.570e+01	2.924e-02	6.943e-02
0.05	1.072e+08	9.938e-02	2.425e-01	2.647e-04	6.460e-04

DOS File: 190-1F.MS5
Run Date: October 13, 1999
Run Time: 3:33:40 PM
Duration: 00:00:09

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	2.961e+06	3.440e-03	8.166e-03	6.833e-06	1.622e-05
0.08	7.089e+07	1.148e-01	2.471e-01	1.817e-04	3.911e-04
0.1	7.808e+08	1.624e+00	3.151e+00	2.484e-03	4.820e-03
0.15	8.951e+01	2.914e-07	4.956e-07	4.799e-10	8.161e-10
0.2	1.238e+08	5.537e-01	8.293e-01	9.772e-04	1.464e-03
0.3	1.349e+04	9.431e-05	1.280e-04	1.789e-07	2.429e-07
0.4	1.293e+07	1.240e-01	1.590e-01	2.417e-04	3.097e-04
0.5	4.482e+06	5.488e-02	6.770e-02	1.077e-04	1.329e-04
0.6	6.028e+11	9.006e+03	1.082e+04	1.758e+01	2.113e+01
0.8	7.429e+08	1.517e+01	1.758e+01	2.886e-02	3.344e-02
1.0	5.588e+08	1.453e+01	1.648e+01	2.679e-02	3.038e-02
1.5	7.086e+08	2.849e+01	3.128e+01	4.794e-02	5.262e-02
2.0	6.324e+00	3.455e-07	3.718e-07	5.342e-10	5.750e-10
TOTALS:	6.551e+11	9.090e+03	1.094e+04	1.787e+01	2.165e+01

Results - Dose Point # 4 - (0,612,0) in

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.945e+10	1.521e+01	3.218e+01	1.507e-01	3.189e-01
0.04	9.719e+09	6.329e+00	1.515e+01	2.799e-02	6.700e-02
0.05	1.072e+08	9.526e-02	2.348e-01	2.538e-04	6.254e-04
0.06	2.961e+06	3.299e-03	7.914e-03	6.554e-06	1.572e-05
0.08	7.089e+07	1.102e-01	2.396e-01	1.744e-04	3.791e-04
0.1	7.808e+08	1.559e+00	3.052e+00	2.385e-03	4.669e-03
0.15	8.951e+01	2.799e-07	4.794e-07	4.610e-10	7.895e-10
0.2	1.238e+08	5.321e-01	8.012e-01	9.391e-04	1.414e-03
0.3	1.349e+04	9.068e-05	1.236e-04	1.720e-07	2.345e-07
0.4	1.293e+07	1.193e-01	1.534e-01	2.325e-04	2.989e-04
0.5	4.482e+06	5.280e-02	6.532e-02	1.036e-04	1.282e-04
0.6	6.028e+11	8.668e+03	1.044e+04	1.692e+01	2.038e+01
0.8	7.429e+08	1.461e+01	1.696e+01	2.779e-02	3.226e-02
1.0	5.588e+08	1.399e+01	1.590e+01	2.580e-02	2.930e-02
1.5	7.086e+08	2.745e+01	3.017e+01	4.618e-02	5.076e-02
2.0	6.324e+00	3.329e-07	3.586e-07	5.148e-10	5.546e-10
TOTALS:	6.551e+11	8.748e+03	1.056e+04	1.720e+01	2.089e+01

ENGINEERING DESIGN FILE

Original COPY

1. Project File No. INEEL / EXT-99-00980 2. Project/Task NGLW Feasibility Study for INTEC Tank Farm

3. Subtask Dose Rate Calculations for WM-190 Modifications To Meet RCRA Storage Requirements of NGLW

4. Title: Gamma Dose Rate Calculation Tables for WM-189 and WM-190 Storage Tanks

5. Summary: This summary briefly defines the problem or activity to be addressed in the EDF, gives a summary of the activities performed in addressing the problem and states the conclusions, recommendations, or results arrived at from this task.

Background:

DOE-ID has issued directions to cease use and storage of NGLW (newly generated liquid waste) using the underground storage tanks (WM-187, 188,189 and 190) at the INTEC Tank Farm after September 30, 2005. LMITCO initiated an engineering study for segregation and RCRA compliant storage of INTEC NGLW after 2005. Part of the study focuses on modifications or upgrades, to the existing WM-190 tank to bring it up to RCRA storage standards for the express purpose of continued use after 2005.

As part of the feasibility study for WM-190 tank modifications, INTEC Radiological Engineering was requested to provide personnel exposure dose rate estimates that can be used for the proposed modification plan. A series of calculations using Microshield 5.0.3. were completed for both the WM-189 and WM-190 tanks in their current configuration. The results of the calculations and the parameters used are detailed on the two attached tables.

The current modification plan being studied involves upgrading WM-190 by removing the soil and vault roof for access to the WM-190 tank vault, followed by cutting the roof out of the tank, and installing a second liner (or new tank) inside the existing tank. After the new tank is installed, the original tank roof would be reinstalled, thereby providing double containment. Of concern is the collective occupational radiation exposure required to upgrade WM-190. The four tanks are in a rectangular pattern separated from one another by a 3'-6" thick concrete wall. All tanks are covered by a pillar and concrete roof with a nominal thickness of 8".

Conclusion:

The collective occupational radiation exposure resulting from the proposed modifications to WM-190 (with an estimated volume of 500 gallons) should not be affected by the WM-187, 188 or 189 tanks provided the roofs for these tanks are not removed. The conclusion is based on the Microshield calculations made for the WM-189 tank. WM-189 was chosen as the comparison model due to:

1. Its listed content of 100,400 gallons of waste;
2. The radioactivity concentration of the radionuclides present.
3. It's close proximity to WM-190.

The collective occupational radiation exposure to upgrade WM-190 as described, is dependent on the tasks required, the location of the task performed, multiplied by the time required to complete each task, which are then added together for a total collective dose which should be reported in person/rem.

On the chart of calculations for WM-190, a second set of calculations (WM-190-A through D) has been provided that represent the potential decrease in direct radiation fields should one foot of grout be added to WM-190 during the modification process. In the interest of ALARA, INTEC Radiological Engineering strongly recommends that the addition of the grout be completed at the earliest possible time in the work scope to reduce the personnel radiation exposure.

Original

ENGINEERING DESIGN FILE

COPY

1. Project File No. INEEL / EXT-99-00980 2. Project/Task NGLW Feasibility Study for INTEC Tank Farm

ATTACHMENTS:

1. Gamma Dose Rate Calculations Table For WM-190 Storage Tank on INTEC Tank Farm, 1 page
2. Gamma Dose Rate Calculations Table For WM-189 Storage Tank on INTEC Tank Farm, 1 page
3. Tank Farm Volumes Data Sheet, 1 page
4. WM-189 Storage Tank Radionuclides Estimated Contents Data Sheet; Updated 12-23-97, 1 page
5. WM-190 Storage Tank Radionuclides Estimated Contents Data Sheet; Updated 12-22-97, 1 page
6. WM-190-1 Calculation Data Sheets From Microshield v5.0.3, 4 pages
7. WM-190-2 Calculation Data Sheets From Microshield v5.0.3, 4 pages
8. WM-190-3 Calculation Data Sheets From Microshield v5.0.3, 4 pages
9. WM-190-4 Calculation Data Sheets From Microshield v5.0.3, 4 pages
10. WM-190-A Calculation Data Sheets From Microshield v5.0.3, 4 pages
11. WM-190-B Calculation Data Sheets From Microshield v5.0.3, 4 pages
12. WM-190-C Calculation Data Sheets From Microshield v5.0.3, 4 pages
13. WM-190-D Calculation Data Sheets From Microshield v5.0.3, 4 pages
14. WM-189-1 Calculation Data Sheets From Microshield v5.0.3, 3 pages
15. WM-189-2 Calculation Data Sheets From Microshield v5.0.3, 2 pages
16. WM-189-3 Calculation Data Sheets From Microshield v5.0.3, 3 pages
17. WM-189-4 Calculation Data Sheets From Microshield v5.0.3, 3 pages
18. WM-189-5 Calculation Data Sheets From Microshield v5.0.3, 3 pages
19. WM-189-6 Calculation Data Sheets From Microshield v5.0.3, 3 pages

cc with attachments 1 and 2:

C. W. Olsen, MS 3211
R. J. Waters, MS 5227
C. R. Wielang, MS 5209
INTEC Radiological Controls Main Files; MS 5209, CPP-630

cc with attachments 1 through 19:

LMITCO Radiological Controls Central EDF Files, MS 4138 (Original Document)
R. W. Kanady Project Files; INTEC, CPP-630

7. Review (R) and Approval (A) Signatures: (Minimum reviews and approvals are listed. Additional reviews/approvals may be added as necessary.)

	R/A	Printed Name	Signature	Date
Author	R	R. W. Kanady	R. Kanady	9-21-99
Independent Verification	R	S. B. Aitken	SB Aiken	9-22-99
Requestor	A	R. J. Waters	RJ Waters	9-22-99
RadCon Supervisor	A	G. G. Hall	GG Hall	9/21/99
N/A	—	—	—	—

GAMMA DOSE RATE CALCULATIONS TABLE FOR WM-190 STORAGE TANK ON THE INTEC TANK FARM

(Prepared by: Wayne Kanady; 9-15-99)

This table is provided for informational purposes only. The dose rates provided are in *millirem/hour* and were calculated using Microshield v5.03. The curie content used for the calculation input is a combination of isotopes. Project Management provided a report of the curie content that was last updated on 12-22-97. Additional isotopes, if used, are the default decay isotopes added by MS 5.03.

The calculation input parameters include:

1. The radioactivity is uniformally distributed into a 50 foot diameter disk by approximately 0.40 inch thick.
2. A total volume of 500 gallons is present per LMITCO Tank Farm Operations Home Page.
3. The source material is a water media and the radioactivity is distributed uniformally.
4. The WM-190 tank side and top walls are 0.25" thick stainless steel.
5. The build-up factor is the shield or transition media provided by Microshield 5.03 or the highest build-up factor noted.
6. The Microshield 5.03 calculations noted as WM-190-A through D show dose rate decreases after the addition of 1 foot of grout with a density of 1.6 gm/cm^3 to the heel material. The radioactivity has been left in a uniformally distributed configuration.

Original

RUN IDENTIFICATION AND SPECIFIC DOSE POINT CONDITIONS	DOSE POINT #1 AND DISTANCE FROM SOURCE	DOSE POINT #2 AND DISTANCE FROM SOURCE	DOSE POINT #3 AND DISTANCE FROM SOURCE	DOSE POINT #4 AND DISTANCE FROM SOURCE	DOSE POINT #5 AND DISTANCE FROM SOURCE	DOSE POINT #6 AND DISTANCE FROM SOURCE
WM-190-1 Location of dose rates are on a vertical directly above center of the tank internals. **WM-190-A	801 mr/hr at 1 inch 115 mr/hr at 1 inch	610 mr/hr at 1 foot 110 mr/hr at 1 foot	360 mr/hr at 4 feet 95 mr/hr at 4 feet	194 mr/hr at 10 feet 70 mr/hr at 10 feet	92 mr/hr at 20 feet 40 mr/hr at 20 feet	68 mr/hr at 25 feet 31 mr/hr at 25 feet
WM-190-2 Location of external dose rates are on a horizontal from the of tank wall at ground level. **WM-190-B	87 mr/hr at 1 inch 28 mr/hr at 1 inch	33 mr/hr at 1 foot 20 mr/hr at 1 foot	12 mr/hr at 3 feet 7.8 mr/hr at 3 feet	5.8 mr/hr at 6 feet 3.7 mr/hr at 6 feet	3.2 mr/hr at 10 feet 2.0 mr/hr at 10 feet	2.4 mr/hr at 12 feet 1.5 mr/hr at 12 feet
WM-190-3 Location of external dose rates are from the tank wall at a three foot vertical above ground level. **WM-190-C	210 mr/hr at 1 inch 51 mr/hr at 1 inch	183 mr/hr at 1 foot 38 mr/hr at 1 foot	137 mr/hr at 3 feet 21 mr/hr at 3 feet	95 m/hr at 6 feet 10 mr/hr at 6 feet	65 mr/hr at 10 feet 5 mr/hr at 10 feet	54 mr/hr at 12 feet 4 mr/hr at 12 feet
WM-190-4 Location of external dose rates are from the tank wall at a six foot vertical above ground level. **WM-190-D	151 mr/hr at 1 inch 45 mr/hr at 1 inch	139 mr/hr at 1 foot 39 mr/hr at 1 foot	116 mr/hr at 3 feet 28 mr/hr at 3 feet	88 mr/hr at 6 feet 17 mr/hr at 6 feet	64 mr/hr at 10 feet 10 mr/hr at 10 feet	54 mr/hr at 12 feet 7.5 mr/hr at 12 feet

ATTACHMENT #1

GAMMA DOSE RATE CALCULATIONS TABLE FOR WM-189 STORAGE TANK ON THE INTEC TANK FARM

(Prepared by: Wayne Kanady; 9-15-99)

This table is provided for informational purposes only. The dose rates provided are in *millirem/hour* and were calculated using Microshield v5.03 on 9-15-99. The curie content used for the calculation input is a combination of isotopes. The basis for curie contents and tank liquid volumes are taken from the LMITCO Tank Farm Operations Home Page available on the intranet.

Original

The calculation input parameters include:

1. The radioactivity is uniformally distributed into a 50 foot diameter disk by approximately 82.1 inches thick.
2. A total volume of 100,400 gallons is present per LMITCO Tank Farm Operations Home Page.
3. The source material is in a water media. The radioactivity is distributed homogeneously throughout the 100,400 gallons except for Microshield runs ** WM-189-1, WM-189-4, and Wm-189-6 which compress the radioactivity to a one foot deep layer at the bottom of the tank with the remaining approximately 6 feet of water serving as shielding.
4. The WM-189 tank side and tops wall are 0.25" thick stainless steel.
5. The total radioactivity present was calculated from the LMITCO Tank Farm Operations Home Page data with the total activity being decayed prior to the development of the Microshield runs.
6. The buildup factor is the shield or transition media selected by Microshield 5.03 or the highest buildup factor noted.

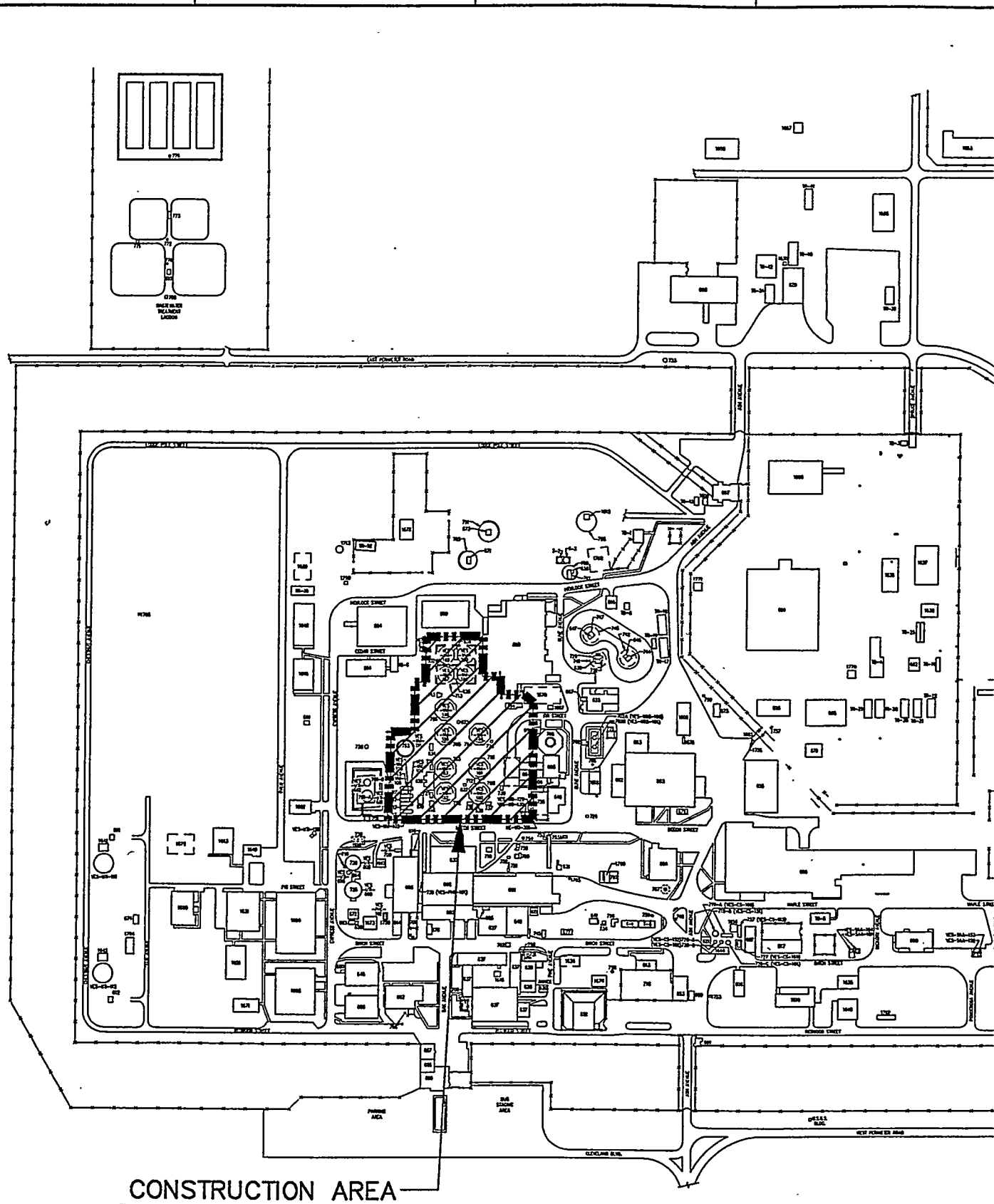
RUN IDENTIFICATION AND SPECIFIC DOSE POINT CONDITIONS	DOSE POINT #1 AND DISTANCE FROM SOURCE	DOSE POINT #2 AND DISTANCE FROM SOURCE	DOSE POINT #3 AND DISTANCE FROM SOURCE	DOSE POINT #4 AND DISTANCE FROM SOURCE
** WM-189-6 Location of dose rate points are at a 3 foot vertical from tank side, above the vault roof at the vaults center support wall. WM-189-5	3.5E-3 mr/hr at 1 inch 349 mr/hr at 1 inch	3.5 E-3 mr/hr at 1 foot 347 mr/hr at 1foot	3.5E-3 mr/hr at 3 feet 342 mr/hr at 3 feet	N/A
WM-189-2 Location of dose rate points are in the WM-190 vault, at a 3 foot vertical through vaults center support wall from WM-189	1.2 E-3 mr/hr at 1 inch	1.1 E-3 mr/hr at 1 foot	N/A	N/A
WM-189-3 Location of dose rate points are in the WM-189 tank vault at a three foot vertical above ground level.	5.12 E+4 mr/hr at 1 inch	4.8 E+4 mr/hr at 1 foot	3.7 E+4 mr/hr at 2 feet	3.3 E+4 m/hr at 2.5 feet
** WM-189-1 Location of dose rate points are directly above the vaults center support wall with the WM-189 roof removed	9.8 E-2 mr/hr at 1 inch	9.7 E-2 mr/hr at 1 foot	9.6 E-2 mr/hr at 2 feet	9.5 E-2 mr/hr at 3 feet
** WM-189-4 Location of dose rate points are in the WM-190 vault, at a 1 foot vertical through vault center support wall from WM-189	1.9 E-3 mr/hr at 1 inch	1.7 E-3 mr/hr at 1 foot	1.5 E-3 mr/hr at 2 feet	N/A

ATTACHMENT # 2

COPY

Appendix E

Drawings



INTEC AREA MAP

SCALE: 1"=200.0'

REVISIONS		
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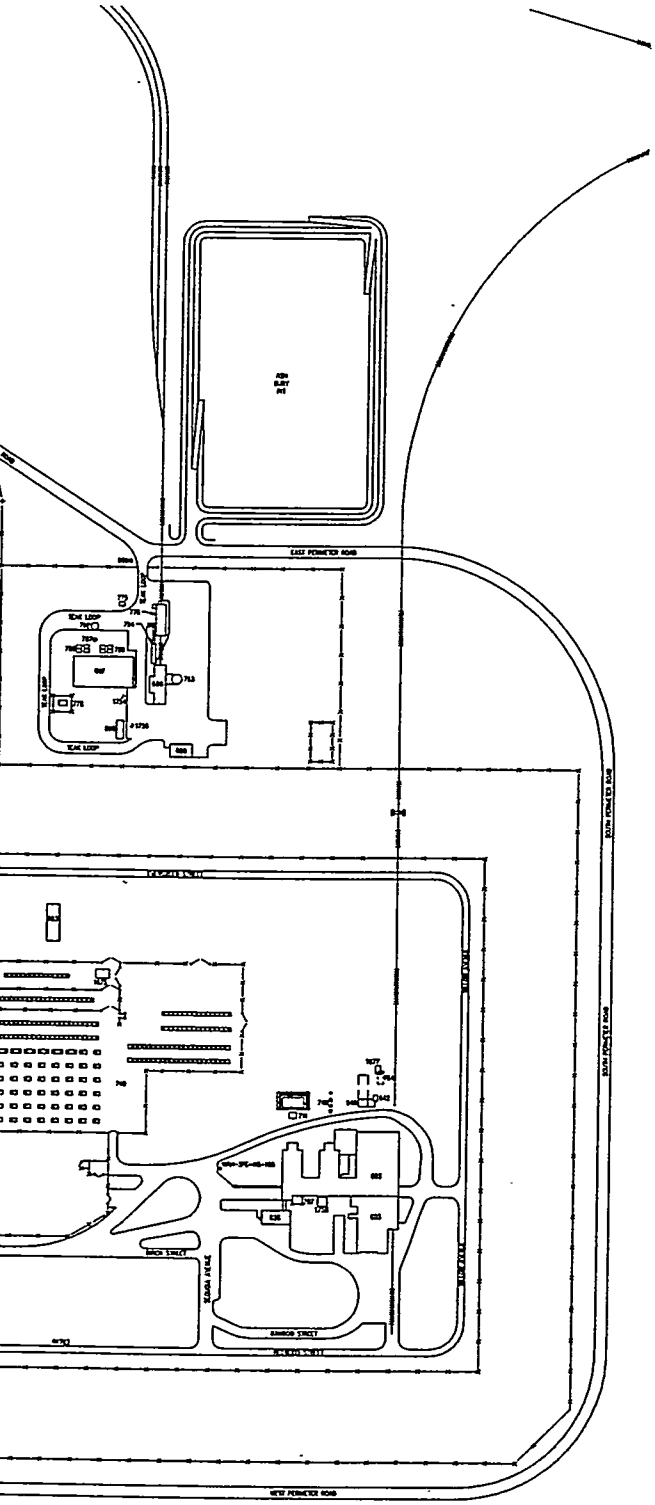
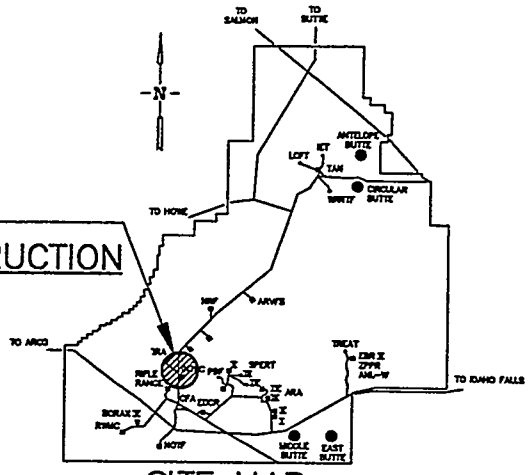


INTEC CONSTRUCTION AREA



SITE MAP
NTS

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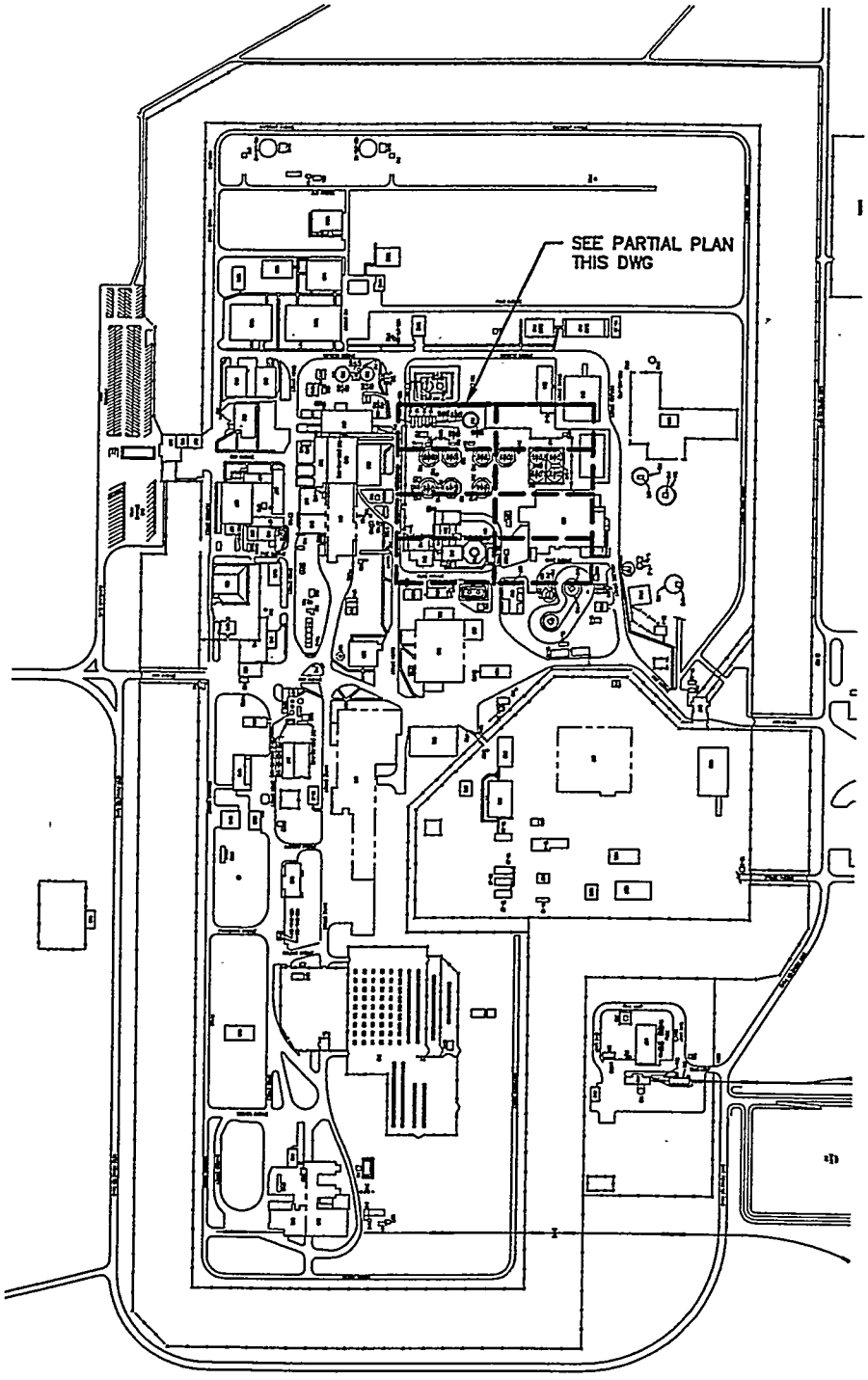
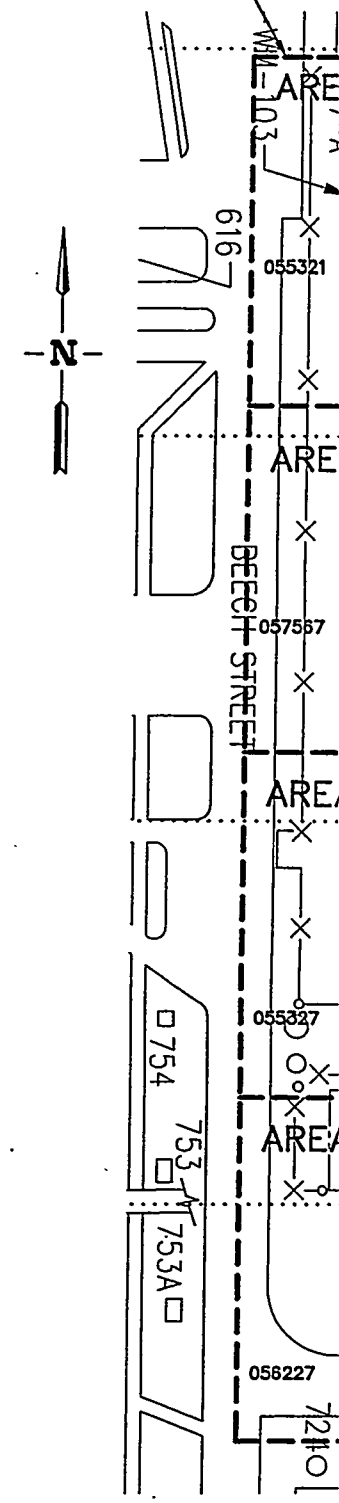
DESIGN PHASE: STUDY QUALITY LEVEL: 3	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO. EFFECTIVE DATE:	SIZE D · CAGE CODE 01MF3 · INDEX CODE NUMBER AREA 200 TYPE 0100 Q 01 DISC 530 · DWG-3638T1 · REV SCALE: 1"=200.0' · SHEET T–1



AREA MAP

SCALE: 1"=300.0'

ENLARGED AREA PLAN
TYP



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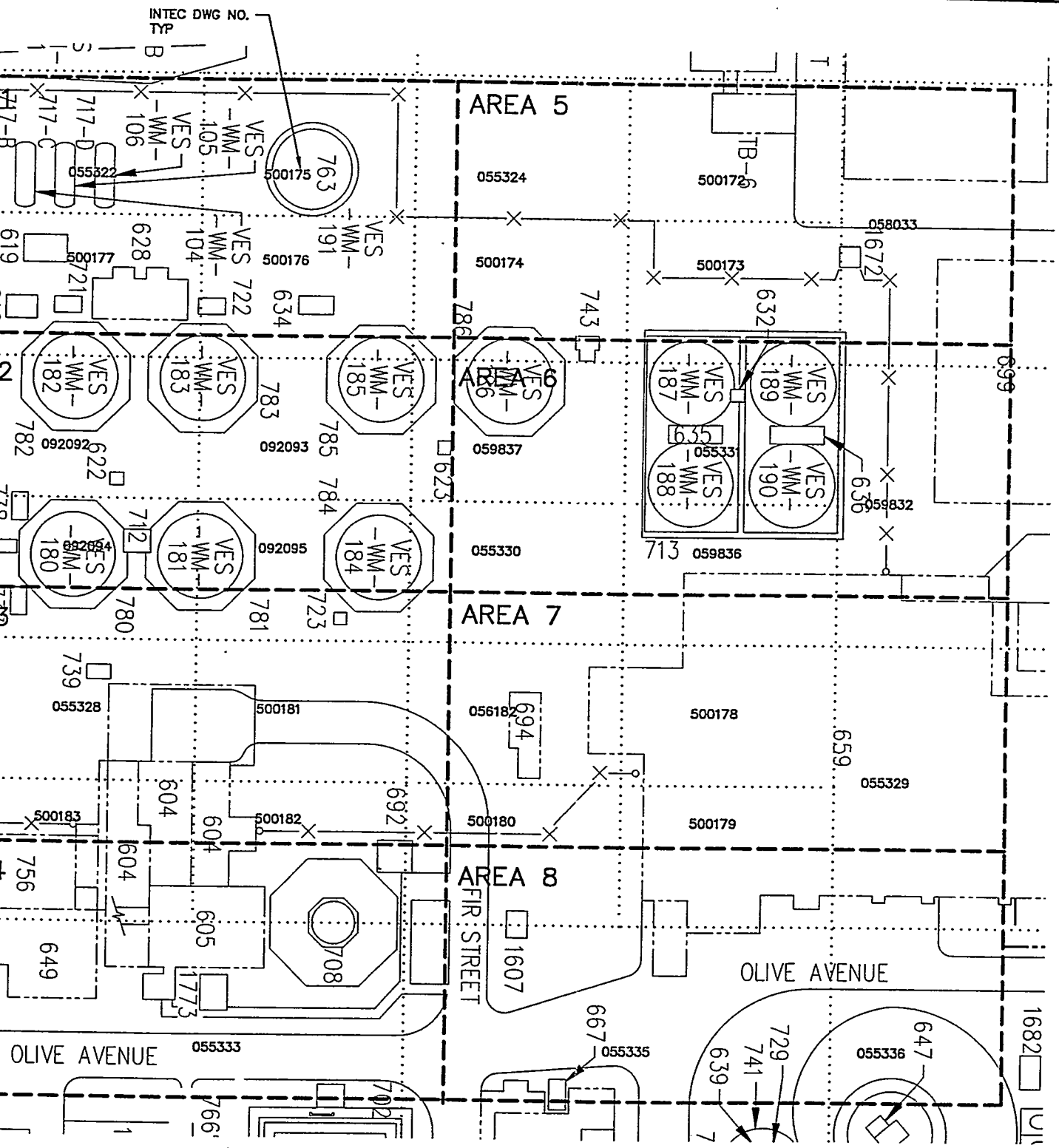

ENLARGED AREA PLAN

SCALE: 1"=40.0'

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	DESIGN:	
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	PROJECT NO.	
	SPEC CODE	
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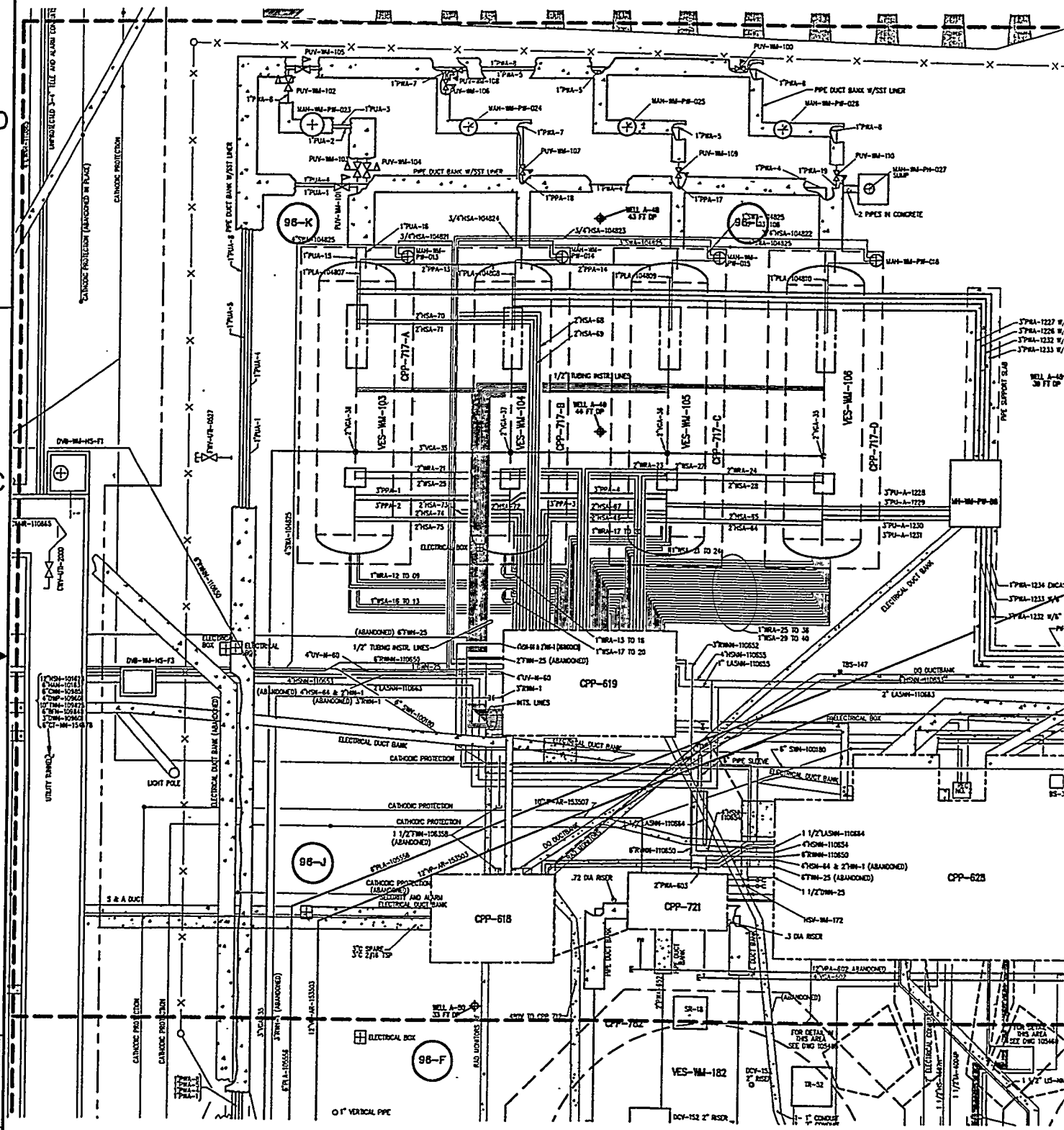

REVISIONS		
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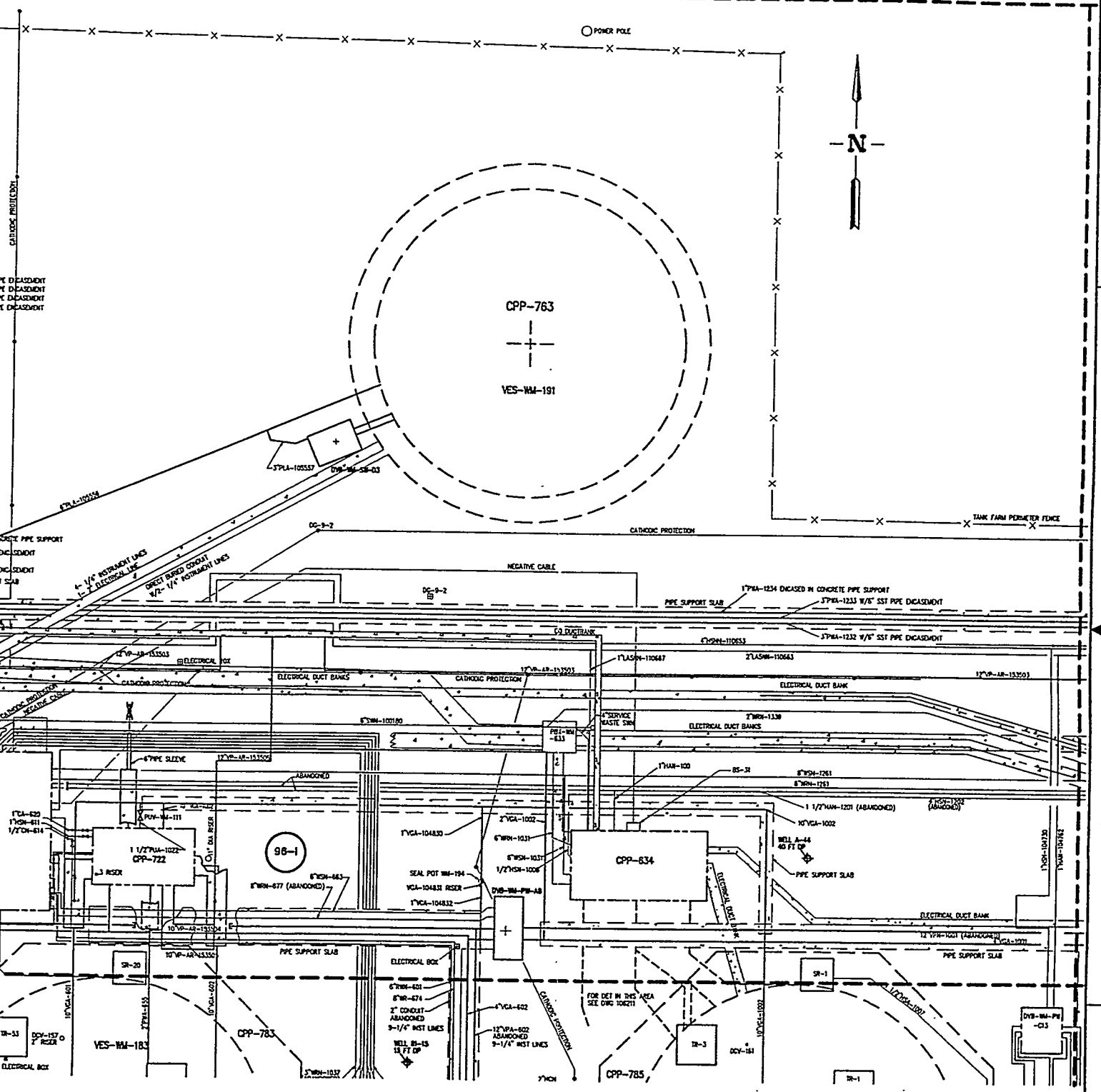

EA 1

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	DRAWN: friesz		
	PROJECT NO.		
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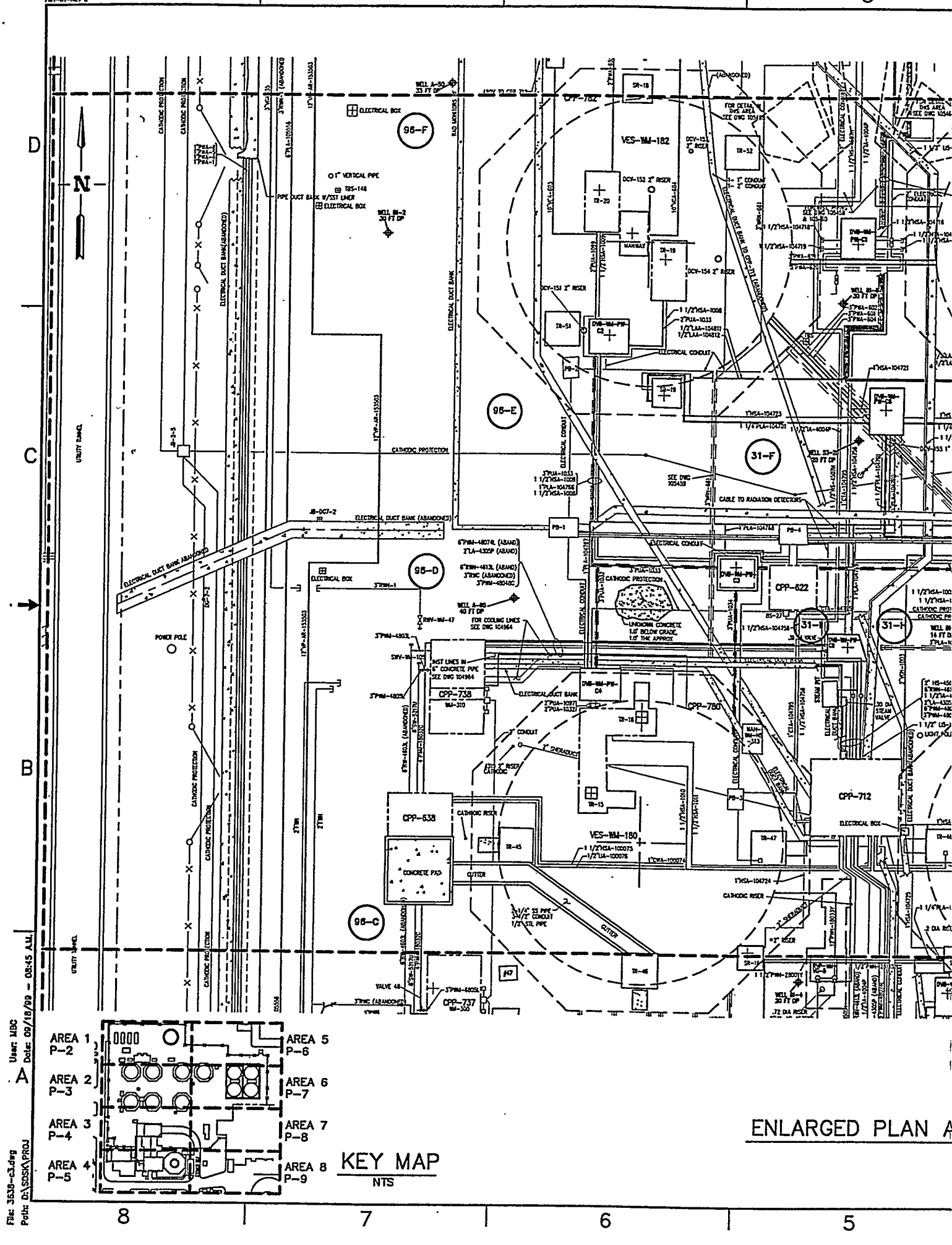
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D
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CPP-780
CPP-738
CPP-638
CPP-712
CPP-737
VES-WM-182
VES-WM-180
ELECTRICAL BOX
CATHODIC PROTECTION
ELECTRICAL DUCT BANK
ELECTRICAL CONDUIT
UTILITY TUNNEL
POWER POLE
CONCRETE PAD
GUTTER
AREA 1 P-2
AREA 2 P-3
AREA 3 P-4
AREA 4 P-5
AREA 5 P-6
AREA 6 P-7
AREA 7 P-8
AREA 8 P-9
KEY MAP
NTS
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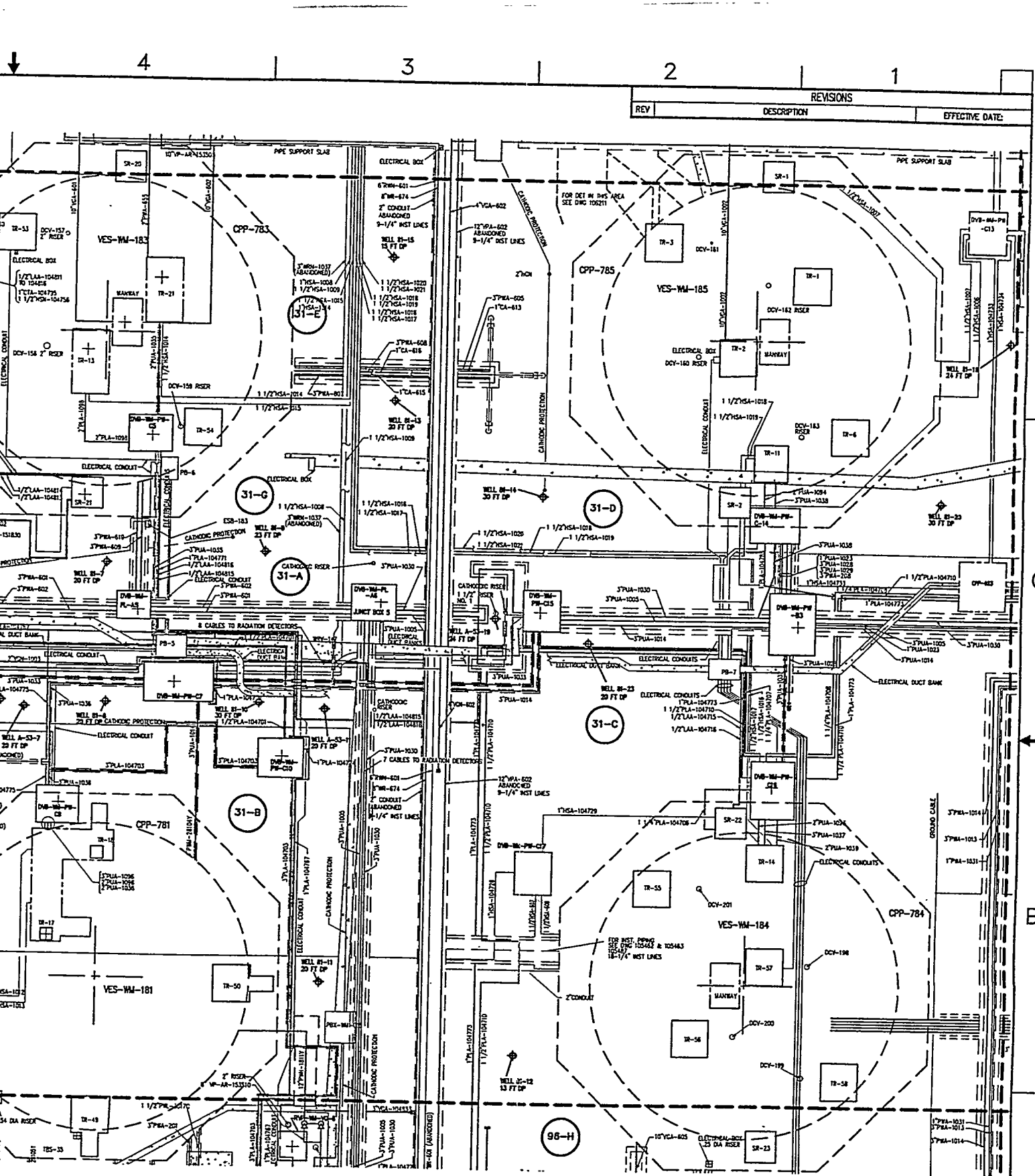

REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:

FOR DRAWING INDEX SEE DRAWING NO.

SUBCONTRACT NO.

REQUESTER:

DESIGN:

DRAWN: friesz

PROJECT NO.

SPEC CODE

FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.

EFFECTIVE DATE:

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SCALE: 1" = 10.0'

DESIGN PHASE: STUDY

QUALITY LEVEL: 3

LOCKHEED MARTIN

INTEC
NGLW RCRA–COMPLIANT STORAGE STUDY

ENLARGED PLAN AREA 2

SIZE	CAGE CODE	INDEX CODE NUMBER				DWG	REV
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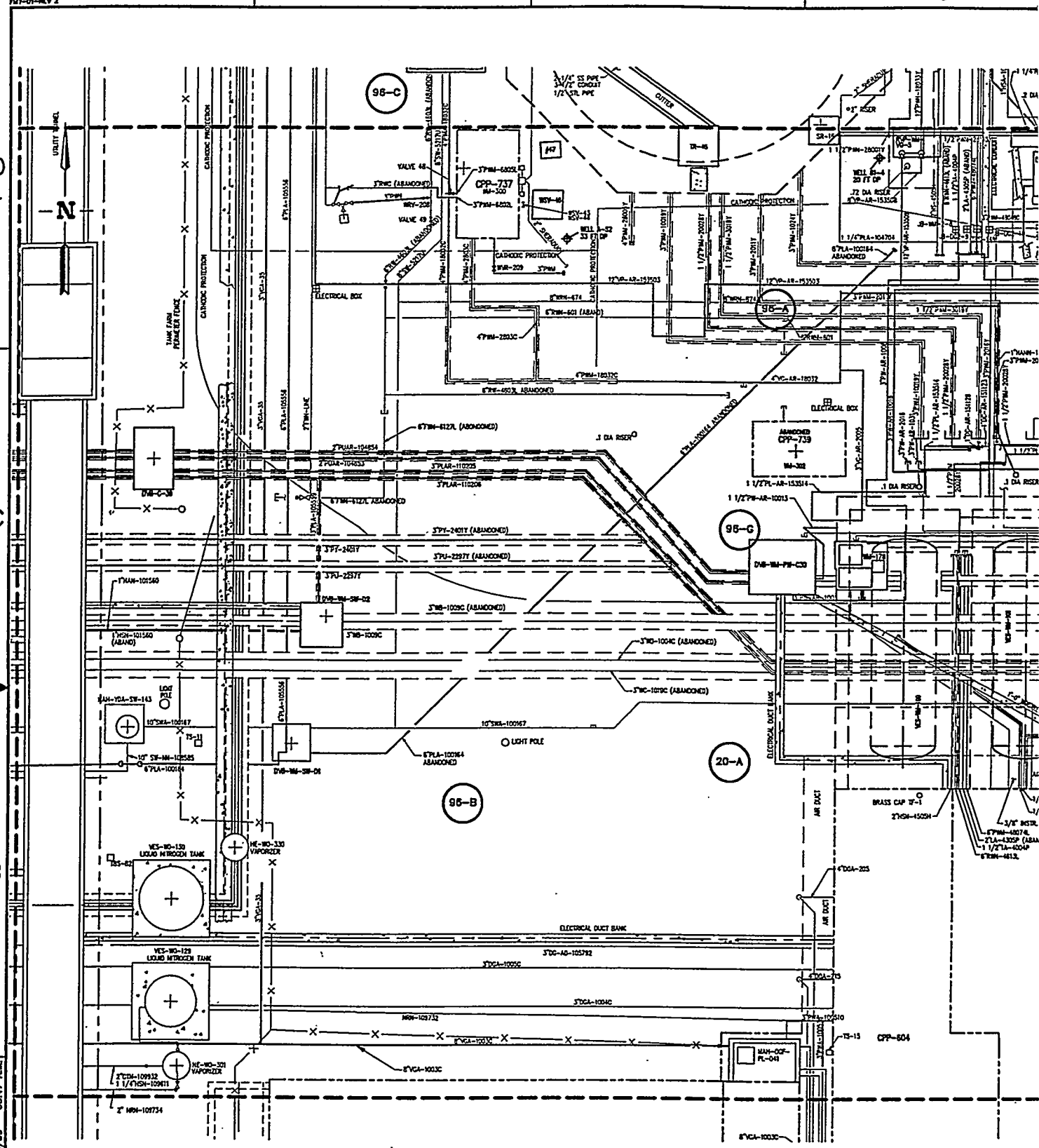
SHEET C-3

EA 2



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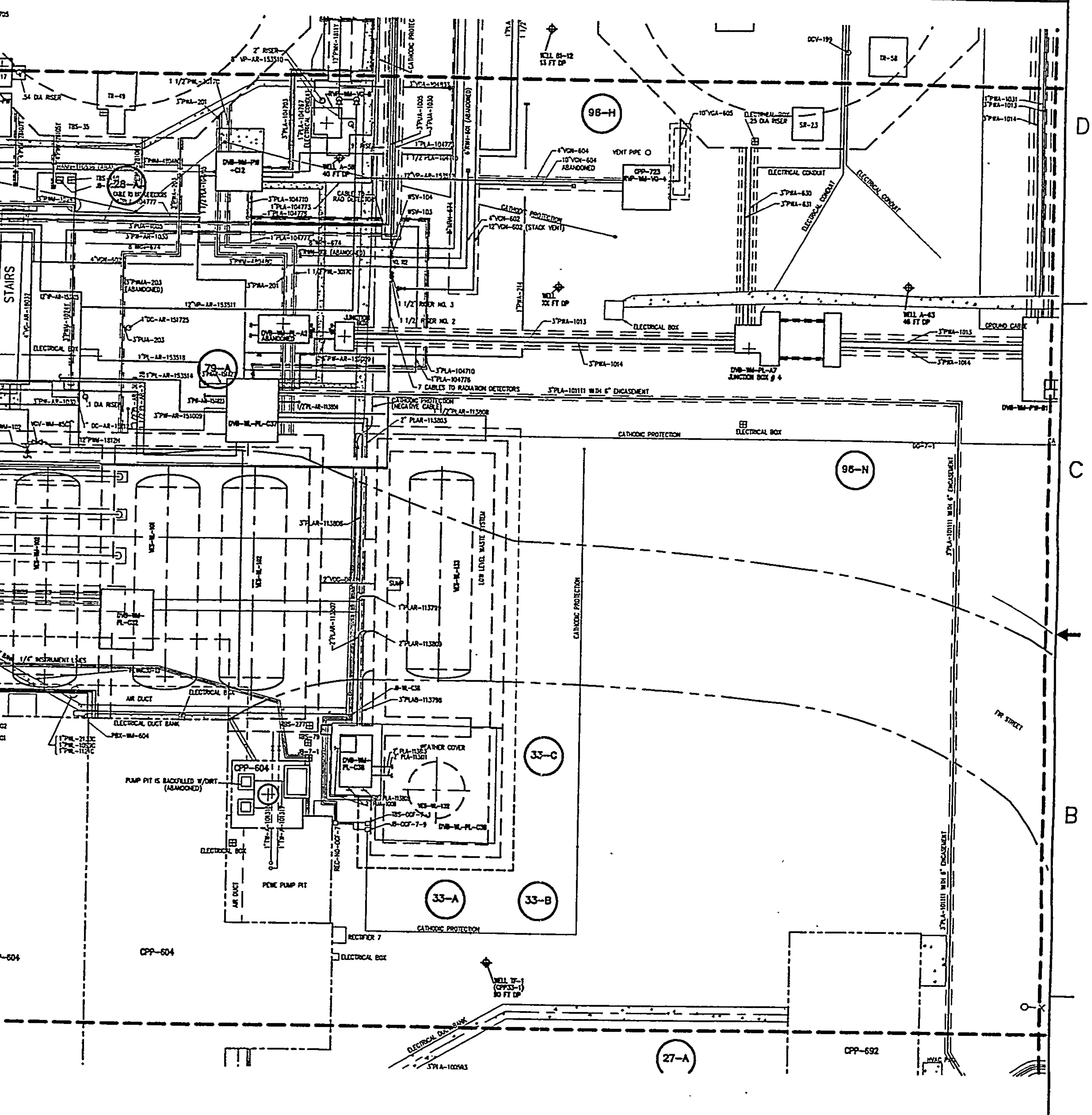

EA 3

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	DRAWN: friesz	ENLARGED PLAN AREA 3
	PROJECT NO.	
	SPEC CODE	
DESIGN PHASE: STUDY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	SIZE D; CAGE CODE 01MF3; INDEX CODE NUMBER: AREA 200, TYPE 0300, CL 02, ORG 530; DWG- 3638c4; REV
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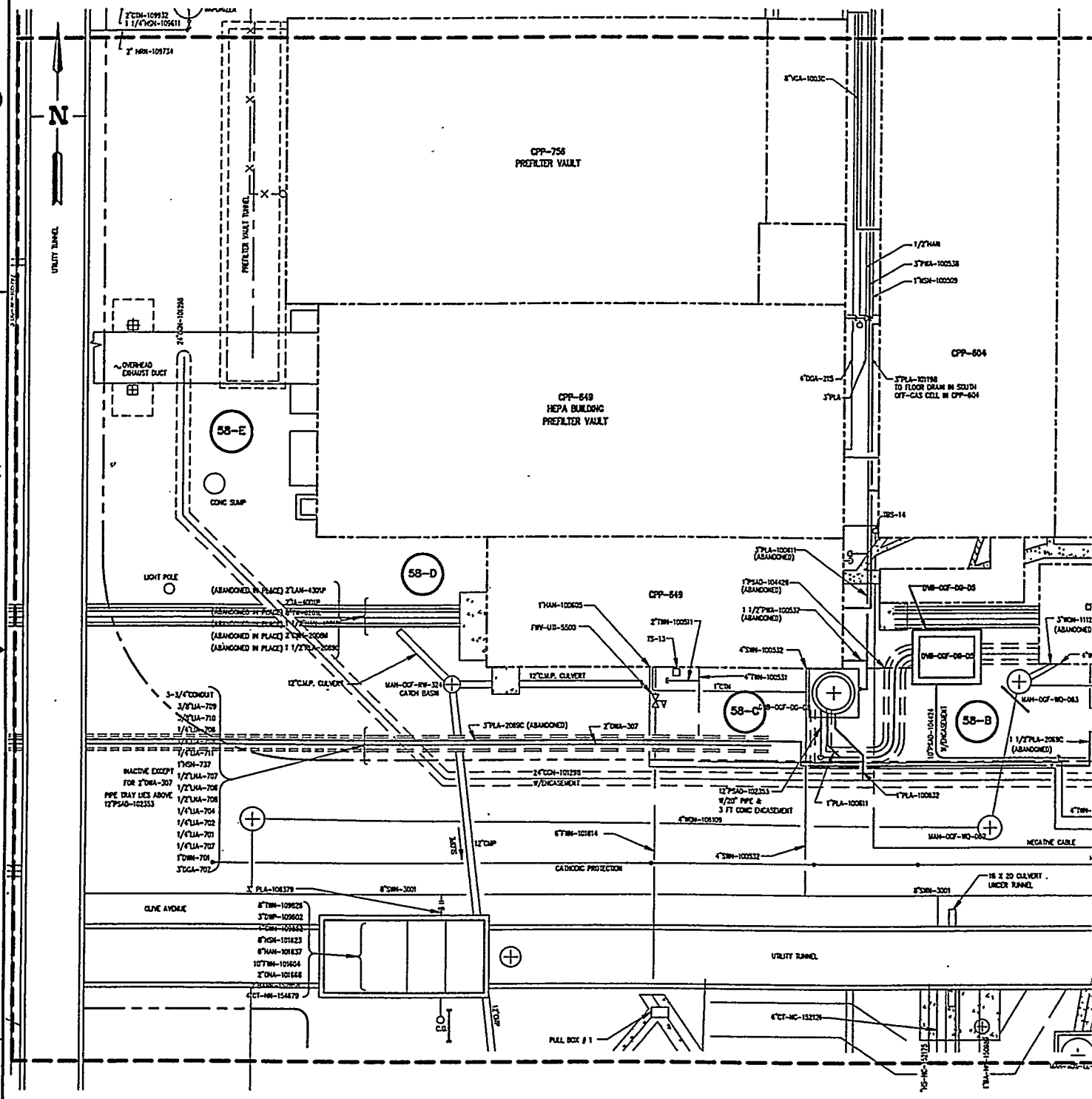
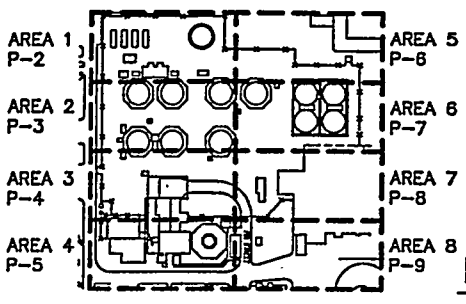
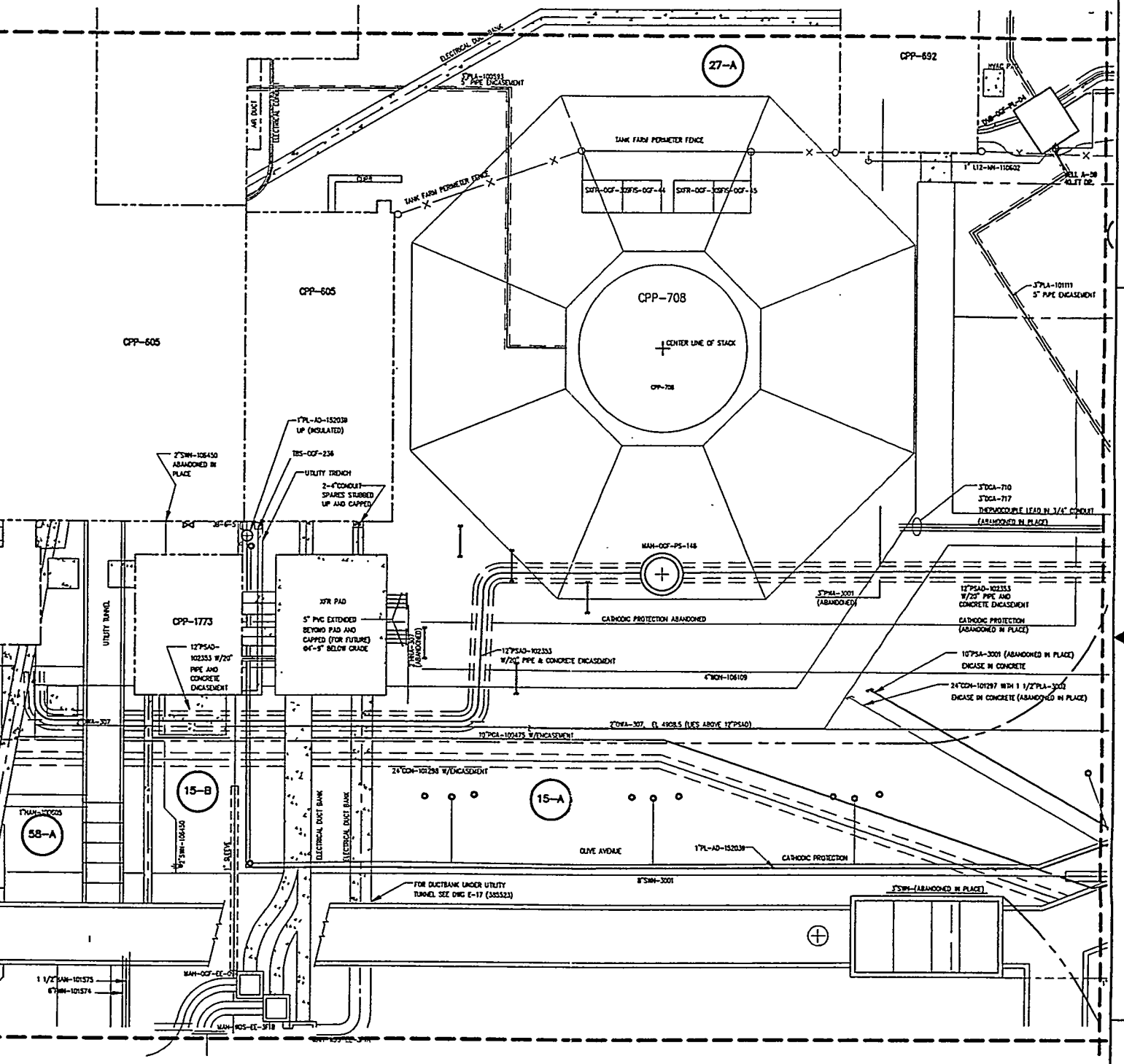




KEY MAP
NTS

ENLARGED PLAN

REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:



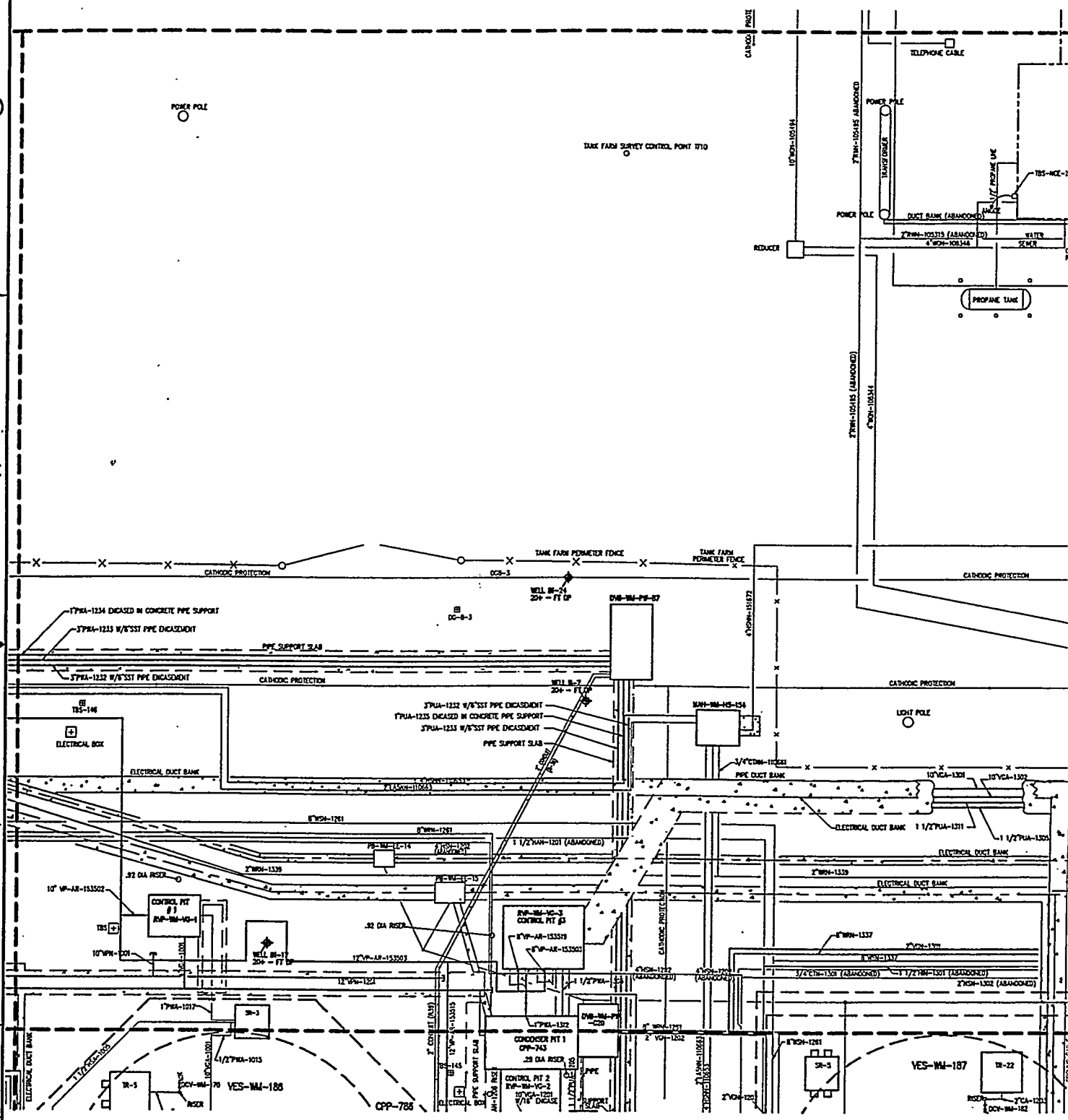
EA 4

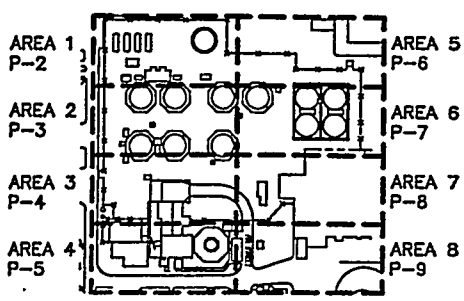
FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
10' 5' 0 10' SCALE: 1" = 10.0'	REQUESTER:	INTEC NGLW RCRA-COMPLIANT STORAGE STUDY
	DESIGN:	
	DRAWN: friesz	ENLARGED PLAN AREA 4
	PROJECT NO.	
	SPEC CODE	
DESIGN PHASE: STUDY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	SIZE: D; CAGE CODE: 01MF3; INDEX CODE NUMBER: AREA 200, TYPE 0300, CI 02, ORG 530; DWG-3638c5; REV
QUALITY LEVEL: 3	EFFECTIVE DATE:	SCALE: 1"=10.0' SHEET C-5

FMT-01-REV 2

8 7 6 5

D C B A



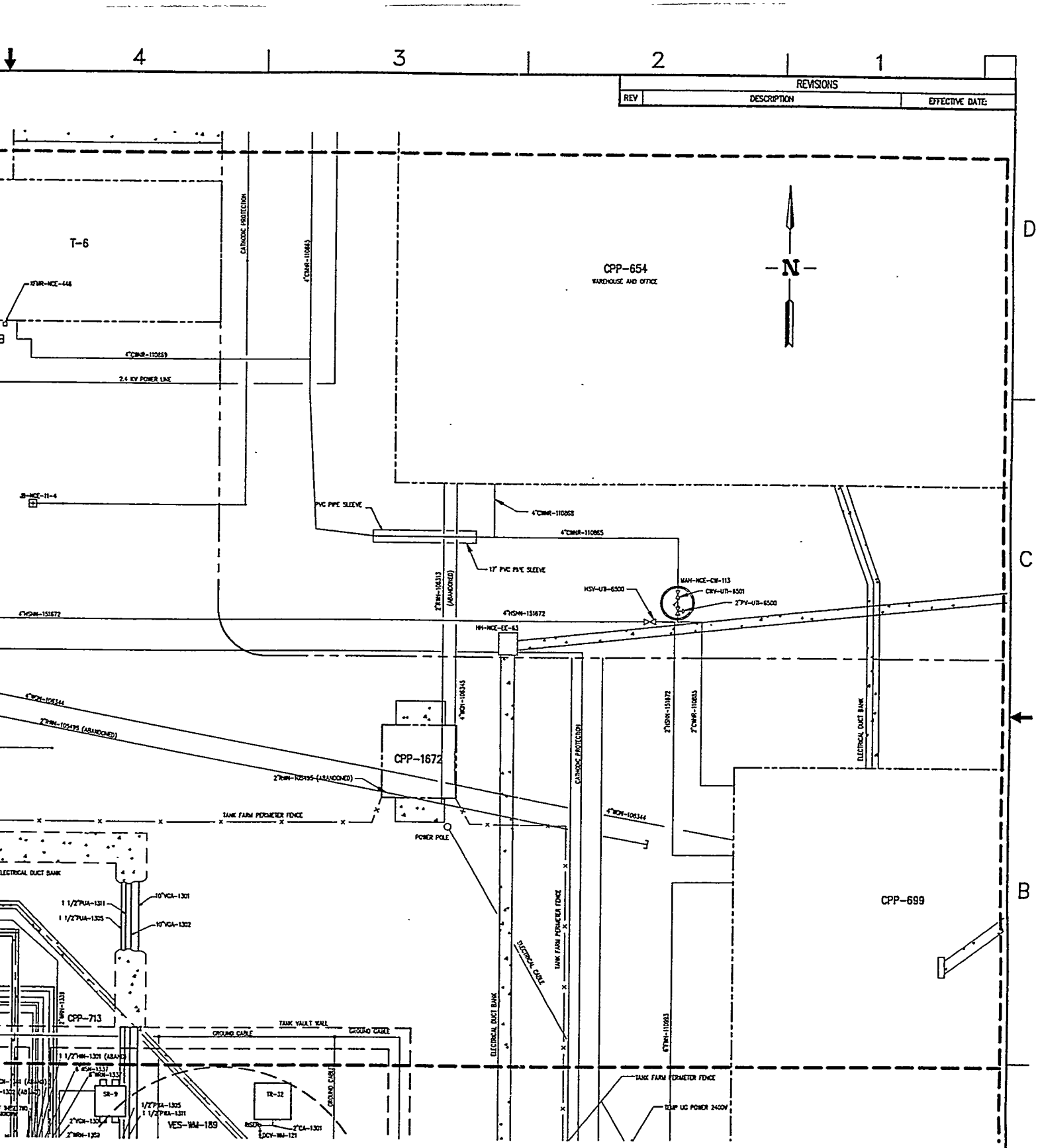


KEY MAP
NTS

ENLARGED PLAN

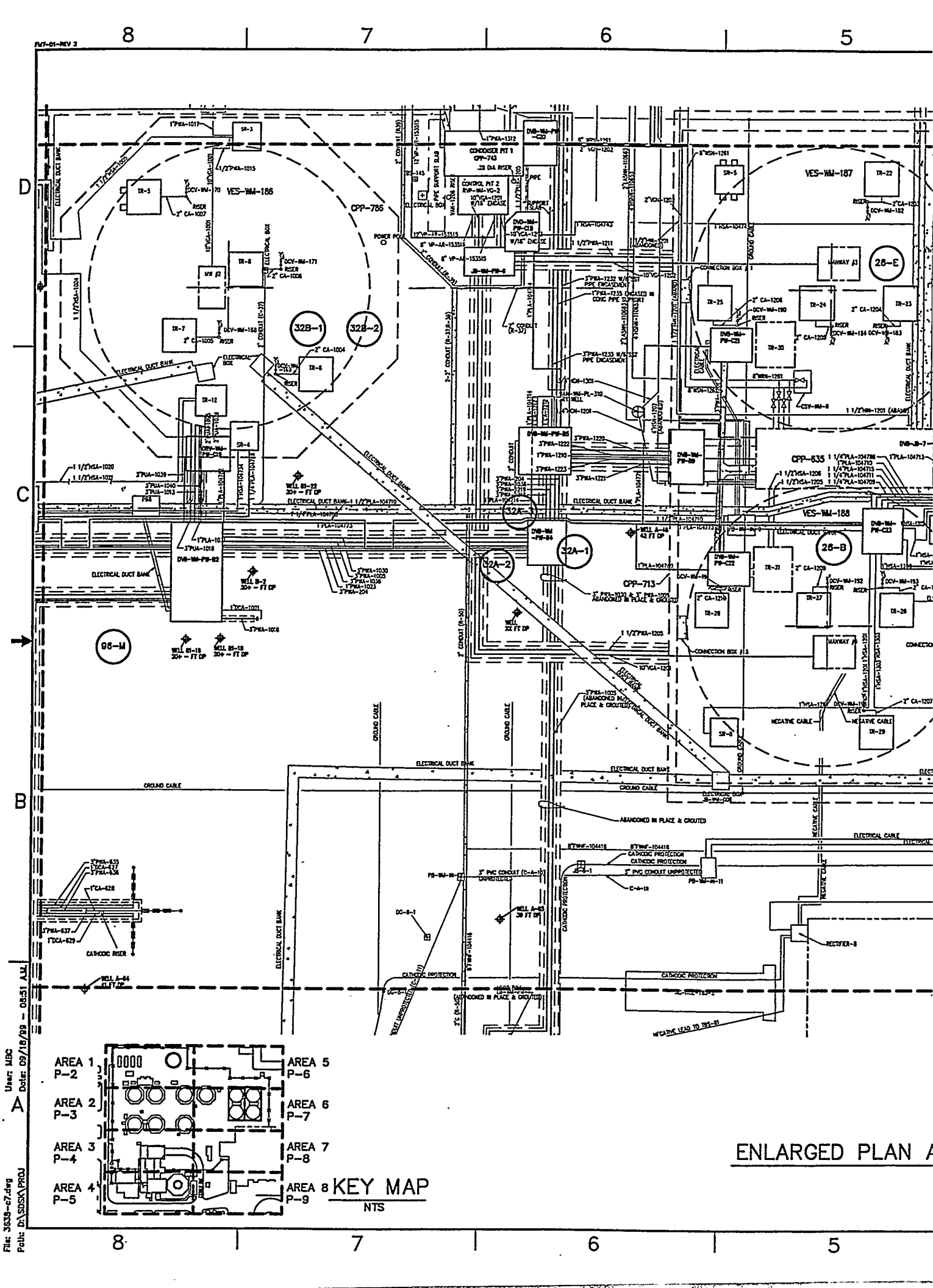
User: MBC
Date: 09/18/99 - 08:49 A.M.
File: 3838-c6.dwg
Path: D:\SDSK\PROJ

8 7 6 5

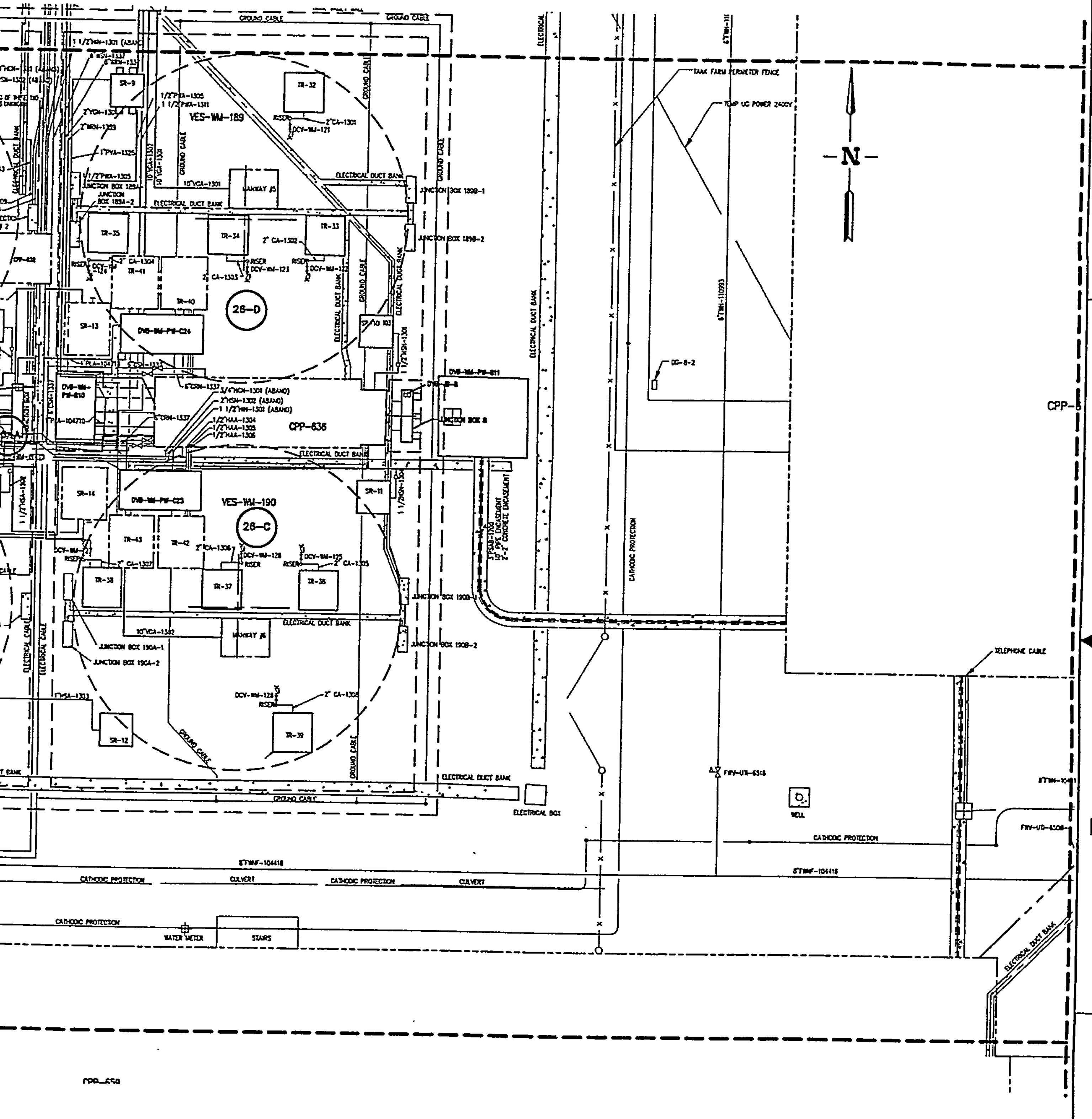


EA 5

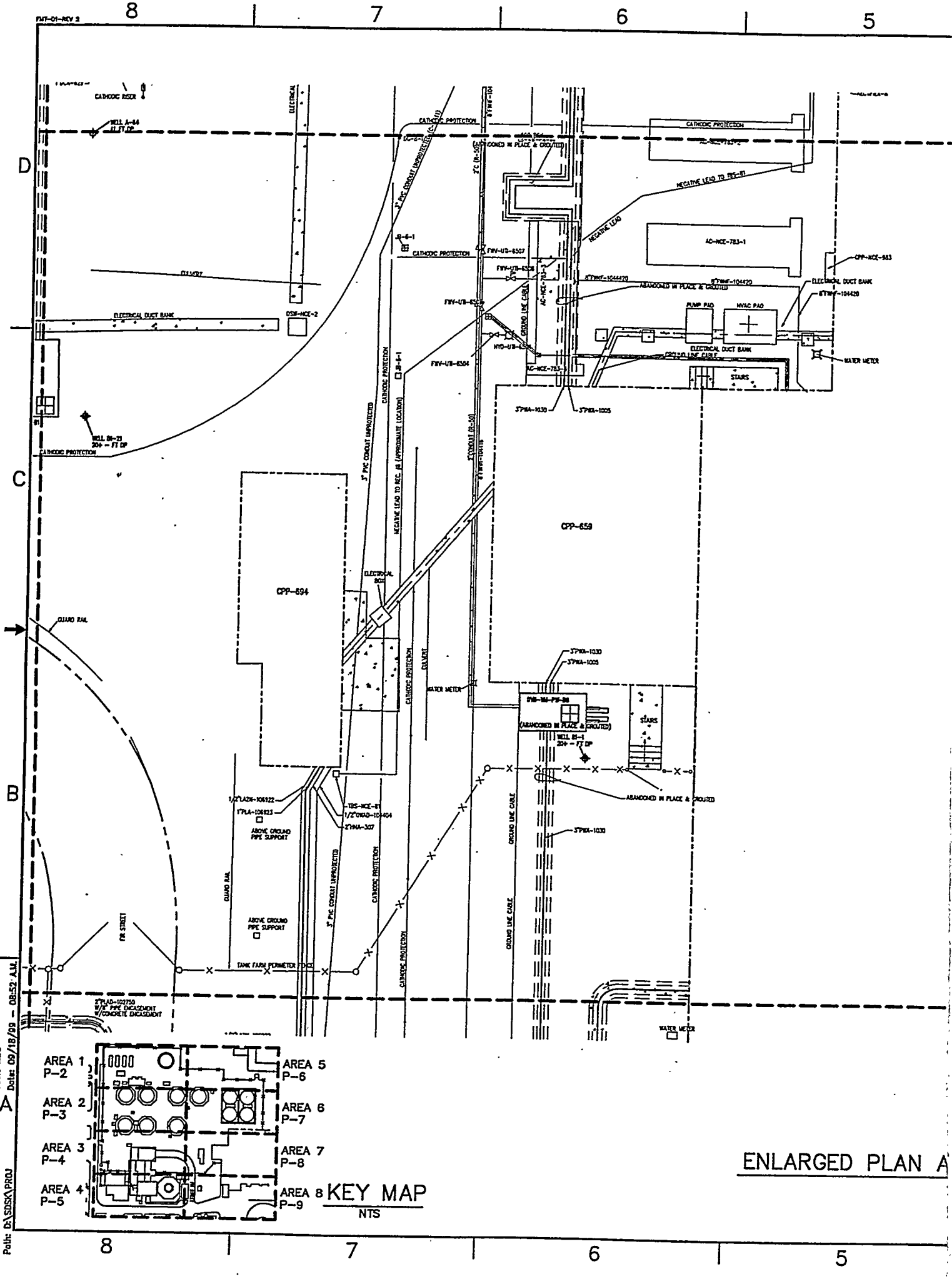
FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
SCALE: 1" = 10.0'	REQUESTER:	INTEC NGLW RCRA–COMPLIANT STORAGE STUDY
	DESIGN:	
	DRAWN: friesz	ENLARGED PLAN AREA 5
	PROJECT NO.	
	SPEC CODE	
DESIGN PHASE: STUDY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	SIZE: D; CAGE CODE: 01MF3; INDEX CODE NUMBER: AREA 200, TYPE 0300, CL 02, ORG 530; DWG-3638c6; REV
QUALITY LEVEL: 3	EFFECTIVE DATE:	SCALE: 1"=10.0'; SHEET C–6


8
7
6
5
D
C
B
A
VES-WM-186
VES-WM-187
VES-WM-188
CPP-785
CPP-635
CPP-713
32B-1
32B-2
32A-1
32A-2
98-M
28-E
28-B
ELECTRICAL DUCT BANK
GROUND CABLE
NEGATIVE CABLE
CATHODIC PROTECTION
ABANDONED IN PLACE & GROUTED
AREA 1 P-2
AREA 2 P-3
AREA 3 P-4
AREA 4 P-5
AREA 5 P-6
AREA 6 P-7
AREA 7 P-8
AREA 8 P-9
KEY MAP
NTS
ENLARGED PLAN A
User: MBC
Date: 09/18/99 - 08:51 AM
File: 3638-e7.dwg
Path: D:\SDSK\PROJ

REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:



FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
SCALE: 1" = 10.0'	REQUESTER:	INTEC NGLW RCRA-COMPLIANT STORAGE STUDY
	DESIGN:	
	DRAWN: friesz	
	PROJECT NO.	
	SPEC CODE	ENLARGED PLAN AREA 6
DESIGN PHASE: STUDY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	SIZE D; CAGE CODE 01MF3; INDEX CODE NUMBER: AREA 200, TYPE 0300, QL 02, ORIG 530; DWG- 3638c7; REV
QUALITY LEVEL: 3	EFFECTIVE DATE:	SCALE: 1"=10.0'; SHEET C-7



FMT-01-REV 2

User: MSC
Date: 09/18/99 - 08:52 AM

File: 3638-e8.dwg
Path: D:\SDSK\PROJ

REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:

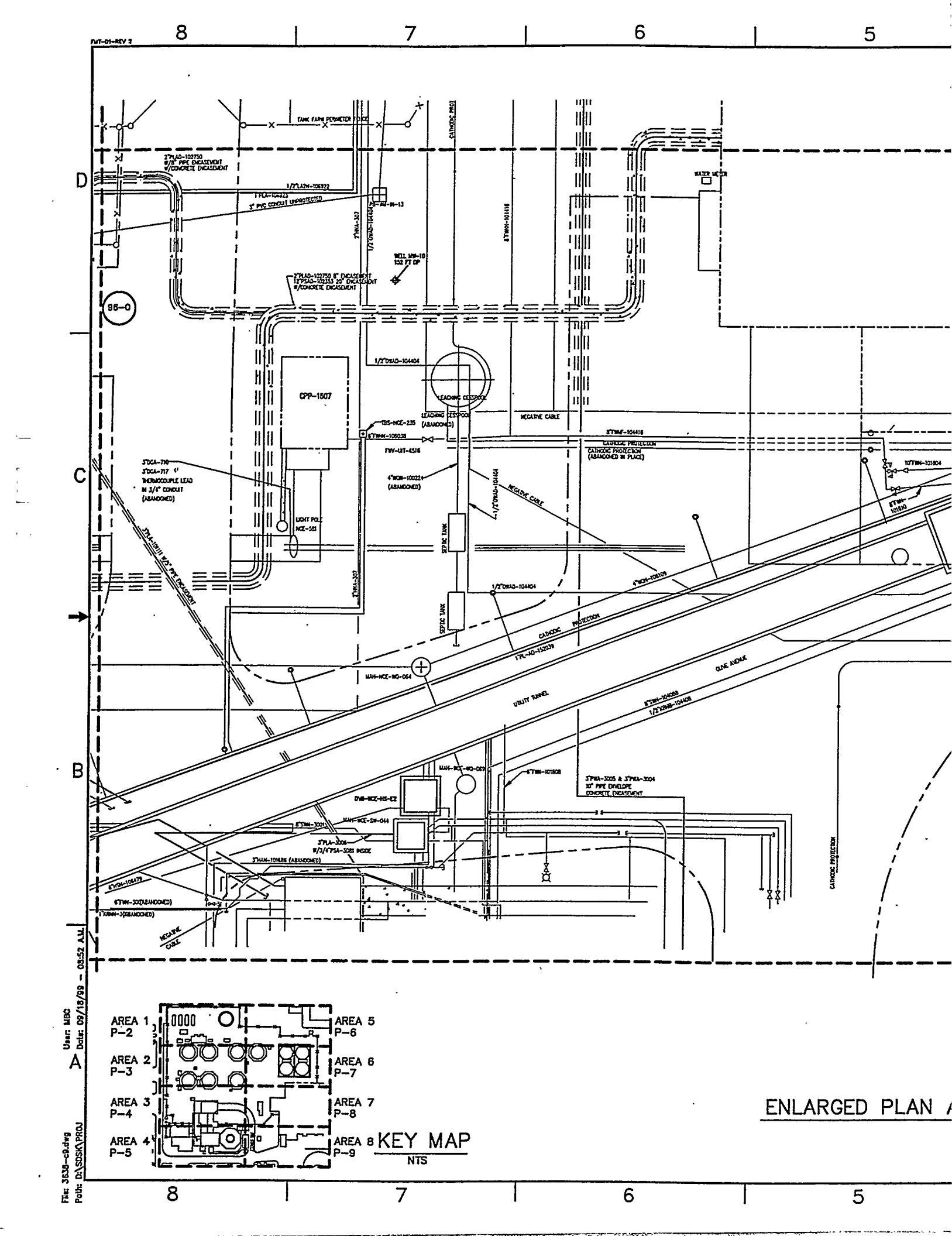
CPP-659

N

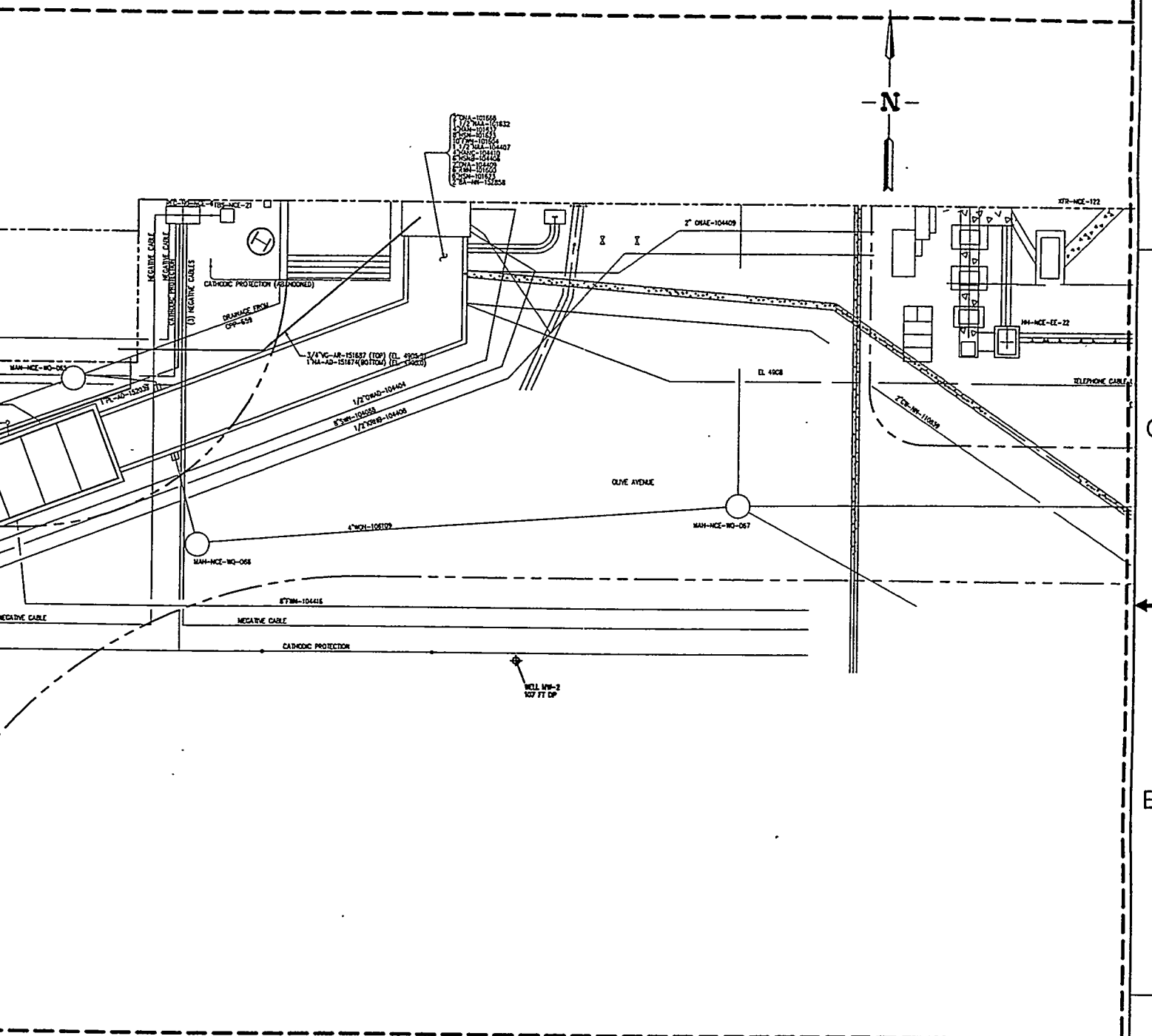
CPP-659

EA 7

FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
10' 5' 0 10' SCALE: 1" = 10.0'	REQUESTER:	INTEC NGLW RCRA-COMPLIANT STORAGE STUDY ENLARGED PLAN AREA 7
	DESIGN:	
	DRAWN: friesz	
	PROJECT NO.	
	SPEC CODE	
DESIGN PHASE: STUDY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	SIZE D; CAGE CODE 01MF3; INDEX CODE NUMBER AREA 200 TYPE 0300 O 02 OBJ 530; DWG-3638c8; REV
QUALITY LEVEL: 3	EFFECTIVE DATE:	SCALE: 1"=10.0'; SHEET C-8

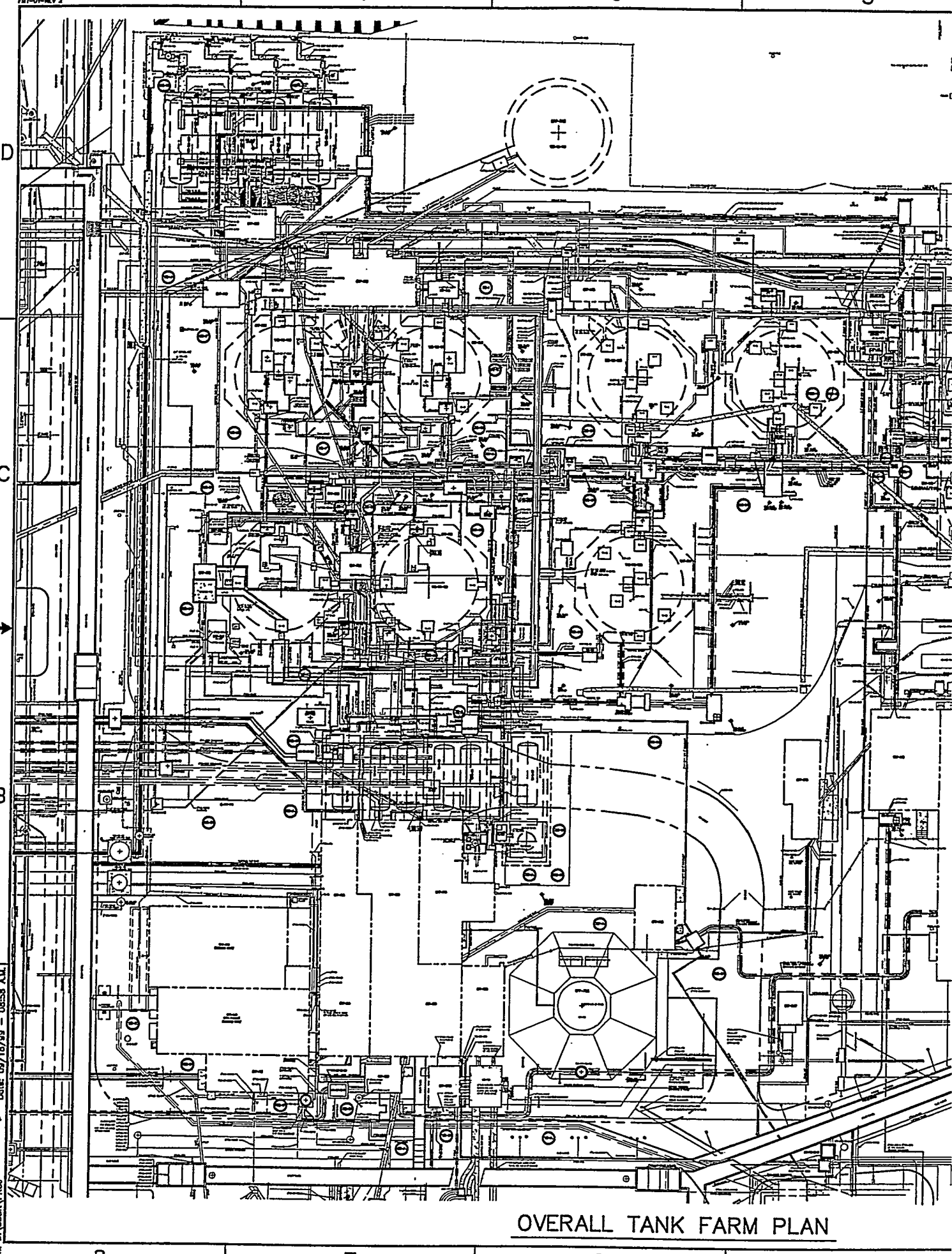

8
7
6
5
D
C
B
A
CPP-1507
WELL MW-10
152 FT DP
LEACHING CESSPOOL
(ABANDONED)
CATHODIC PROTECTION
(ABANDONED IN PLACE)
NEGATIVE CABLE
SEPTIC TANK
LIGHT POLE
MCE-581
WATER METER
UTILITY TUNNEL
OLNE AVENUE
CATHODIC PROTECTION
AREA 1 P-2
AREA 2 P-3
AREA 3 P-4
AREA 4 P-5
AREA 5 P-6
AREA 6 P-7
AREA 7 P-8
AREA 8 P-9
KEY MAP
NTS
ENLARGED PLAN A

REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:

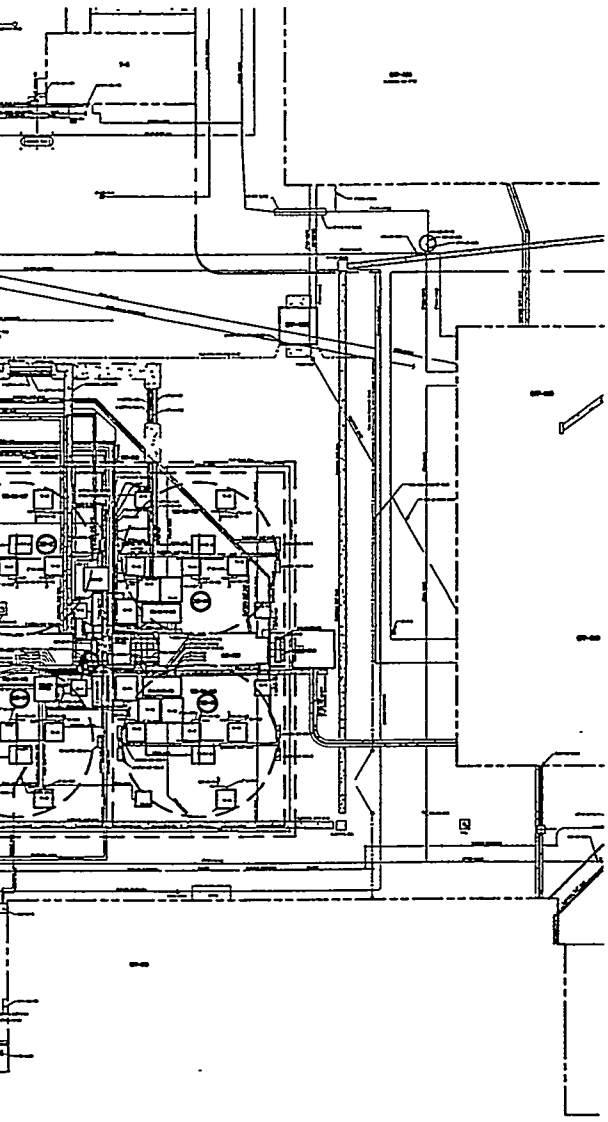


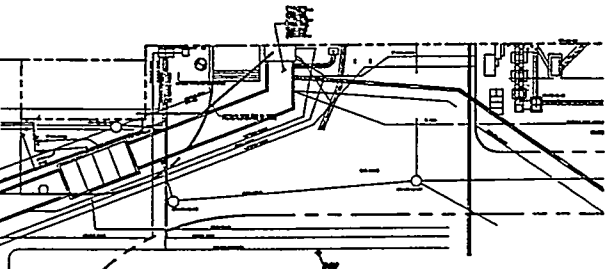
EA 8

FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
10' 5' 0 10' SCALE: 1" = 10.0'	REQUESTER:	INTEC NGLW RCRA-COMPLIANT STORAGE STUDY
	DESIGN:	
	DRAWN: firesz	ENLARGED PLAN AREA 8
	PROJECT NO.	
	SPEC CODE	
DESIGN PHASE: STUDY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	SIZE D; CAGE CODE 01MF3; INDEX CODE NUMBER AREA 200 TYPE 0300 CL 02 ORG 530; DWG-3638c9; REV
QUALITY LEVEL: 3	EFFECTIVE DATE:	SCALE: 1"=10.0'; SHEET C-9

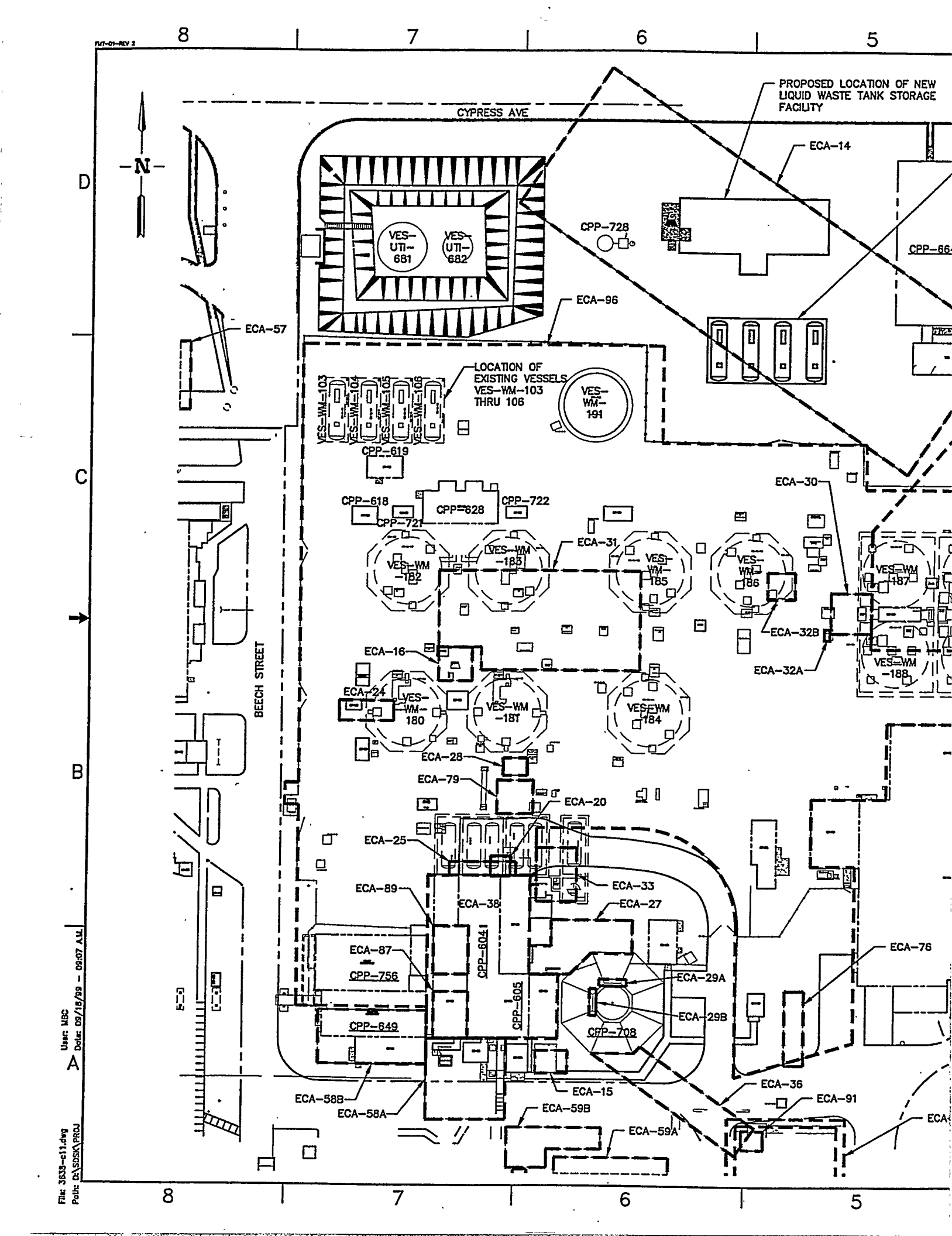

8
7
6
5
D
C
B
A
OVERALL TANK FARM PLAN

REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:

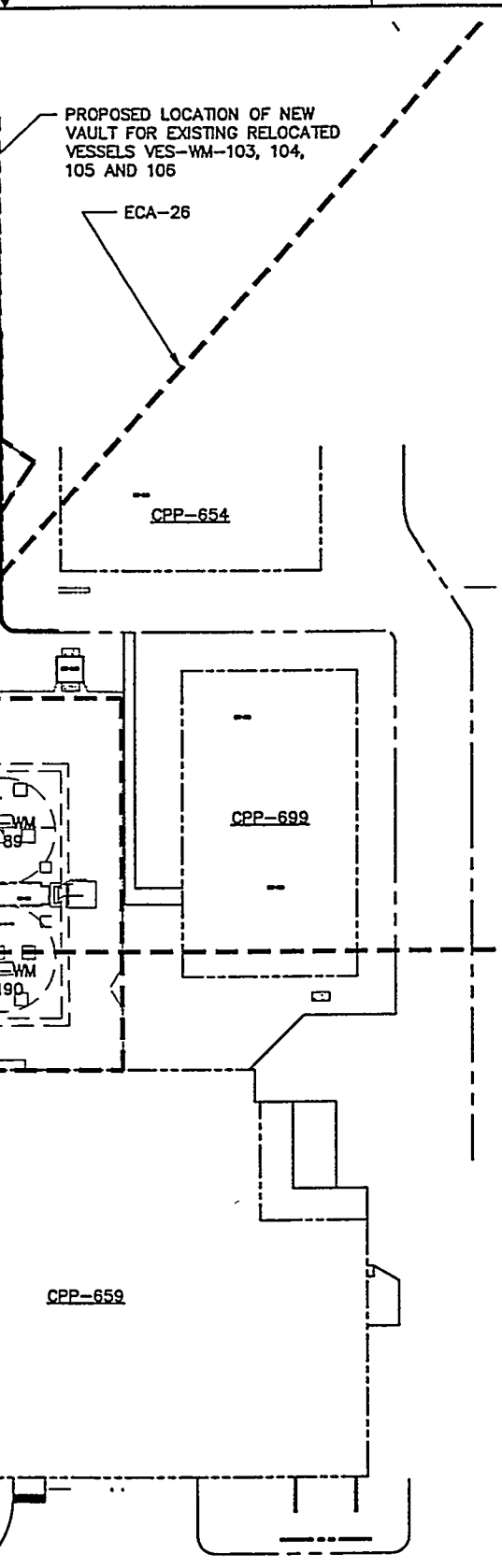




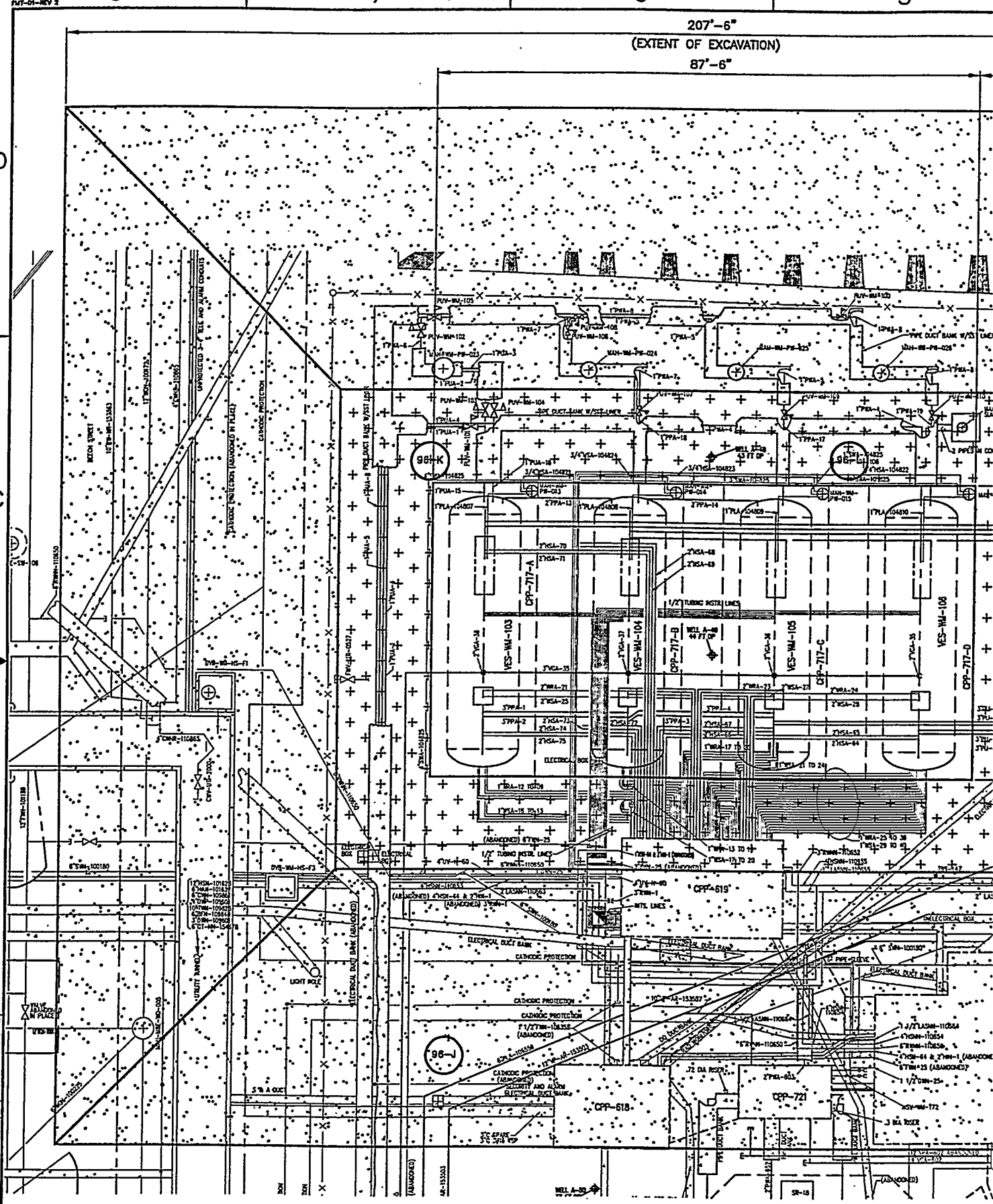
FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
30' 20' 10' 0 30' SCALE: 1" = 30.0'	REQUESTER:	INTEC NGLW RCRA–COMPLIANT STORAGE STUDY
	DESIGN:	
	DRAWN: friesz	OVERALL TANK FARM PLAN
	PROJECT NO.	
	SPEC CODE	
DESIGN PHASE: STUDY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	SIZE: D; CAGE CODE: 01MF3; INDEX CODE NUMBER: AREA 200, TYPE 0300, CL 02, ORG 530; DWG- 3638c10; REV
QUALITY LEVEL: 3	EFFECTIVE DATE:	SCALE: 1"=30.0'; SHEET C–10


PROPOSED LOCATION OF NEW LIQUID WASTE TANK STORAGE FACILITY
CYPRESS AVE
ECA-14
CPP-728
VES-UTI-681
VES-UTI-682
ECA-96
ECA-57
LOCATION OF EXISTING VESSELS VES-WM-103 THRU 106
VES-WM-103
VES-WM-104
VES-WM-105
VES-WM-106
VES-WM-191
CPP-619
CPP-618
CPP-628
CPP-722
CPP-721
ECA-30
ECA-31
VES-WM-182
VES-WM-185
VES-WM-186
VES-WM-187
ECA-32B
ECA-32A
VES-WM-188
ECA-16
ECA-24
VES-WM-180
VES-WM-181
VES-WM-184
ECA-28
ECA-79
ECA-20
ECA-25
ECA-89
ECA-33
ECA-38
ECA-27
ECA-87
CPP-756
CPP-604
CPP-605
ECA-29A
ECA-29B
CPP-649
CPP-708
ECA-76
ECA-58B
ECA-58A
ECA-15
ECA-36
ECA-91
ECA-59B
ECA-59A
BEECH STREET
N
8
7
6
5
D
C
B
A

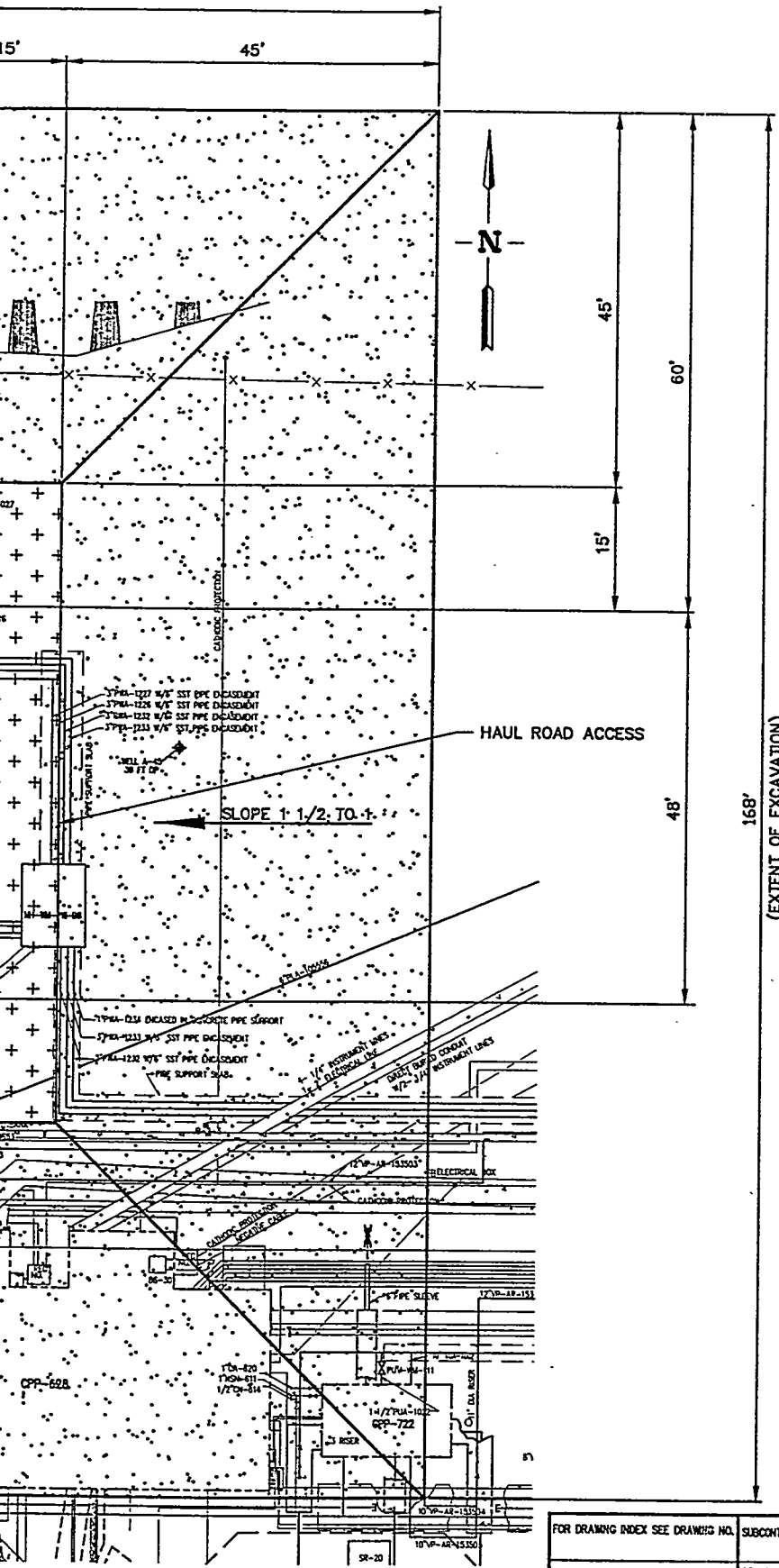
REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:



FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
40' 20' 5' 0 40' SCALE: 1" = 40.0'	REQUESTER:	INTEC NGLW RCRA-COMPLIANT STORAGE STUDY
	DESIGN:	
	DRAWN: friesz	TANK FARM ECA AND NEW FACILITY PLAN
	PROJECT NO.	
	SPEC CODE	SIZE: D; CAGE CODE: 01MF3; INDEX CODE NUMBER: AREA 200, TYPE 0300, CI 02, 080 530; DWG- 3638c11; REV
DESIGN PHASE: STUDY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	
QUALITY LEVEL: 3	EFFECTIVE DATE:	SCALE: 1"=40.0"; SHEET C-11



EXCAVATION PLAN



REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:

FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.
	REQUESTER:
	DESIGN:
	DRAWN: friesz
	PROJECT NO.
	SPEC CODE
DESIGN PHASE: STUDY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.
QUALITY LEVEL:	EFFECTIVE DATE:

10' 5' 0 10'
SCALE: 1" = 10.0'

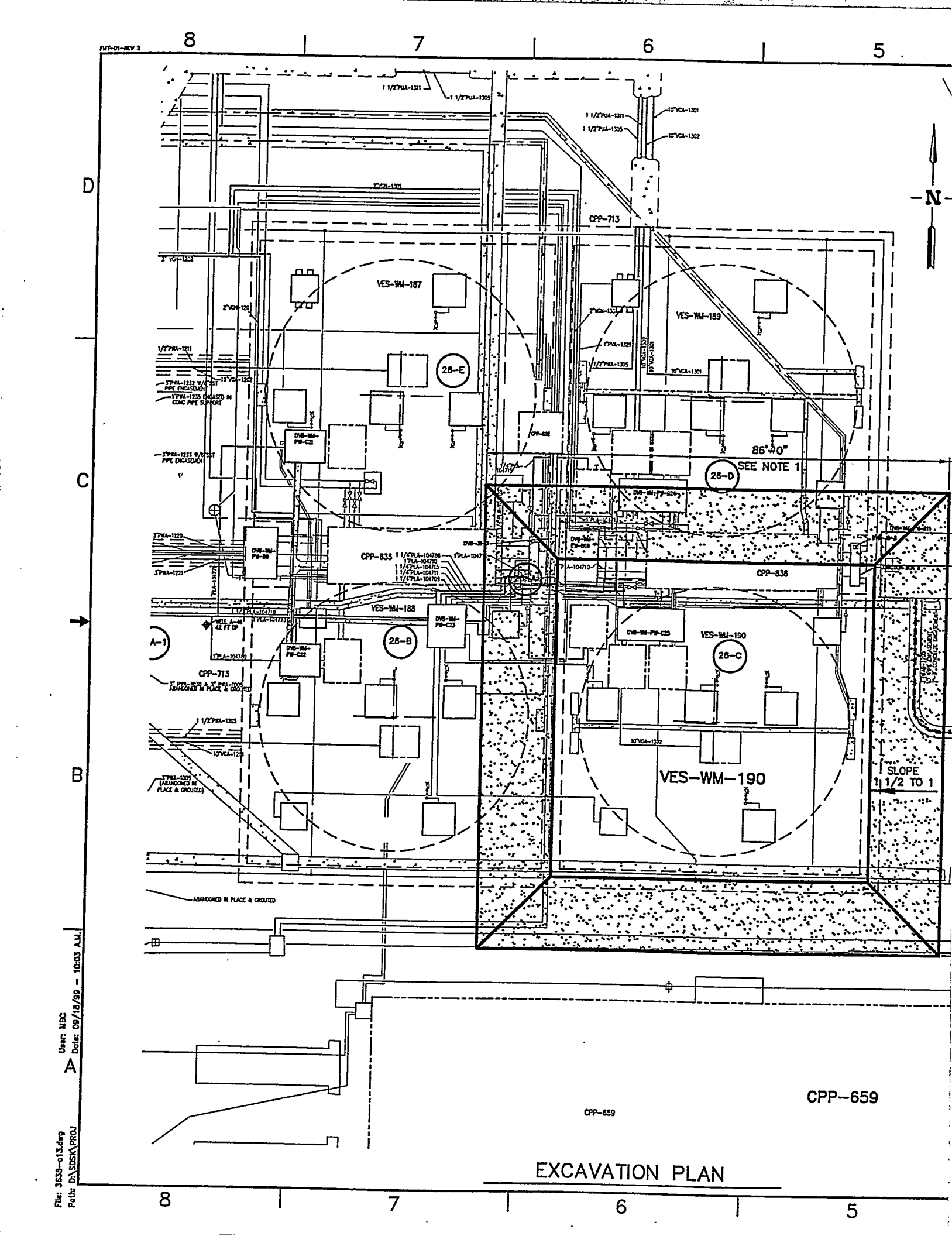
LOCKHEED MARTIN

INTEC
NGLW RCRA-COMPLIANT STORAGE STUDY

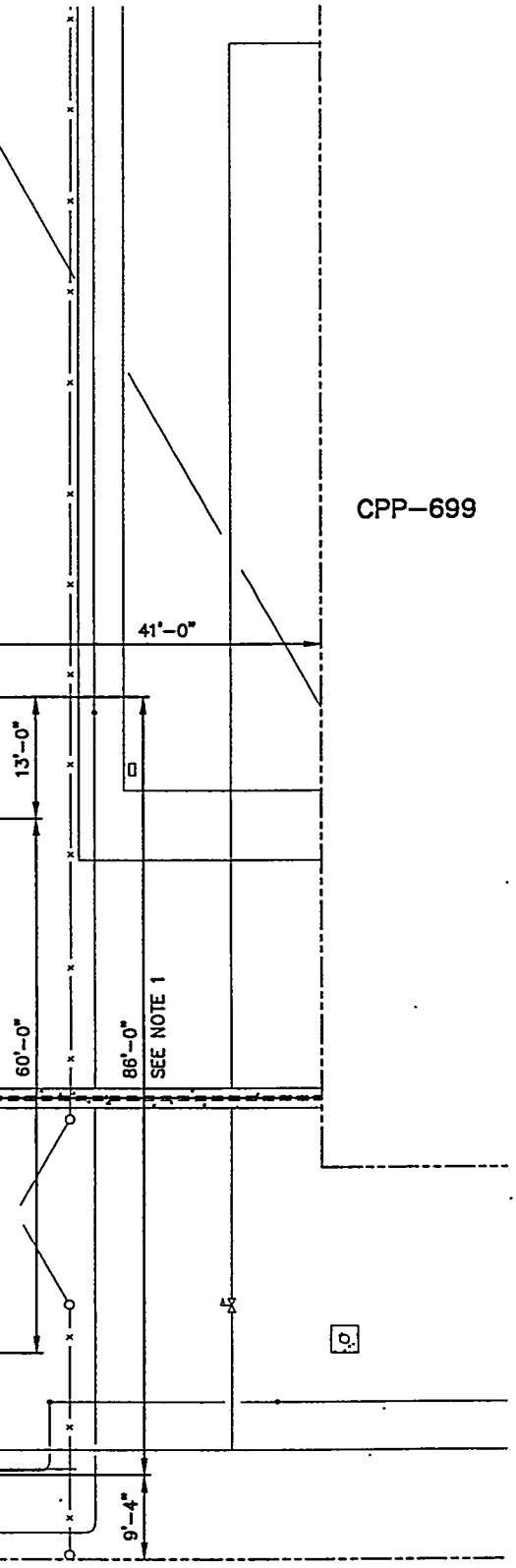
VES-WM-103 THRU 106 EXCAVATION PLAN

SIZE	CAGE CODE	INDEX CODE NUMBER				DWG	REV
		AREA	TYPE	CL	SEQ		
D	01MF3	200	0300	02	530	3638c12	

SCALE: 1"=10.0' SHEET C-12


8
7
6
5
D
C
B
A
N
VES-WM-187
VES-WM-188
VES-WM-189
VES-WM-190
26-E
26-B
26-C
26-D
CPP-713
CPP-635
CPP-636
CPP-659
SEE NOTE 1
86'40"
SLOPE 1 1/2 TO 1
ABANDONED IN PLACE & GROUTED
EXCAVATION PLAN
User: MBC
Date: 09/18/99 - 10:03 A.M.
File: 3638-c13.dwg
Path: D:\SDSK\PROJ

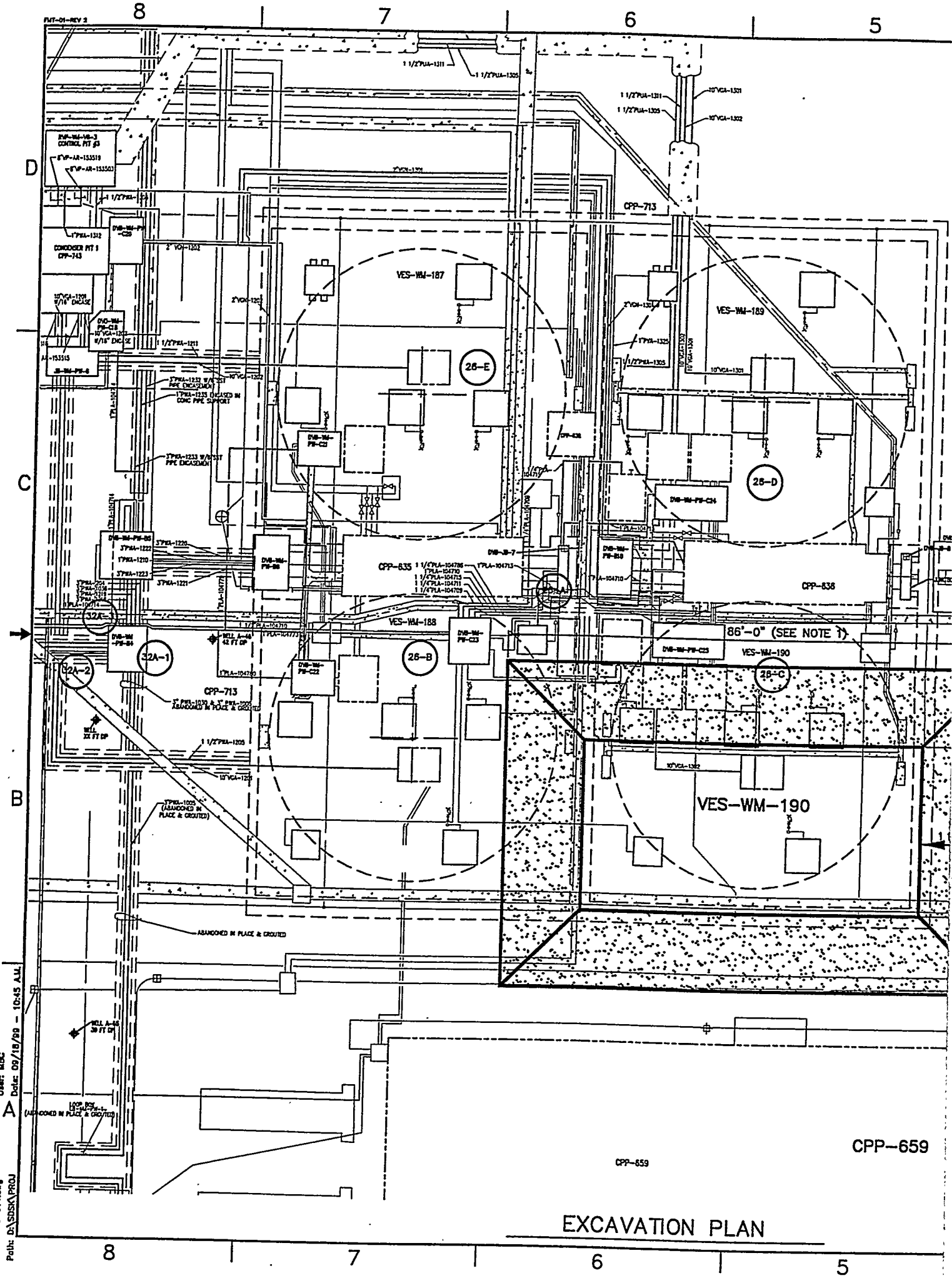
REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:

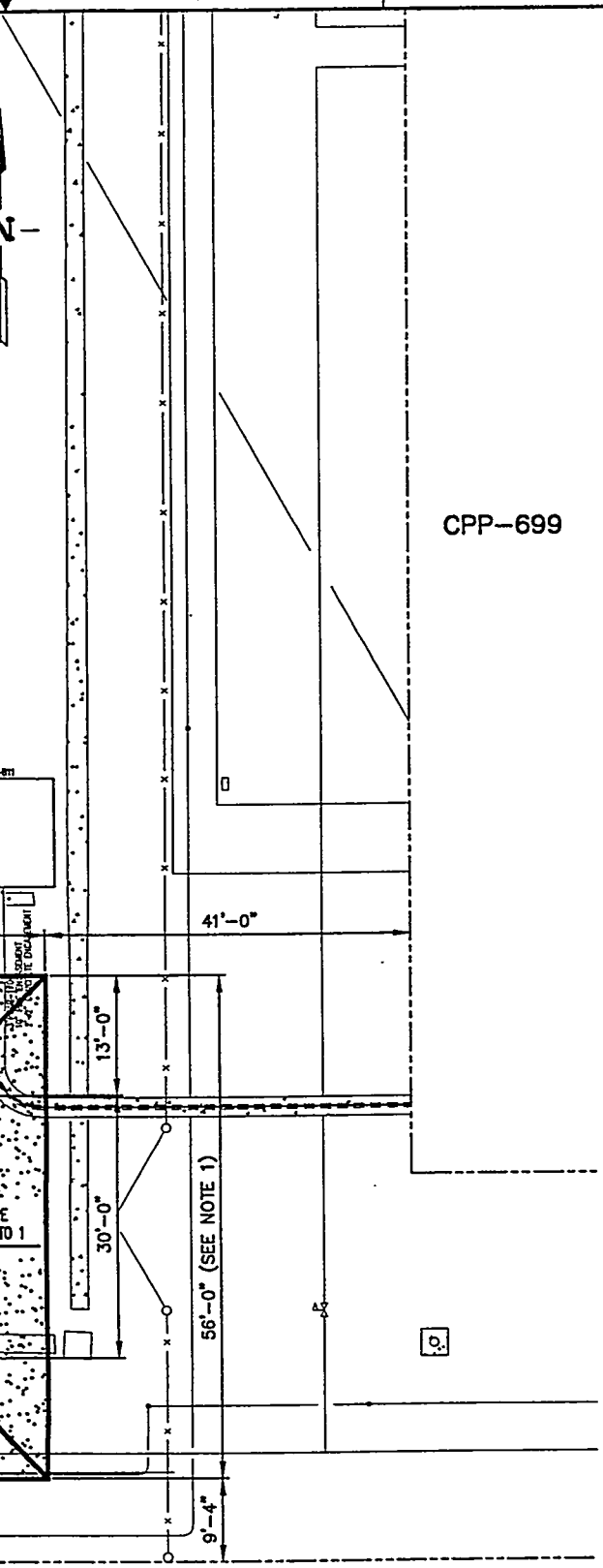


NOTE

1. EXCAVATION AREA SHOWN IS BASED UPON A 1 1/2:1 SLOPE WITH NO SHORING.

FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
10' 5' 0 10' SCALE: 1" = 10.0'	REQUESTER:	INTEC NGLW RCRA–COMPLIANT STORAGE STUDY TANK VAULT CPP–713 – VES–WM–190 EXCAVATION PLAN – OPTION "1"
	DESIGN:	
	DRAWN: friesz	
	PROJECT NO.	
	SPEC CODE	
DESIGN PHASE: STUDY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	SIZE D · CAGE CODE 01MF3 · INDEX CODE NUMBER AREA 200 · TYPE 0300 · 02 · ORG 530 · DWG- 3638c13 · REV
QUALITY LEVEL:	EFFECTIVE DATE:	SCALE: 1"=10.0' · SHEET C–13


8
7
6
5
D
C
B
A
CPP-713
VES-WM-187
VES-WM-189
VES-WM-188
VES-WM-190
26-E
26-D
26-B
26-C
32A-1
32A-2
CPP-835
CPP-836
86'-0" (SEE NOTE 1)
ABANDONED IN PLACE & GROUTED
CPP-659
EXCAVATION PLAN
User: MBC
Date: 09/18/99 - 10:45 A.M.
File: 3638-c14.dwg
Path: D:\SDSK\PROJ



REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:

NOTE

1. EXCAVATION AREA SHOWN IS BASED UPON A 1 1/2:1 SLOPE WITH NO SHORING.

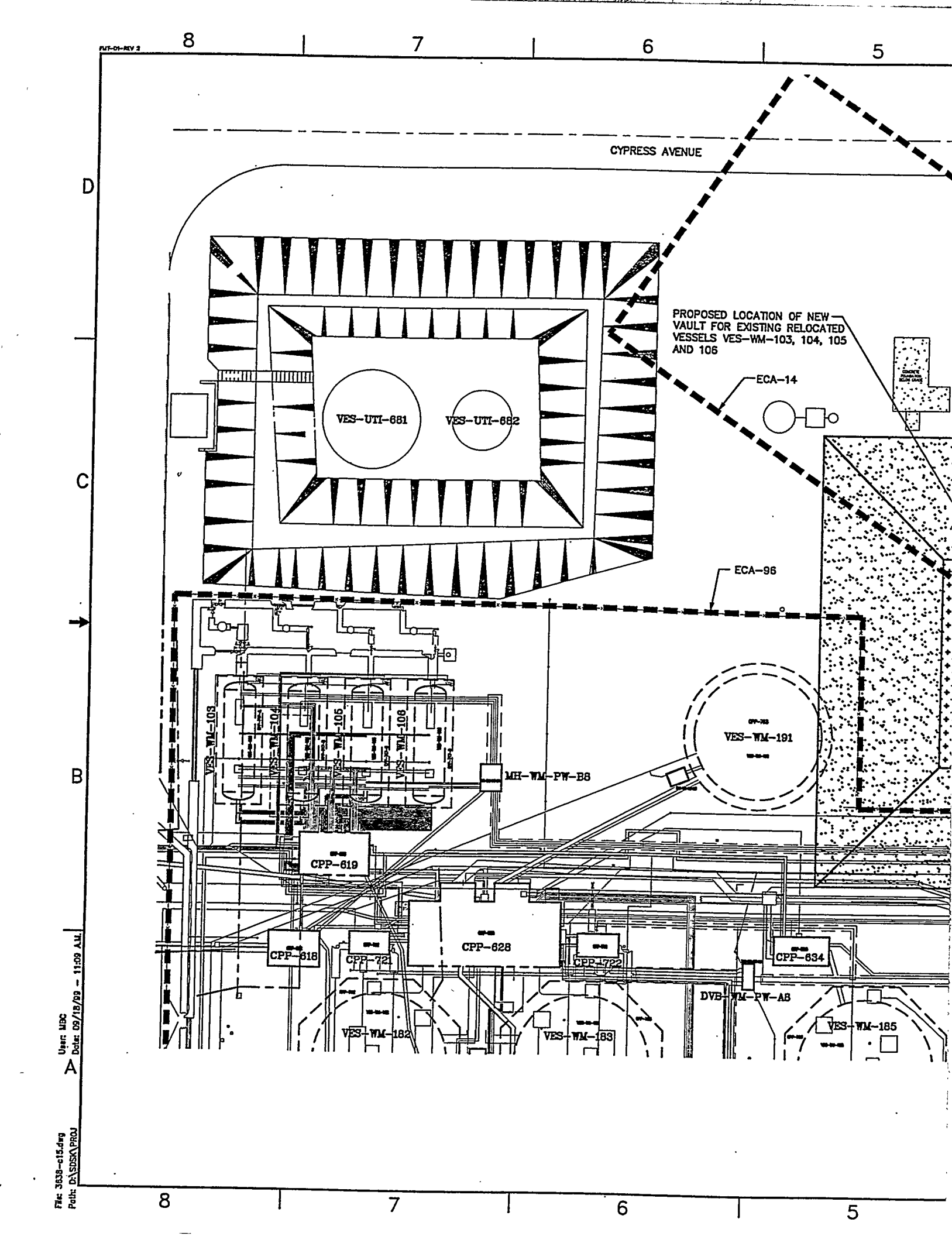
FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.
	REQUESTER:
10' 5' 0 10' SCALE: 1" = 10.0'	DESIGN:
	DRAWN: friesz
	PROJECT NO.
	SPEC CODE
	FOR REVIEW/APPROVAL SIGNATURES
DESIGN PHASE: STUDY	SEE DAR NO.
QUALITY LEVEL: 3	EFFECTIVE DATE:

LOCKHEED MARTIN

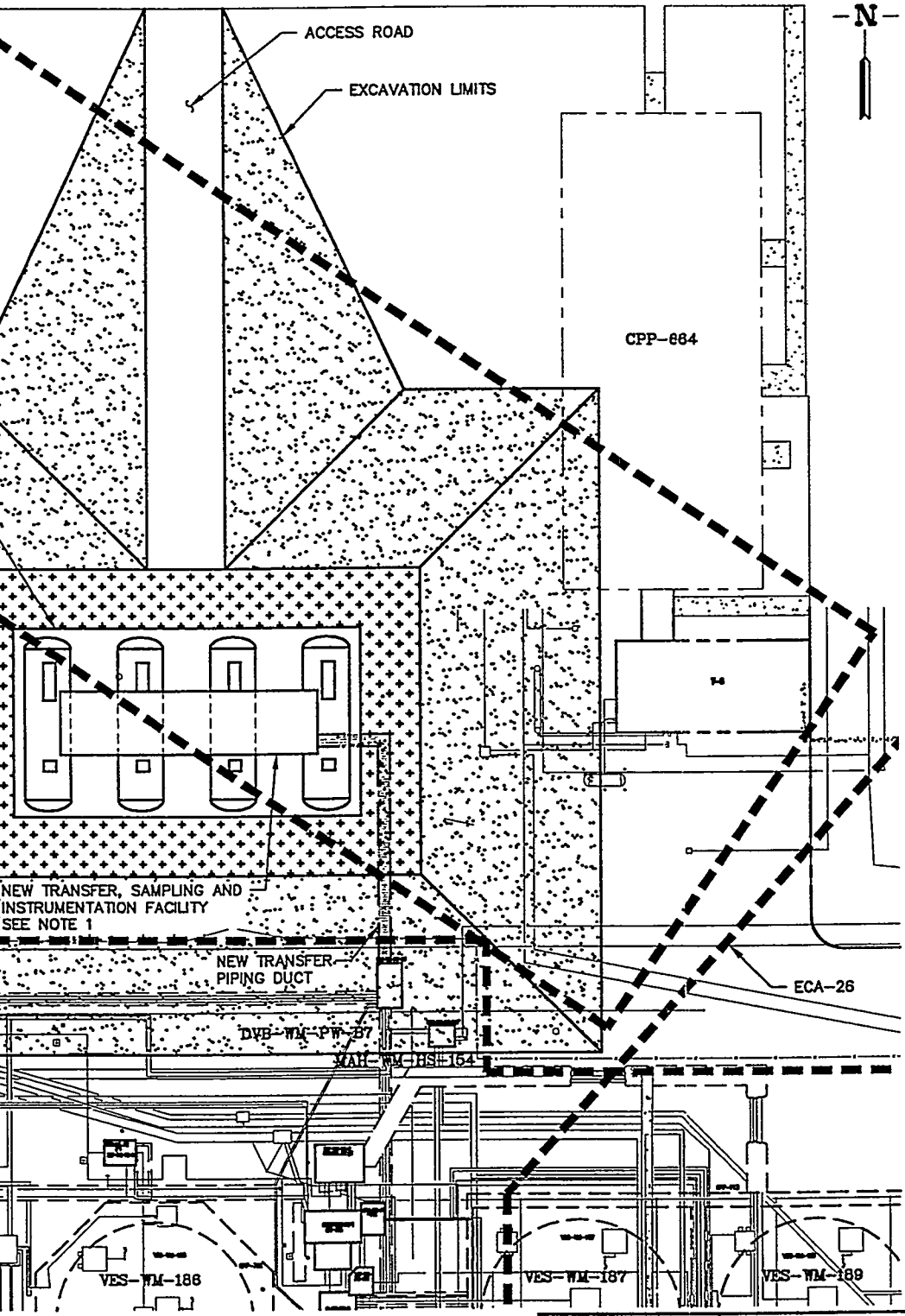
INTEC
NGLW RCRA-COMPLIANT STORAGE STUDY
TANK VAULT CPP-713 - VES-WM-190
EXCAVATION PLAN - OPTION "2"

SIZE	CAGE CODE	INDEX CODE NUMBER AREA	TYPE	SL	ORG	DWG-	REV
D	01MF3	200	0300	02	530	3638c14	

SCALE: 1"=10.0' SHEET C-14


FVT-01-REV 3
8
7
6
5
D
C
B
A
CYPRESS AVENUE
PROPOSED LOCATION OF NEW VAULT FOR EXISTING RELOCATED VESSELS VES-WM-103, 104, 105 AND 106
ECA-14
ECA-96
VES-UTI-681
VES-UTI-682
VES-WM-103
VES-WM-104
WM-105
WM-106
MH-WM-PW-B8
VES-WM-191
CPP-619
CPP-618
CPP-721
CPP-628
CPP-722
CPP-634
DVB-WM-PW-A8
VES-WM-182
VES-WM-183
VES-WM-185
User: MBC
Date: 09/18/09 - 11:09 A.M.
File: 3638-c15.dwg
Path: D:\SDSA\PROJ
8
7
6
5

REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE



N

NOTE

1. FOR DETAILS OF THE NEW TRANSFER, SAMPLING AND INSTRUMENTATION FACILITY, SEE SHEETS FROM THE NEW TANK FARM FEASIBILITY STUDY. THESE SHEETS ARE IDENTIFIED AS A-4, A-8, A-9, A-10, C-1 AND C-2.

FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.
40' 20' 5' 0 40' SCALE: 1" = 40.0'	REQUESTER:
	DESIGN:
	DRAWN: friesz
	PROJECT NO.
	SPEC CODE
DESIGN PHASE: STUDY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.
QUALITY LEVEL: 3	EFFECTIVE DATE:

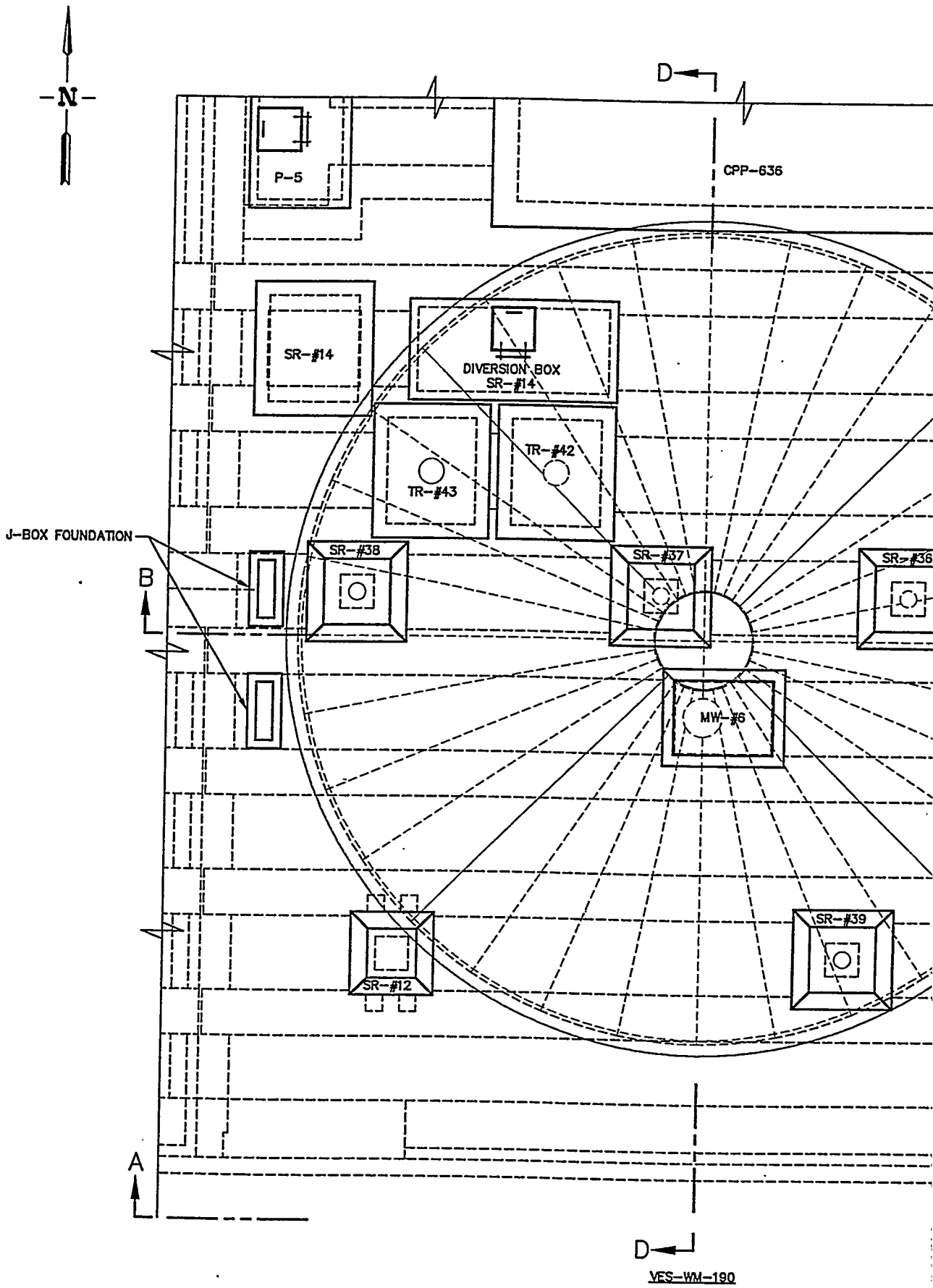
LOCKHEED MARTIN

INTEC
NGLW RCRA-COMPLIANT STORAGE STUDY

TANK FARM NEW FACILITY PLAN

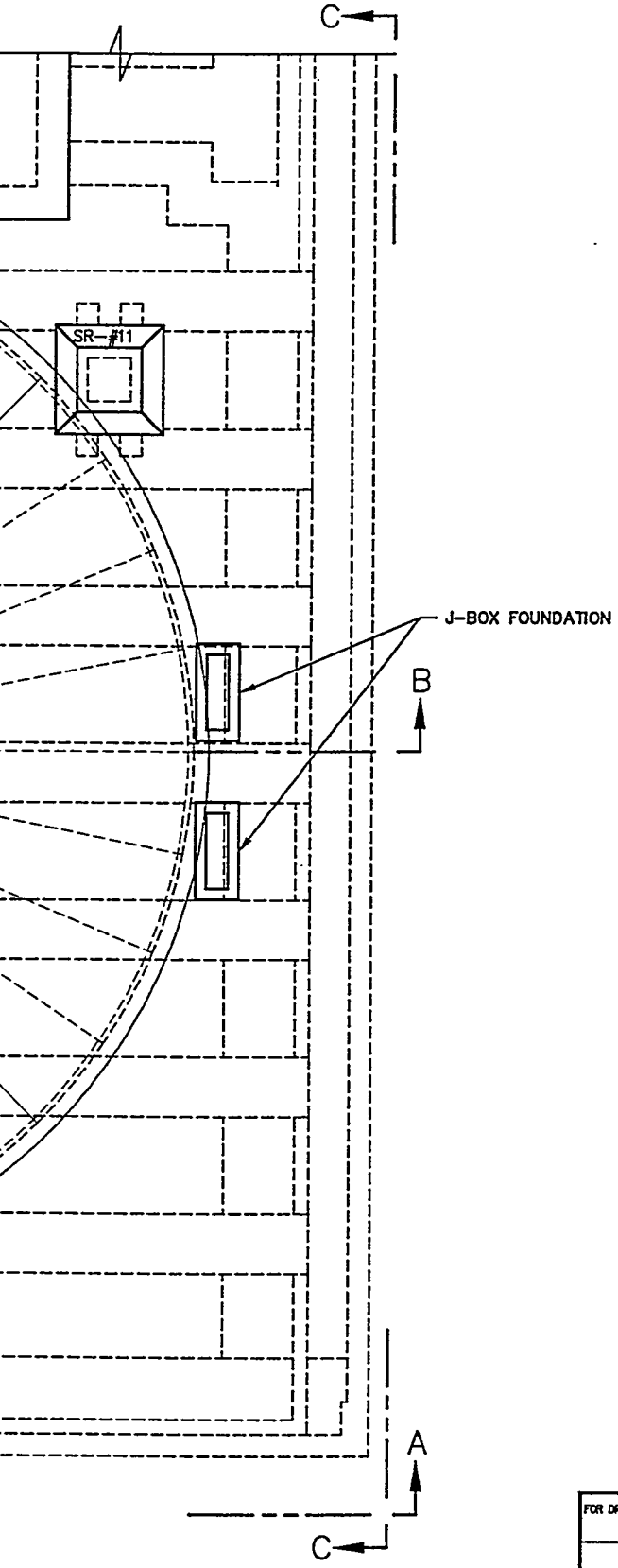
SIZE	CAGE CODE	INDEX CODE NUMBER				DWG-	REV
		AREA	TYPE	CL	OBG		
D	01MF3	200	0300	02	530	3638c15	

SCALE: 1"=40.0" SHEET C-15

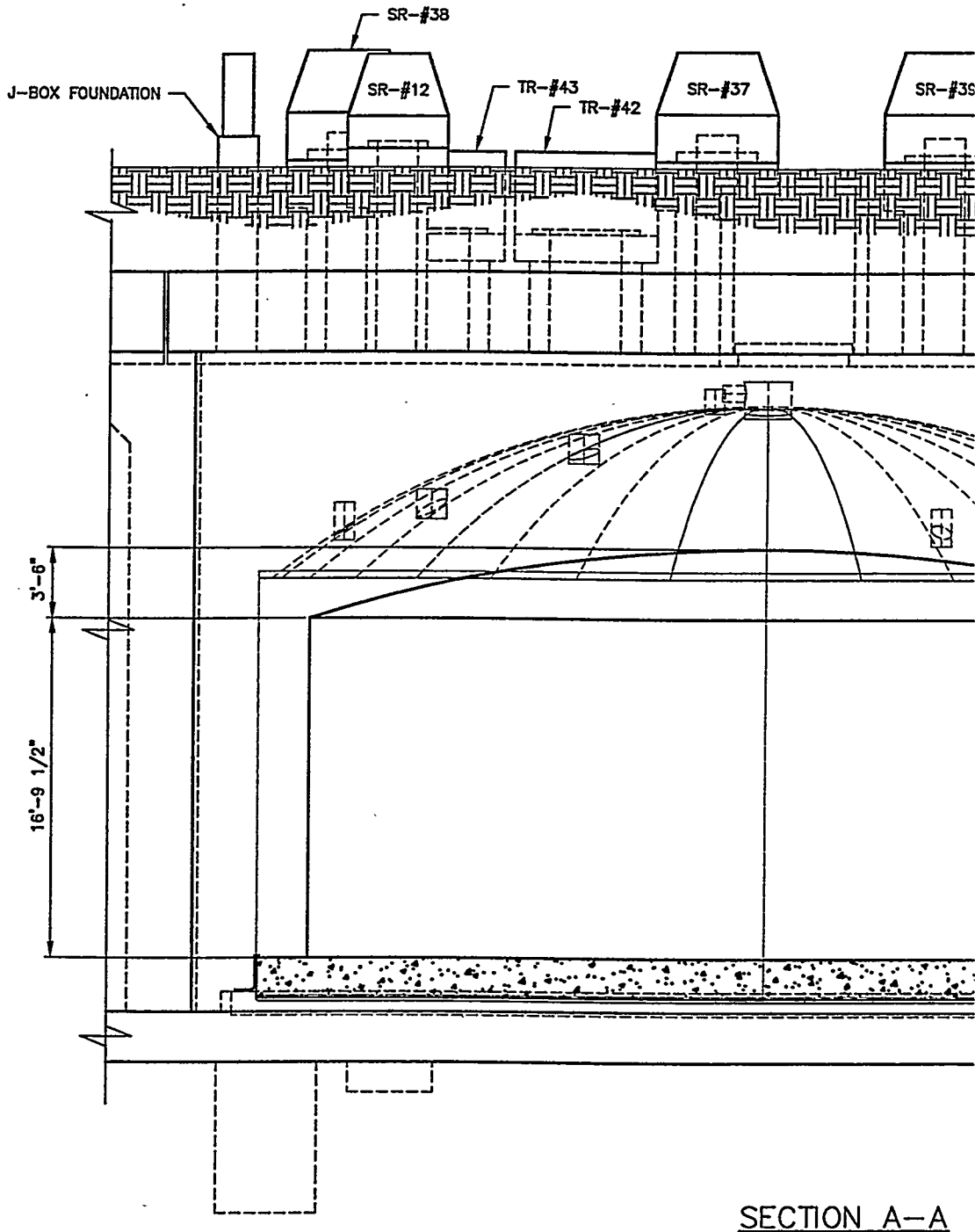


EXISTING VAULT CPP-713 PLAN

REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:



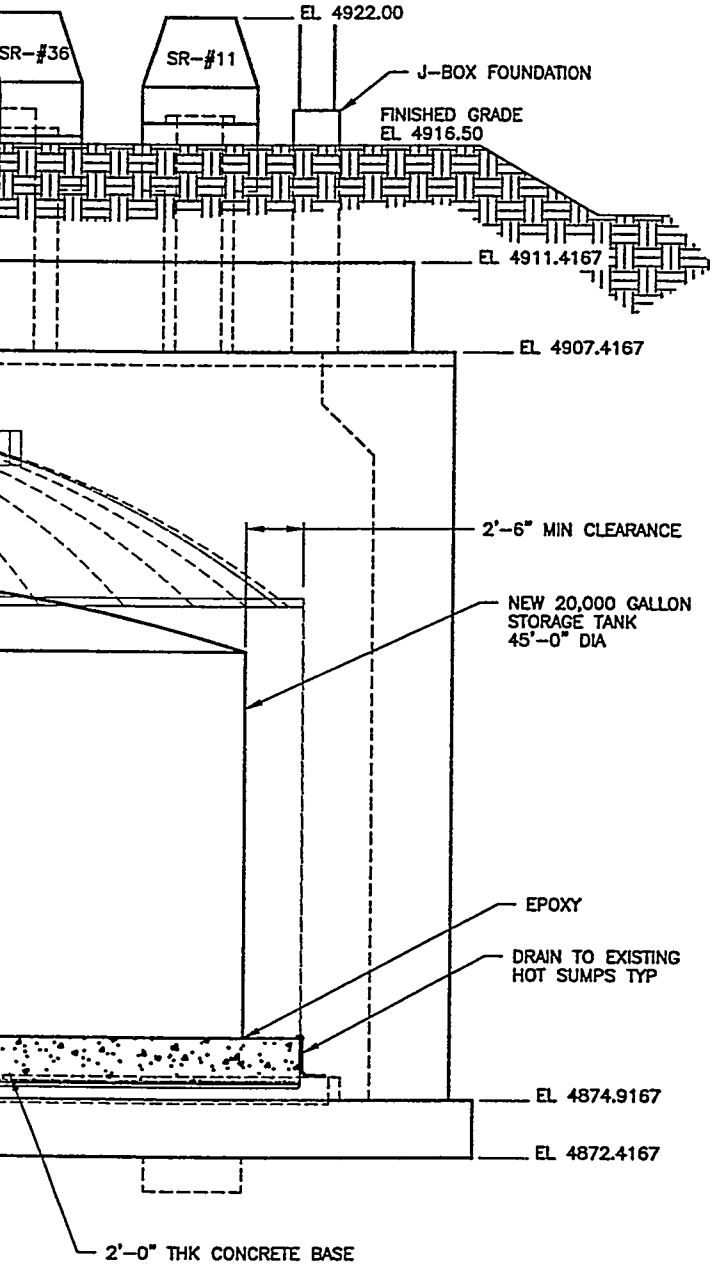
FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
3" 2" 1" 0 3" SCALE: 3" = 1'-0"	REQUESTER: C. OLSEN DESIGN: RJ WATERS DRAWN: RA FRIESZ PROJECT NO. SPEC CODE	INTEC NGLW RCRA-COMPLIANT STORAGE STUDY TANK VAULT CPP-713 PLAN VES-WM-190
DESIGN PHASE: STUDY QUALITY LEVEL: 3	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO. EFFECTIVE DATE:	SIZE: D; CAGE CODE: 01MF3; INDEX CODE NUMBER: AREA 200, TYPE 0713, CI 62, ORG 530; DWG-3638s1; REV SCALE: 3"=1'-0"; SHEET S-1



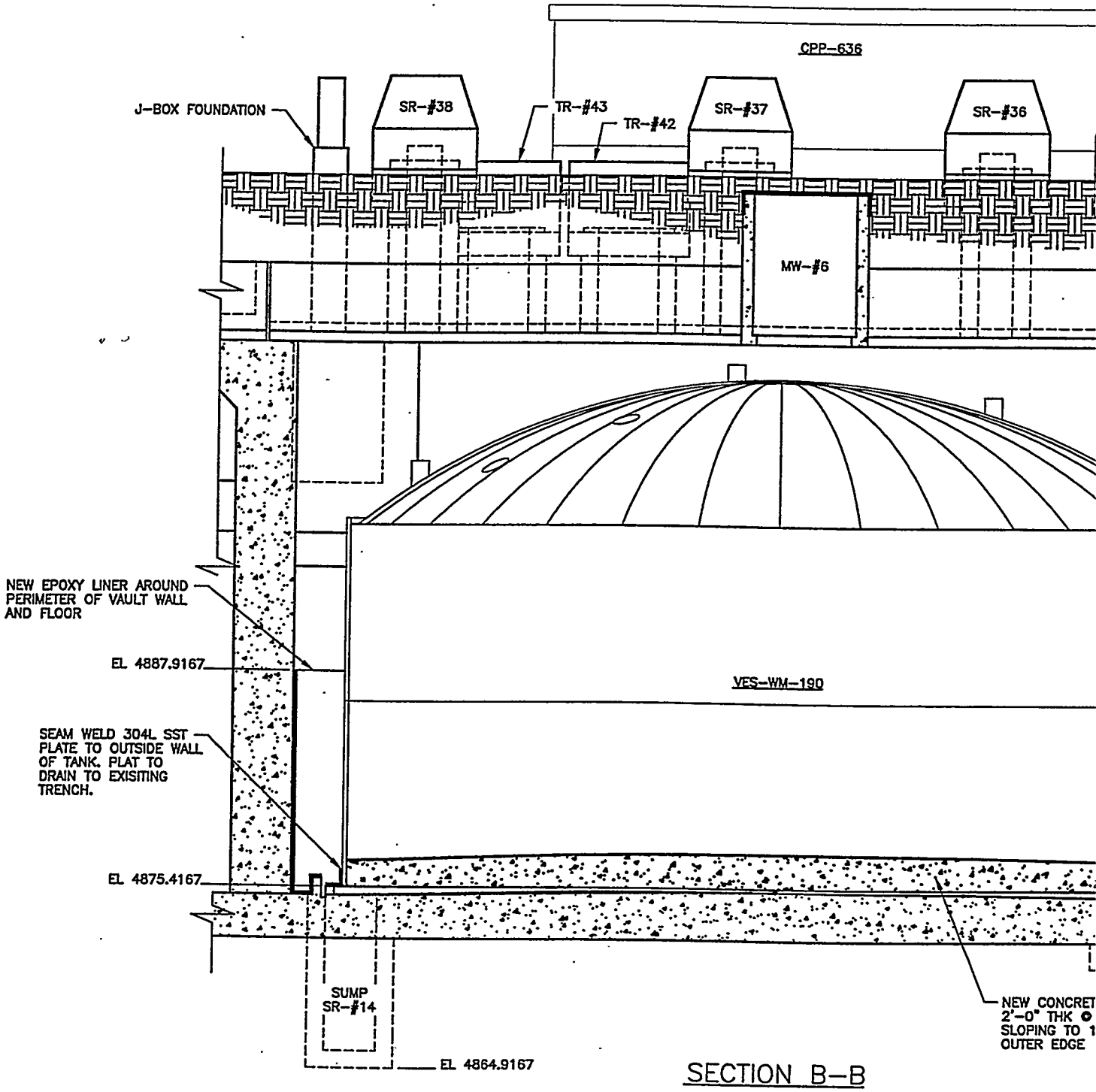
SECTION A-A

MODIFIED TO SHOW OPTION "1"

REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:



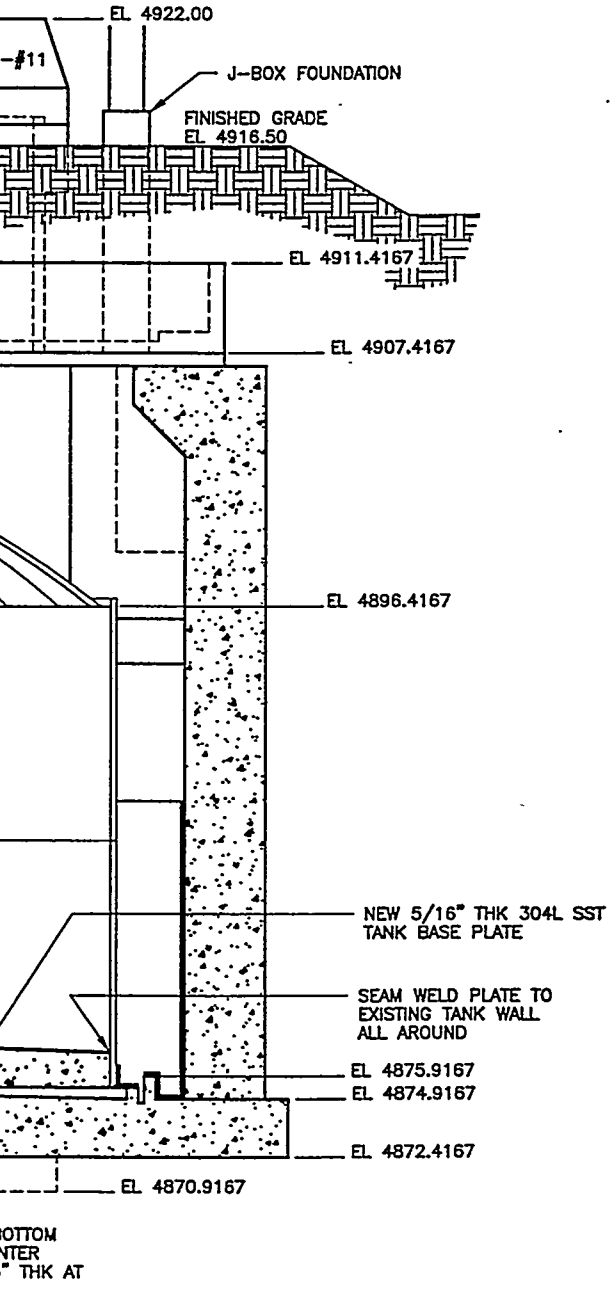
FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
SCALE: 1/4" = 1'-0"	REQUESTER: RJ WATERS	INTEC NGLW RCRA-COMPLIANT STORAGE STUDY TANK VAULT CPP-713 SECTION A-A
	DESIGN:	
	DRAWN: RA FRIESZ	
	PROJECT NO.	
	SPEC CODE	
DESIGN PHASE: STUDY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	SIZE: D; CAGE CODE: 01MF3; INDEX CODE NUMBER: AREA 200, TYPE 0713, CL 62, ORG 530; DWG-3638s2; REV
QUALITY LEVEL: 3	EFFECTIVE DATE:	SCALE: 1/4"=1'-0"; SHEET S-2



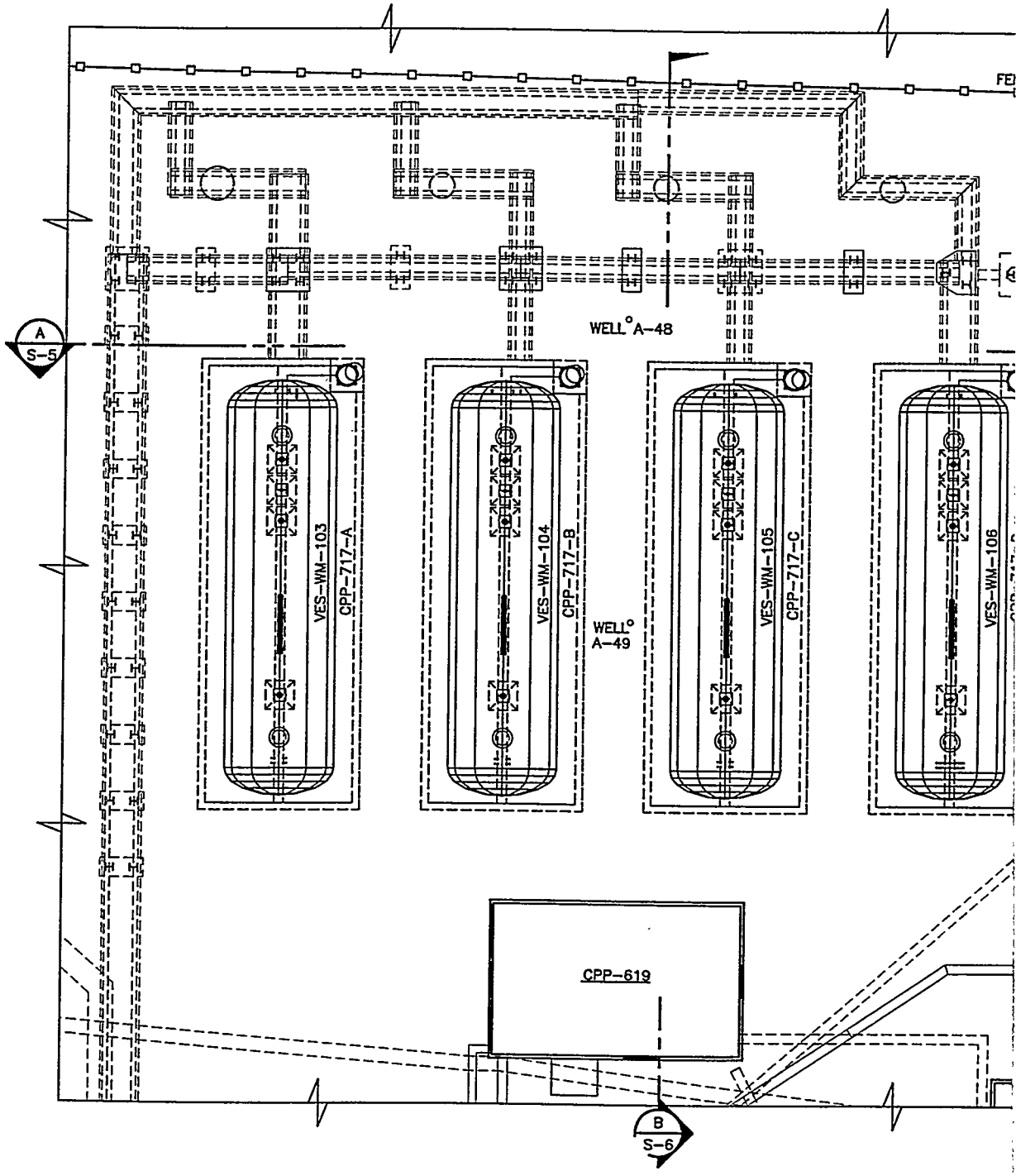
SECTION B-B

MODIFIED TO SHOW OPTION "2"

REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:

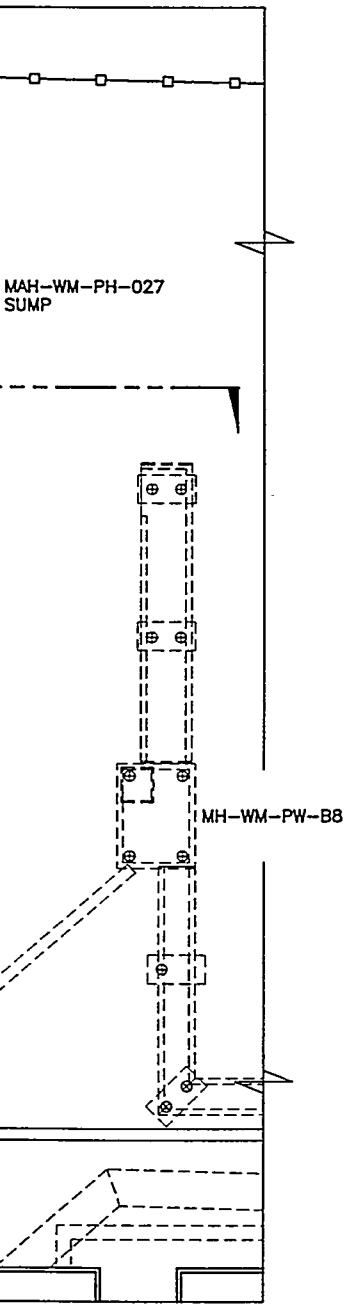


FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
SCALE: 1/4" = 1'-0"	REQUESTER: CW OLSEN	INTEC NGLW RCRA-COMPLIANT STORAGE STUDY TANK VAULT CPP-713 SECTION B-B
	DESIGN:	
	DRAWN: RA FRIESZ	
	PROJECT NO.	
	SPEC CODE	
DESIGN PHASE: STUDY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	SIZE: D; CAGE CODE: 01MF3; INDEX CODE NUMBER: AREA 200, TYPE 0713, CL 62, OSG 530; DWG-3638s3; REV
QUALITY LEVEL: 3	EFFECTIVE DATE:	SCALE: 1/4"=1'-0"; SHEET S-3



EXISTING CPP-717 PLAN

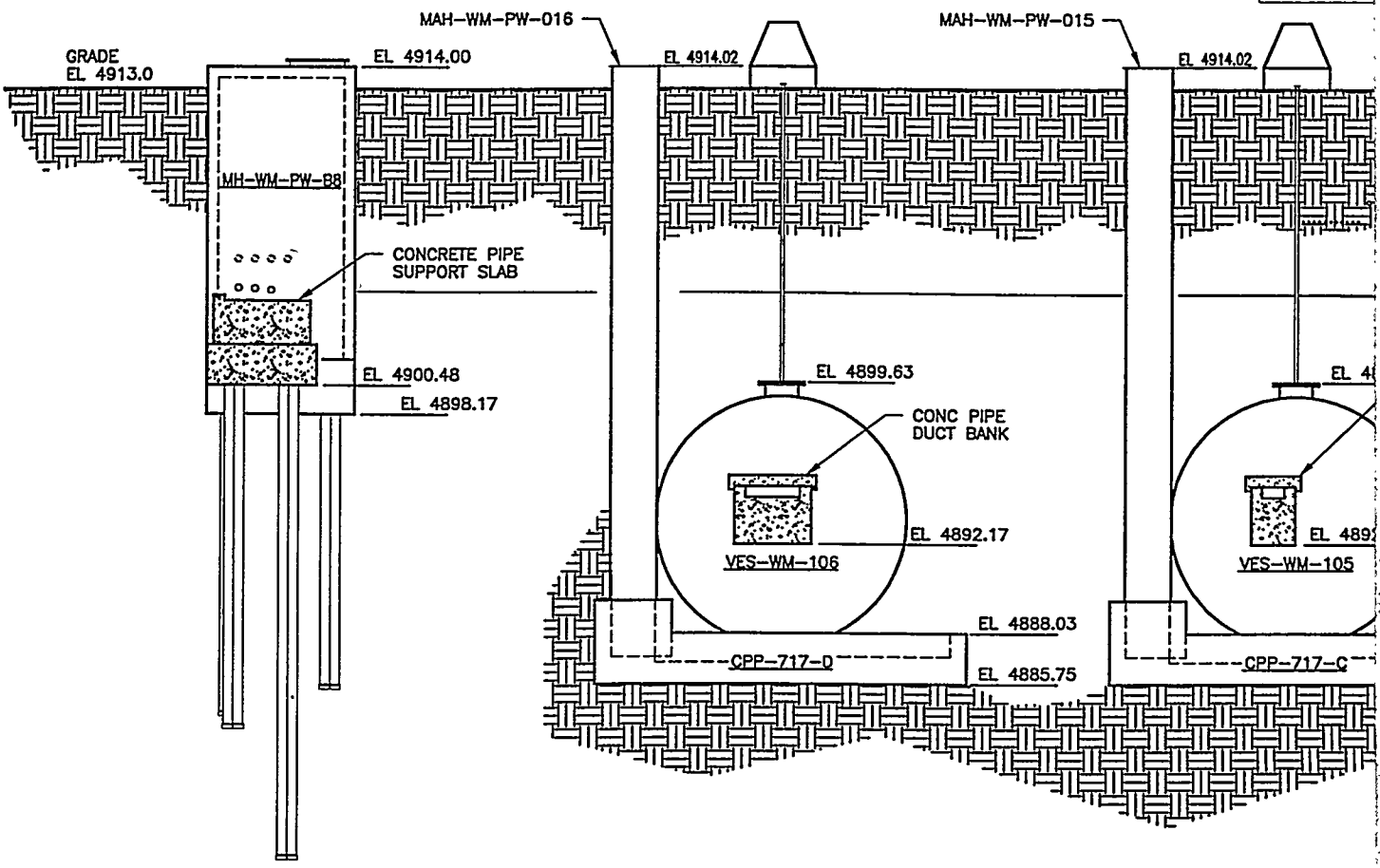
REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:



NOTE

1. FOR RELOCATION OF EXISTING VESSELS VES-WM-103, VES-WM-104, VES-WM-105 AND VES-WM-106, SEE SHEET C-15.

FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
SCALE: 1 1/2" = 1'-0"	REQUESTER: CW OLSEN	INTEC NGLW RCRA-COMPLIANT STORAGE STUDY
	DESIGN:	
	DRAWN: RA FRIESZ	EXISTING CPP-717 PLAN
	PROJECT NO.	
	SPEC CODE	SIZE: D; CAGE CODE: 01MF3; INDEX CODE NUMBER: AREA 200, TYPE 0717, QL 62, ORG 530; DWG-3638s4; REV
DESIGN PHASE: STUDY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	
QUALITY LEVEL: 3	EFFECTIVE DATE:	SCALE: 1 1/2"=1'-0"; SHEET S-4



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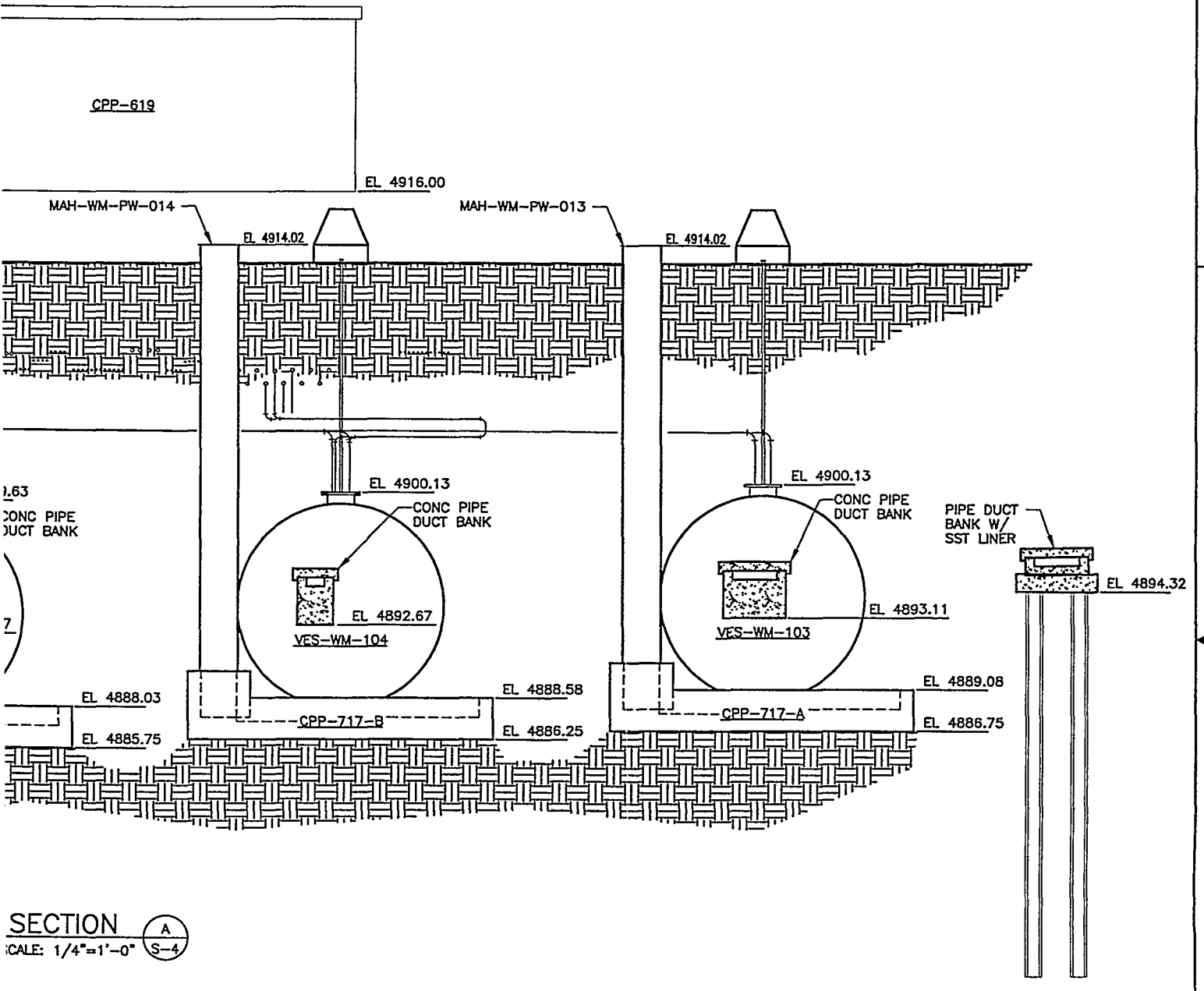
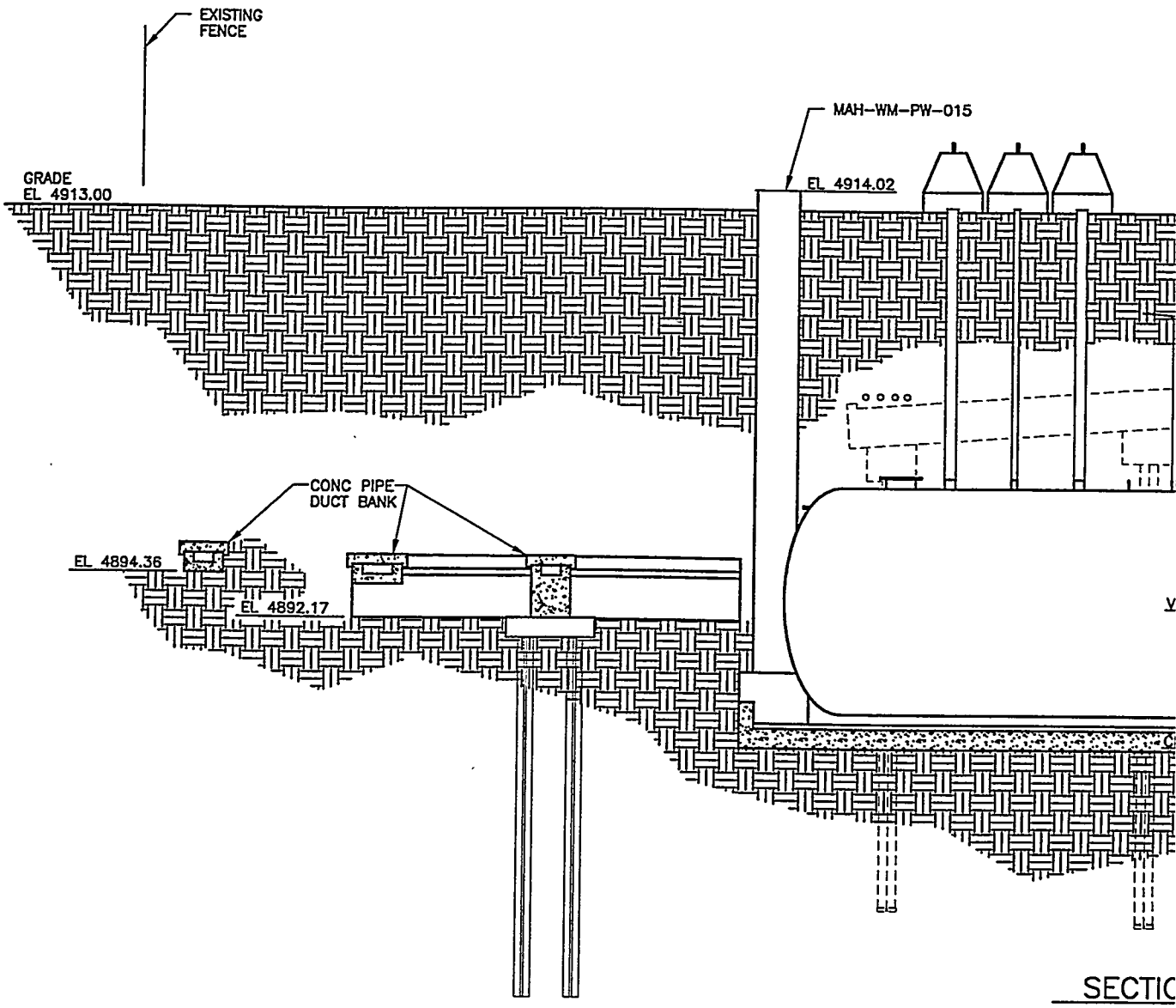


SECTION (A / S-4)
SCALE: 1/4"=1'-0"

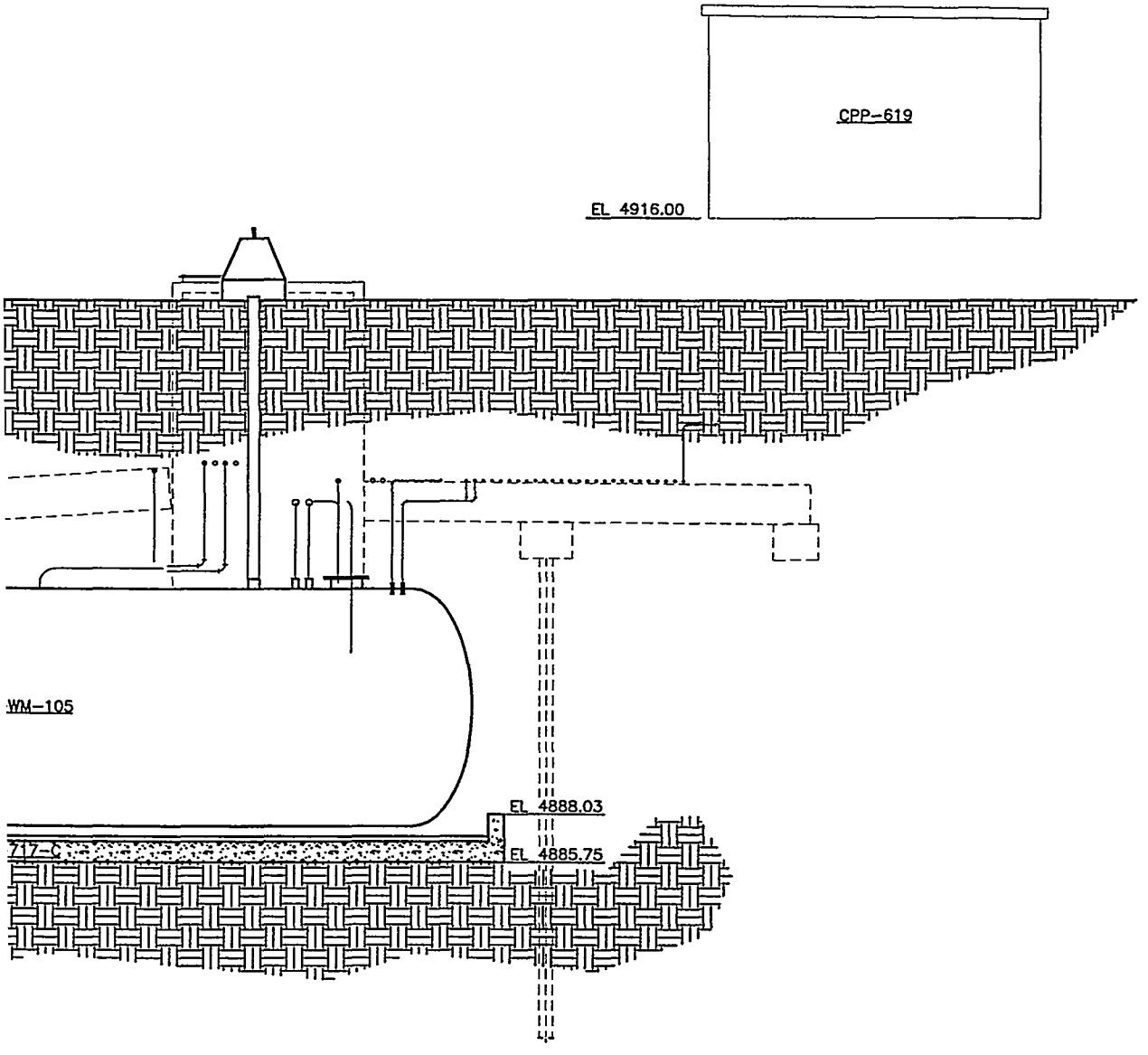
FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
SCALE: 1/4" = 1'-0"	REQUESTER: CW OLSEN	INTEC NGLW RCRA-COMPLIANT STORAGE STUDY CPP-717 SECTIONS
	DESIGN:	
	DRAWN: RA FRIESZ	
	PROJECT NO.	
	SPEC CODE	
DESIGN PHASE: STUDY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	SIZE D / CAGE CODE 01MF3 / INDEX CODE NUMBER AREA 200 TYPE 0717 SL 52 SEQ 530 / DWG- 3638s5 / REV
QUALITY LEVEL: 3	EFFECTIVE DATE:	SCALE: 1/4"=1'-0" / SHEET S-5



SECTIO

SCALE: 1/4"=

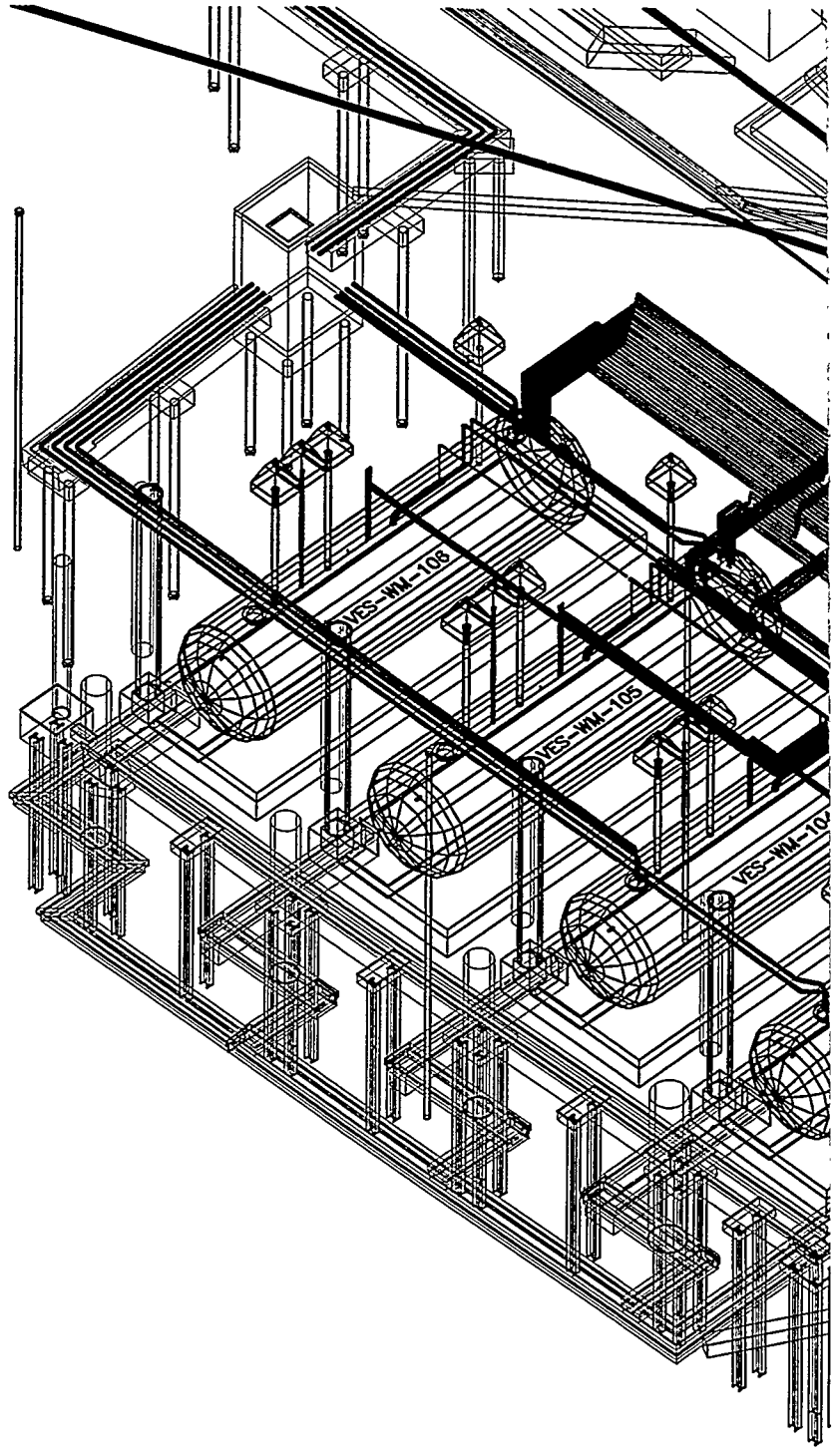
REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:



B
S-4

FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
SCALE: 1/4" = 1'-0"	REQUESTER: CW OLSEN DESIGN: DRAWN: RA FRIESZ PROJECT NO. SPEC CODE	INTEC NGLW RCRA-COMPLIANT STORAGE STUDY CPP-717 SECTION
DESIGN PHASE: STUDY QUALITY LEVEL: 3	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO. EFFECTIVE DATE:	SIZE: D CAGE CODE: 01MF3 INDEX CODE NUMBER: AREA 200 | TYPE 0717 | CL 62 | ORG 530 DWG-3638s6 REV SCALE: 1/4"=1'-0" SHEET S-6

FMT-01-REV 2



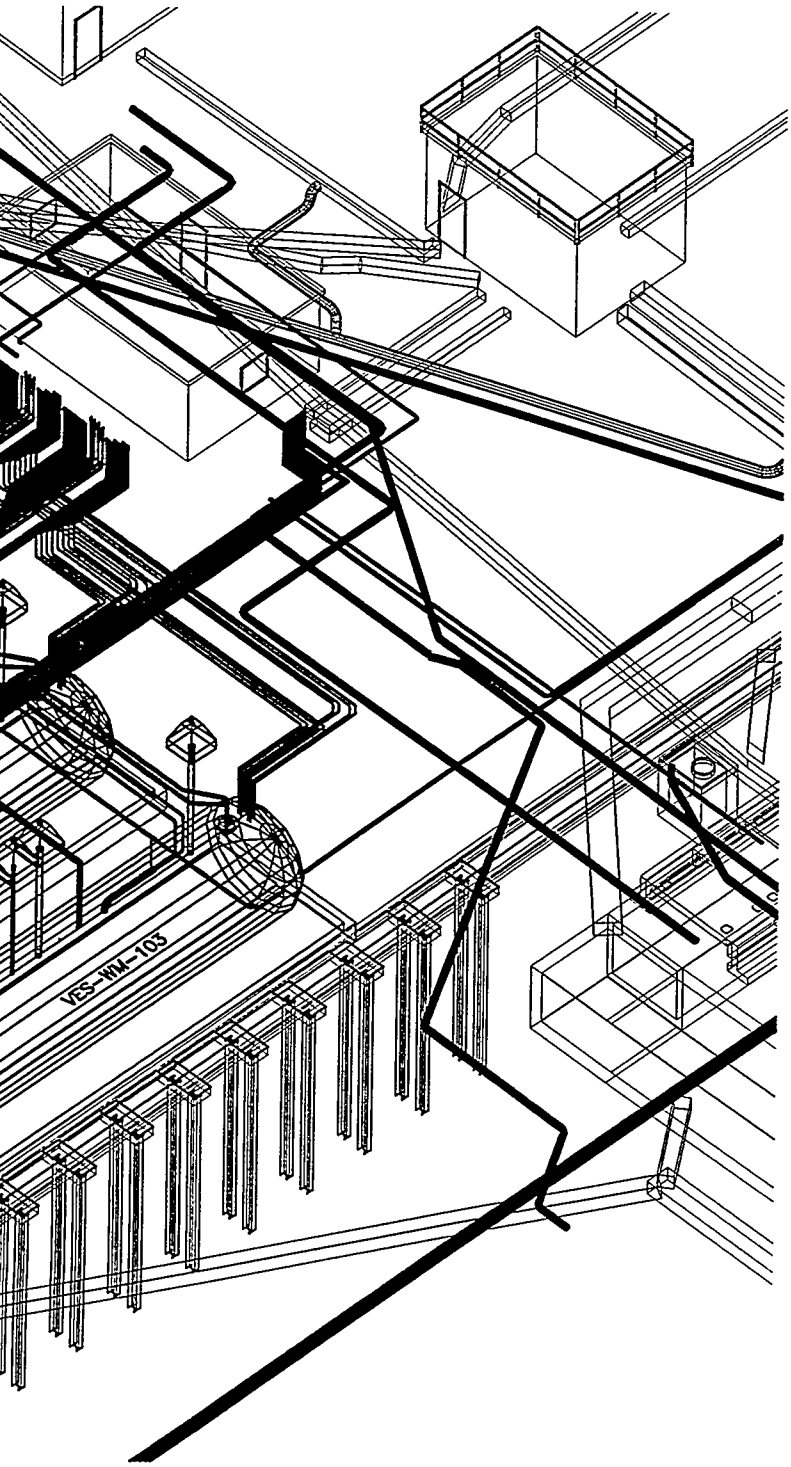
ISOME

LOOKING SOU

User: MBC
Date: 09/20/99 - 09:16 AM

File: 3538-s7.dwg
Path: D:\SDSK\PROJ

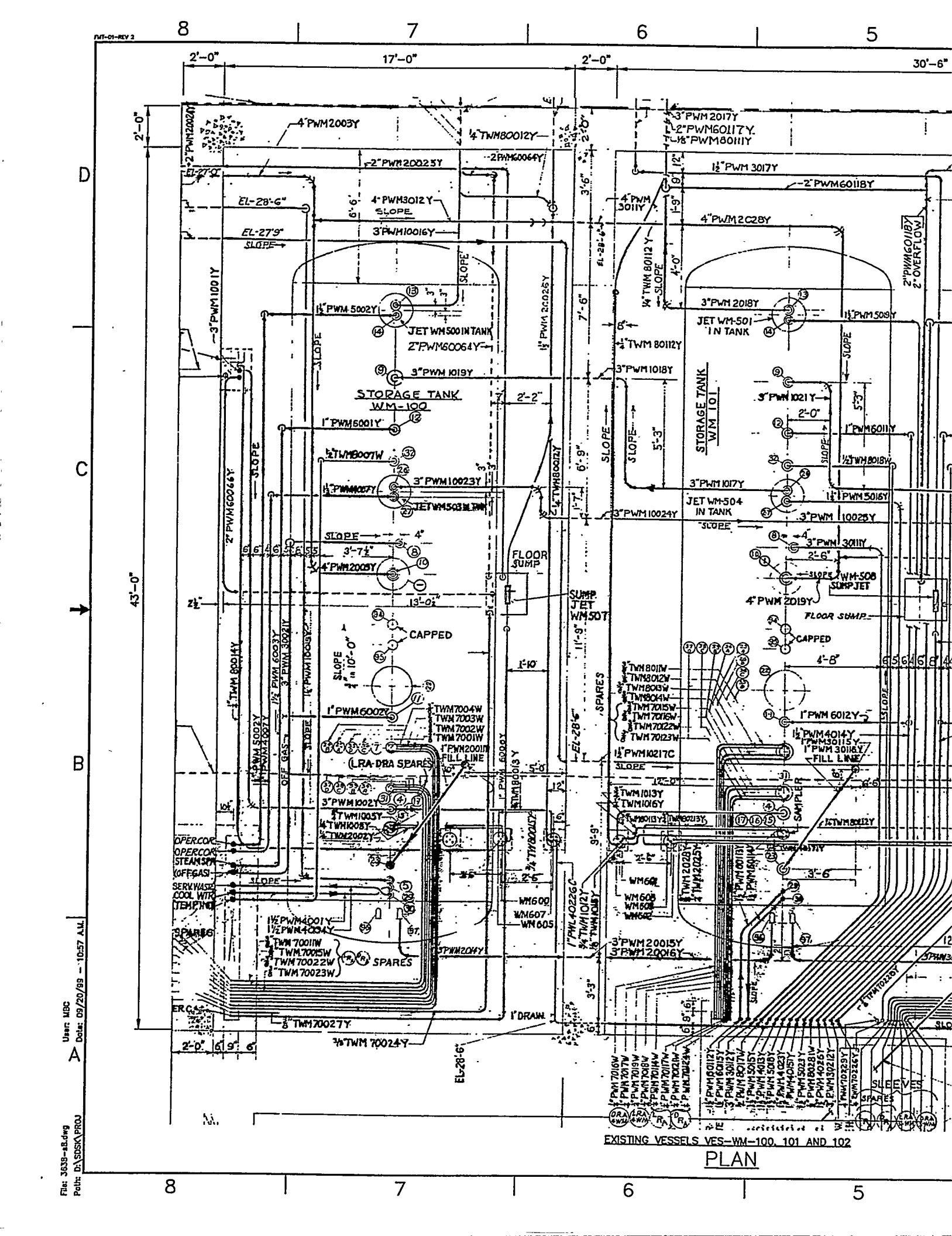
REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:

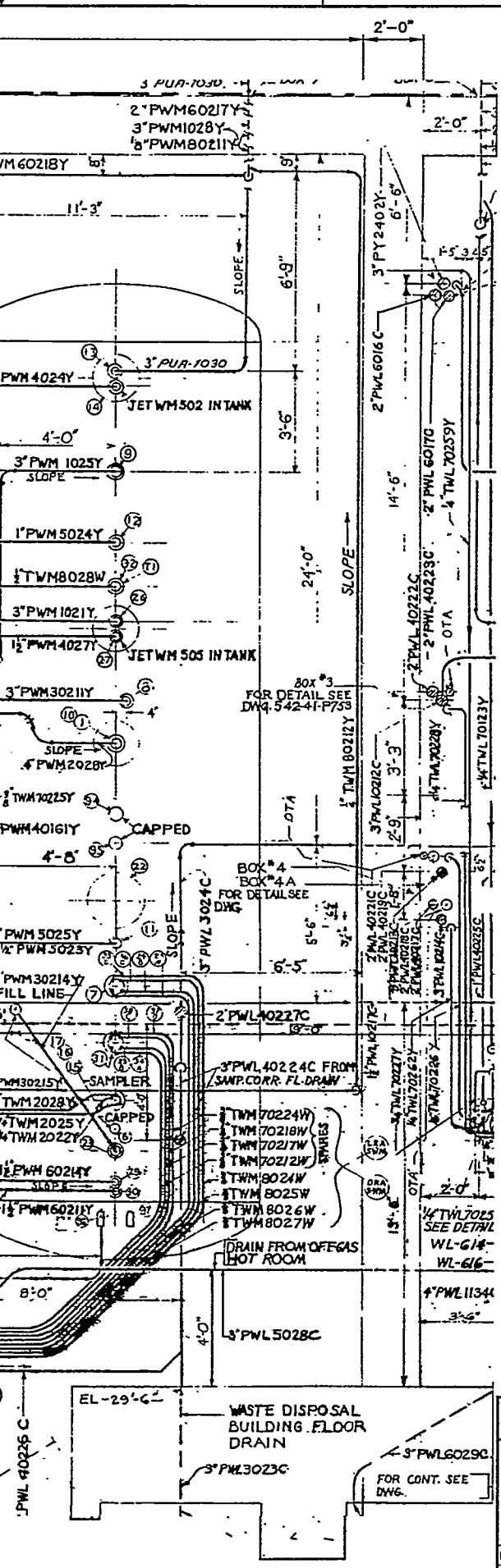


RIC

ASTERLY

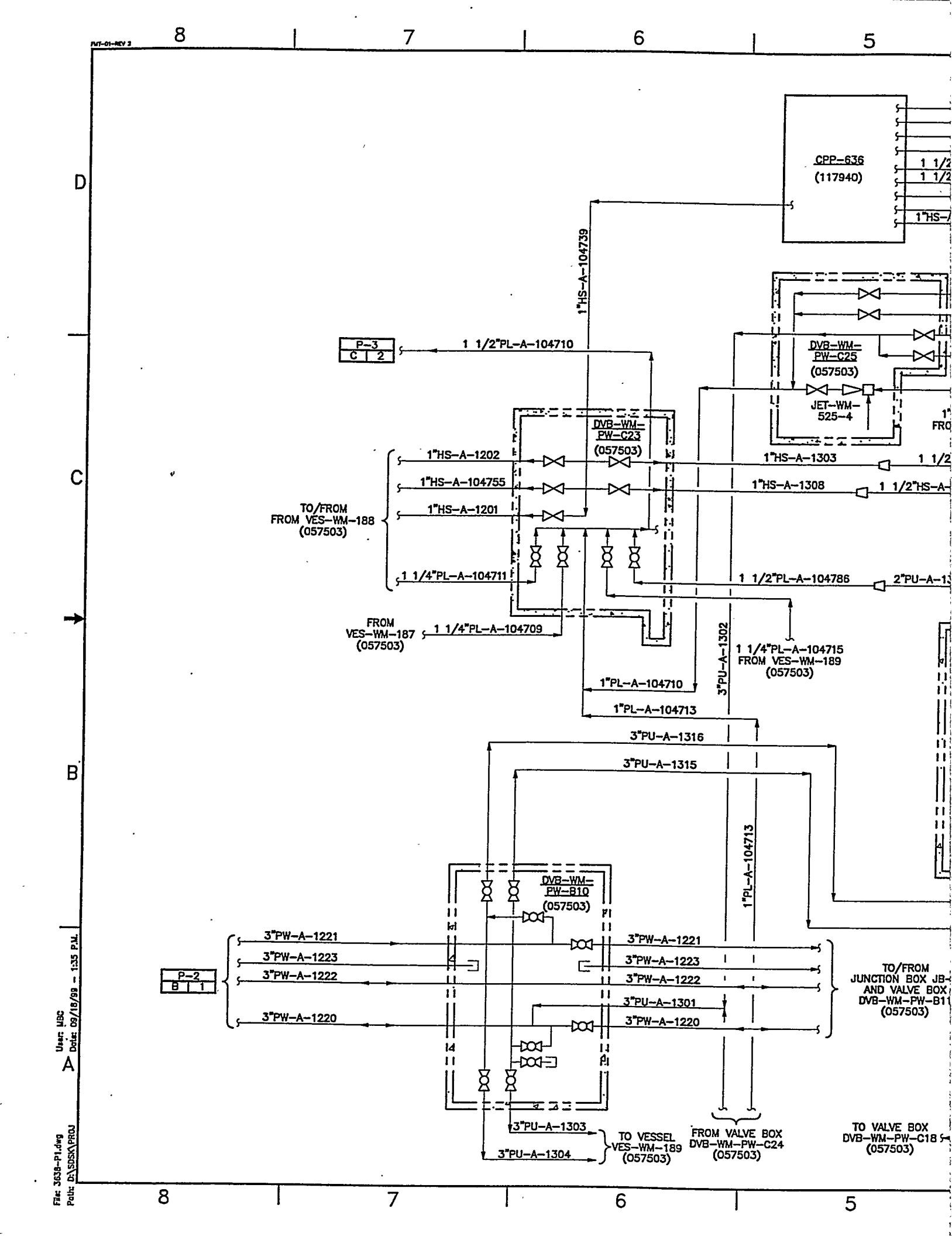
FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
NO SCALE	REQUESTER: CW OLSEN DESIGN: DRAWN: RA FRIESZ PROJECT NO. SPEC CODE	INTEC NGLW RCRA-COMPLIANT STORAGE STUDY CPP-717 ISOMETRIC
DESIGN PHASE: STUDY QUALITY LEVEL: 3	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO. EFFECTIVE DATE:	SIZE: D CAGE CODE: 01MF3 INDEX CODE NUMBER: AREA 200 | TYPE 0717 | CL 62 | OSC 530 DWG-3638s7 REV SCALE: NONE SHEET S-7


8
7
6
5
D
C
B
A
2'-0"
17'-0"
2'-0"
30'-6"
43'-0"
STORAGE TANK WM-100
STORAGE TANK WM 101
JET WM-500 IN TANK
JET WM-501 IN TANK
JET WM-503 IN TANK
JET WM-504 IN TANK
WM-508 SUMP JET
SUMP JET WM-507
FLOOR SUMP
CAPPED
LRA-DRA SPARES
SPARES
SLEEVES
SAMPLER
EL-27'-0"
EL-28'-6"
EL-27'9"
EL-28'-6"
SLOPE
EXISTING VESSELS VES-WM-100, 101 AND 102
PLAN



REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:

FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
SCALE: 3/8" = 1'-0"	REQUESTER: cw olsen	INTEC
	DESIGN: craig	NGLW RCRA–COMPLIANT STORAGE STUDY
	DRAWN: friesz	EXISTING VES–WM–100, 101 AND 102 PLAN
	PROJECT NO.	
	SPEC CODE	SIZE: D; CAGE CODE: 01MF3; INDEX CODE NUMBER: AREA 200, TYPE 0604, CI 62, DISC 530; DWG: 3638s8; REV
DESIGN PHASE: STUDY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	
QUALITY LEVEL: 3	EFFECTIVE DATE:	SCALE: 3/8"=1'-0"; SHEET: S–8


8
7
6
5
D
C
B
A
CPP-636
(117940)
1"HS-A-104739
P-3
C 2
1 1/2"PL-A-104710
DVB-WM-
PW-C25
(057503)
JET-WM-
525-4
DVB-WM-
PW-C23
(057503)
1"HS-A-1202
1"HS-A-104755
1"HS-A-1201
TO/FROM
FROM VES-WM-188
(057503)
1"HS-A-1303
1"HS-A-1308
1 1/4"PL-A-104711
1 1/2"PL-A-104786
FROM
VES-WM-187
(057503)
1 1/4"PL-A-104709
3"PU-A-1302
1 1/4"PL-A-104715
FROM VES-WM-189
(057503)
1"PL-A-104710
1"PL-A-104713
3"PU-A-1316
3"PU-A-1315
DVB-WM-
PW-B10
(057503)
1"PL-A-104713
P-2
B 1
3"PW-A-1221
3"PW-A-1223
3"PW-A-1222
3"PW-A-1220
3"PU-A-1301
TO/FROM
JUNCTION BOX JB-
AND VALVE BOX
DVB-WM-PW-B11
(057503)
3"PU-A-1303
3"PU-A-1304
TO VESSEL
VES-WM-189
(057503)
FROM VALVE BOX
DVB-WM-PW-C24
(057503)
TO VALVE BOX
DVB-WM-PW-C18
(057503)
User: MBC
Date: 09/18/99 - 1:35 P.M.
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REVISIONS		
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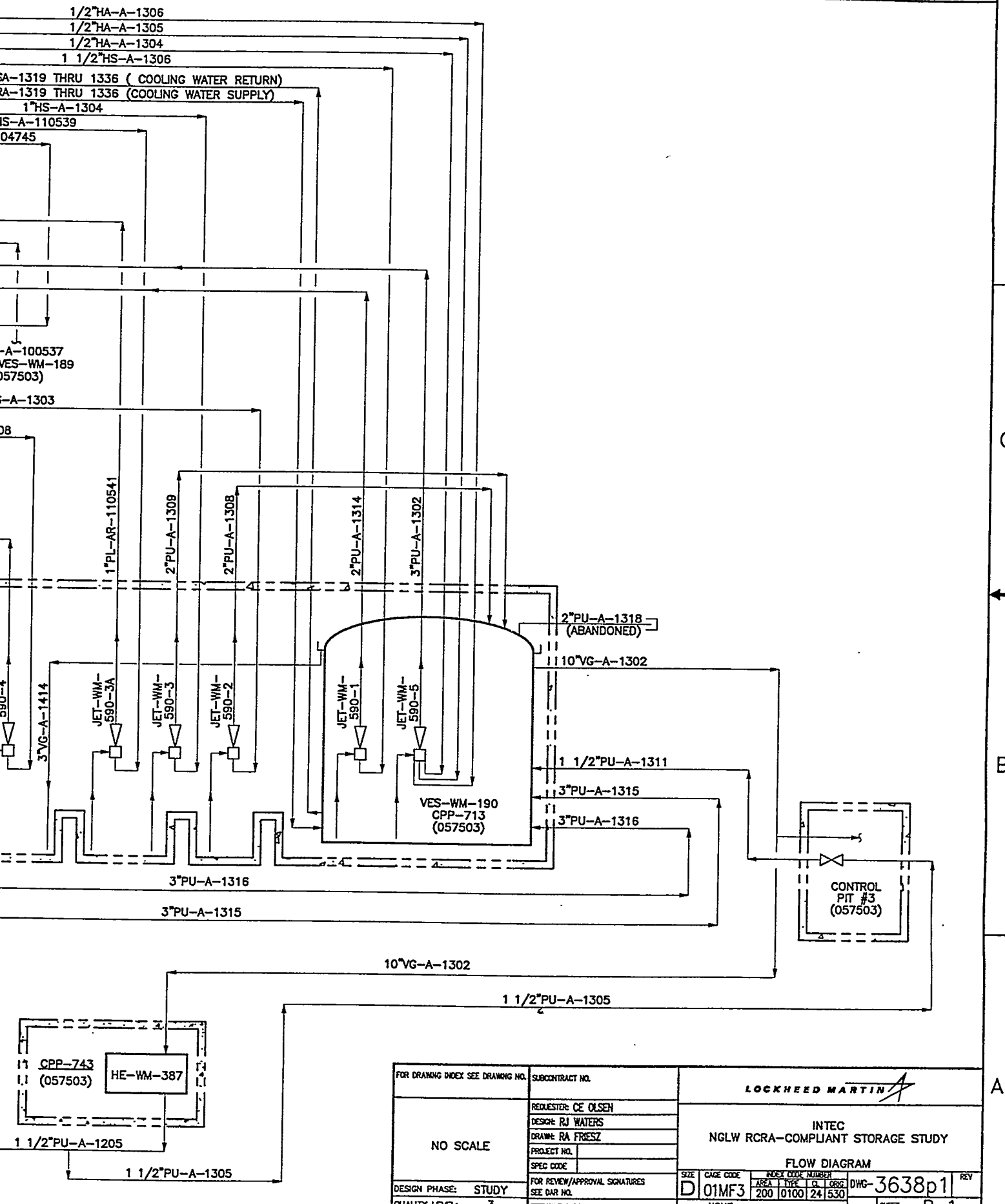
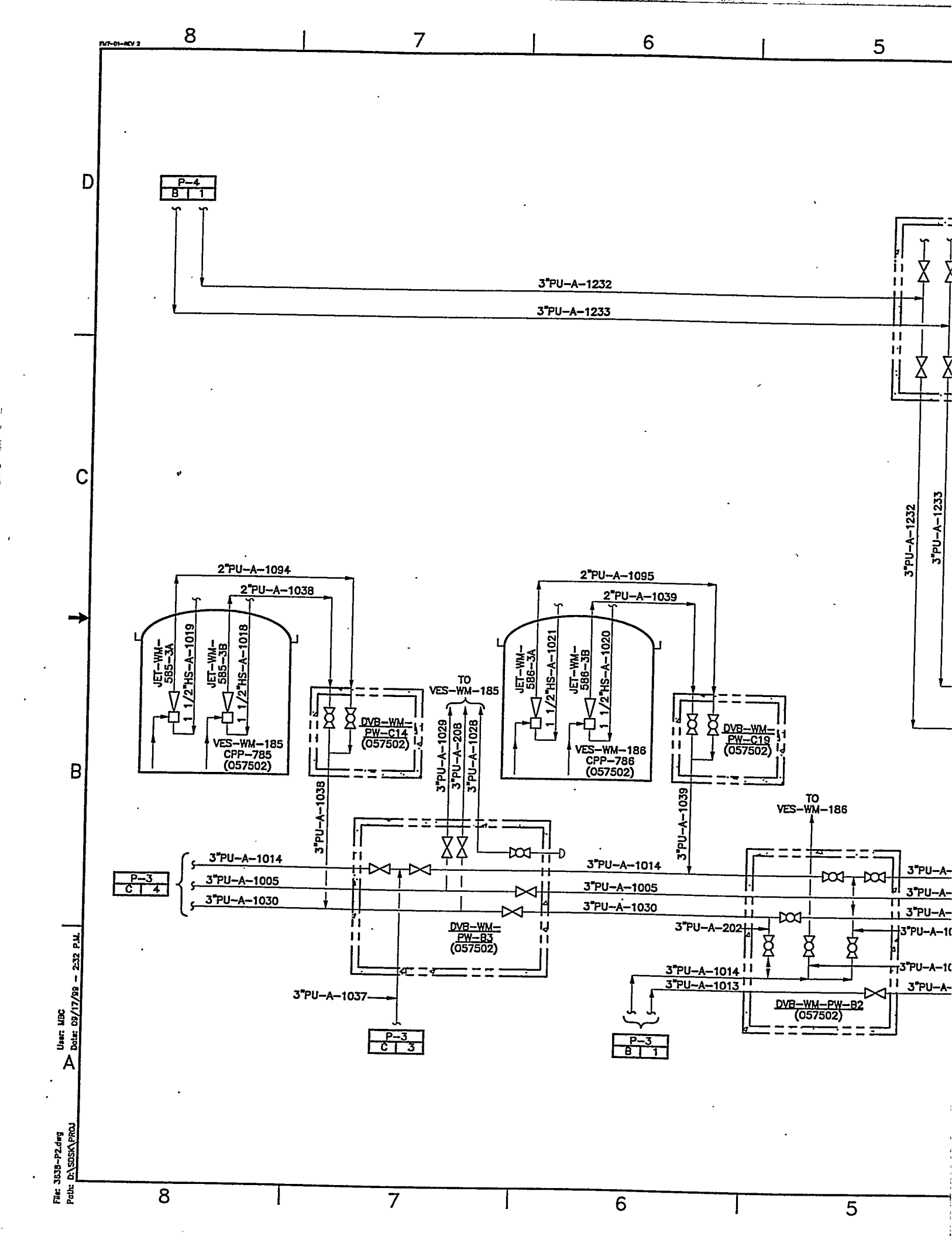


FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
NO SCALE	REQUESTER: CE OLSEN DESIGN: RJ WATERS DRAWN: RA FRIESZ PROJECT NO. SPEC CODE	INTEC NGLW RCRA-COMPLIANT STORAGE STUDY FLOW DIAGRAM
DESIGN PHASE: STUDY QUALITY LEVEL: 3	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO. EFFECTIVE DATE:	SIZE: D CAGE CODE: 01MF3 INDEX CODE NUMBER: AREA 200 TYPE 0100 CL 24 ORG 530 DWG-3638p1 REV SCALE: NONE SHEET P-1


8
7
6
5
D
C
B
A
P-4
B 1
3"PU-A-1232
3"PU-A-1233
2"PU-A-1094
2"PU-A-1038
JET-WM-585-3A
JET-WM-585-3B
1 1/2"HS-A-1019
1 1/2"HS-A-1018
VES-WM-185
CPP-785
(057502)
DVB-WM-PW-C14
(057502)
TO VES-WM-185
3"PU-A-1029
3"PU-A-208
3"PU-A-1028
3"PU-A-1038
2"PU-A-1095
2"PU-A-1039
JET-WM-586-3A
JET-WM-586-3B
1 1/2"HS-A-1021
1 1/2"HS-A-1020
VES-WM-186
CPP-786
(057502)
DVB-WM-PW-C19
(057502)
3"PU-A-1039
TO VES-WM-186
P-3
C 4
3"PU-A-1014
3"PU-A-1005
3"PU-A-1030
DVB-WM-PW-B3
(057502)
3"PU-A-1037
P-3
C 3
3"PU-A-202
3"PU-A-1013
DVB-WM-PW-B2
(057502)
P-3
B 1
User: MBC
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REVISIONS		
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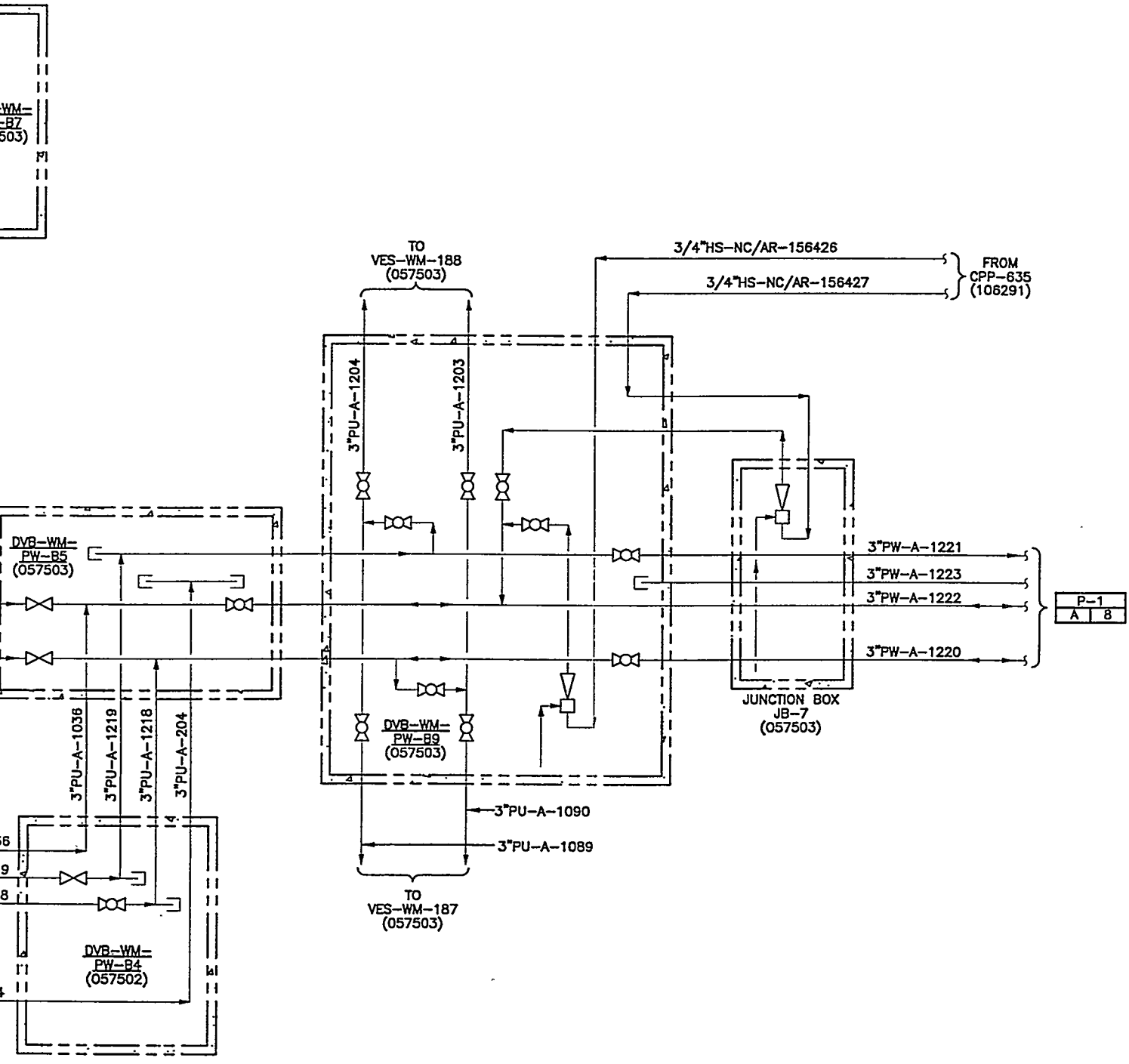
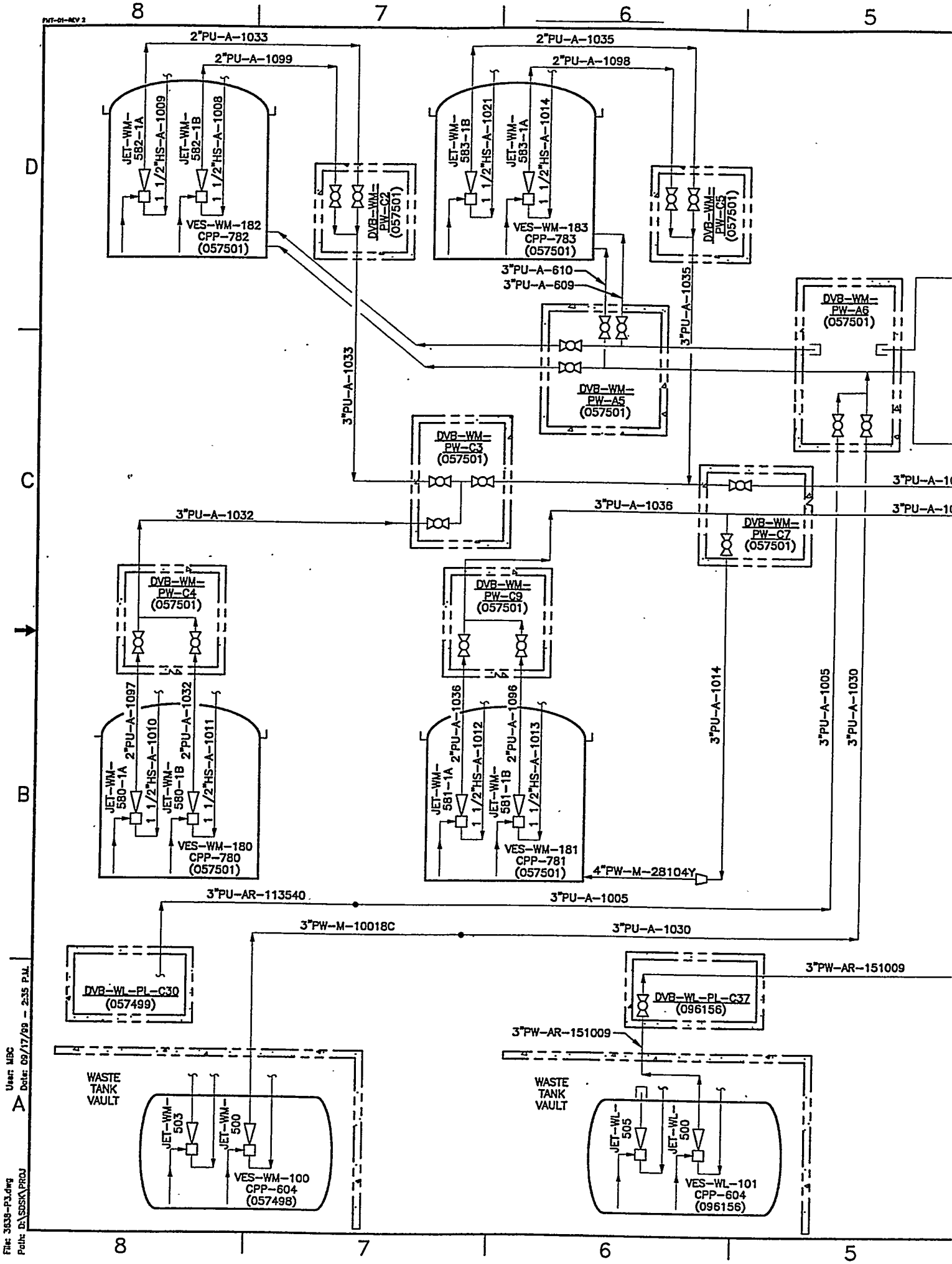


FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
NO SCALE	REQUESTER: CE OLSEN DESIGN: RJ WATERS DRAWN: RA FRIESZ PROJECT NO. SPEC CODE	INTEC NGLW RCRA-COMPLIANT STORAGE STUDY FLOW DIAGRAM
DESIGN PHASE: STUDY QUALITY LEVEL: 3	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO. EFFECTIVE DATE:	SIZE: D CAGE CODE: 01MF3 INDEX CODE NUMBER: AREA 200, TYPE 0100, QL 24, OBS 530 DWG-3638p2 REV SCALE: NONE SHEET P-2


8
7
6
5
D
C
B
A
2"PU-A-1033
2"PU-A-1099
2"PU-A-1035
2"PU-A-1098
JET-WM-582-1A
JET-WM-582-1B
1 1/2"HS-A-1009
1 1/2"HS-A-1008
VES-WM-182
CPP-782
(057501)
DVB-WM-PW-C2
(057501)
JET-WM-583-1B
JET-WM-583-1A
1 1/2"HS-A-1021
1 1/2"HS-A-1014
VES-WM-183
CPP-783
(057501)
DVB-WM-PW-C5
(057501)
3"PU-A-610
3"PU-A-609
3"PU-A-1035
3"PU-A-1033
DVB-WM-PW-A6
(057501)
DVB-WM-PW-A5
(057501)
DVB-WM-PW-C3
(057501)
3"PU-A-1032
3"PU-A-1036
DVB-WM-PW-C7
(057501)
DVB-WM-PW-C4
(057501)
DVB-WM-PW-C9
(057501)
JET-WM-580-1A
JET-WM-580-1B
2"PU-A-1097
2"PU-A-1032
1 1/2"HS-A-1010
1 1/2"HS-A-1011
VES-WM-180
CPP-780
(057501)
JET-WM-581-1A
JET-WM-581-1B
2"PU-A-1036
2"PU-A-1096
1 1/2"HS-A-1012
1 1/2"HS-A-1013
VES-WM-181
CPP-781
(057501)
3"PU-A-1014
3"PU-A-1005
3"PU-A-1030
4"PW-M-28104Y
3"PU-AR-113540
3"PU-A-1005
3"PW-M-10018C
3"PU-A-1030
3"PW-AR-151009
DVB-WL-PL-C30
(057499)
DVB-WL-PL-C37
(096156)
3"PW-AR-151009
WASTE TANK VAULT
JET-WM-503
JET-WM-500
VES-WM-100
CPP-604
(057498)
WASTE TANK VAULT
JET-WL-505
JET-WL-500
VES-WL-101
CPP-604
(096156)
User: MBC
Date: 09/17/99 - 2:35 P.M.
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REVISIONS		
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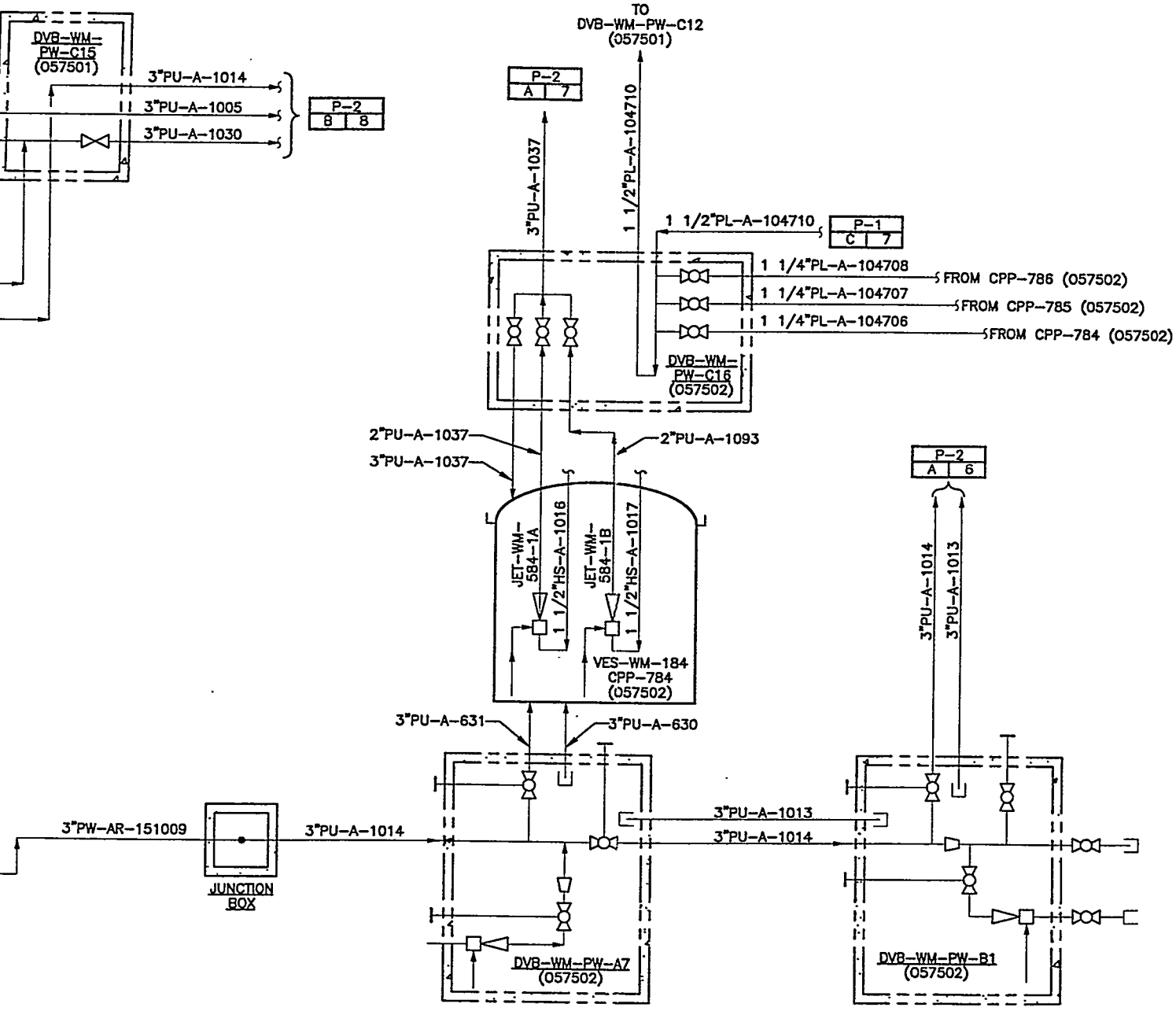
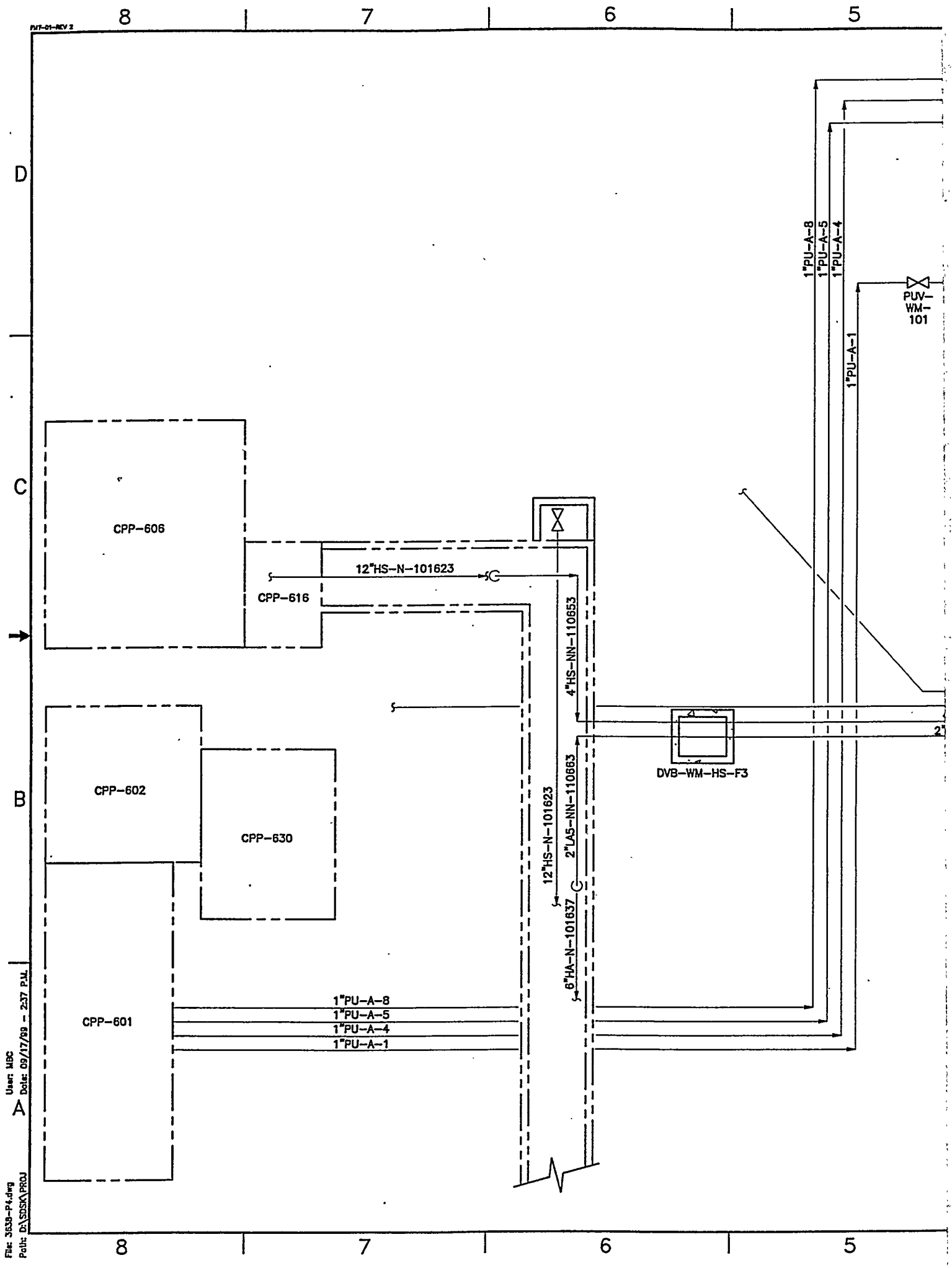


FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
NO SCALE	REQUESTER: CE OLSEN DESIGN: RJ WATERS DRAWN: RA FRIESZ PROJECT NO. SPEC CODE	INTEC NGLW RCRA-COMPLIANT STORAGE STUDY FLOW DIAGRAM
DESIGN PHASE: STUDY QUALITY LEVEL: 3	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO. EFFECTIVE DATE:	SIZE: D CAGE CODE: 01MF3 INDEX CODE NUMBER: AREA 200, TYPE 0100, CI 24, OSC 530 DWG: 3638p3 REV SCALE: NONE SHEET P-3


8
7
6
5
D
C
B
A
CPP-606
CPP-616
CPP-602
CPP-630
CPP-601
12"HS-N-101623
4"HS-NN-110653
12"HS-N-101623
2"LA5-NN-110663
6"HA-N-101637
1"PU-A-8
1"PU-A-5
1"PU-A-4
1"PU-A-1
PUV-WM-101
DVB-WM-HS-F3
2"
1"PU-A-8
1"PU-A-5
1"PU-A-4
1"PU-A-1
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Date: 09/17/99 - 2:37 PM
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REVISIONS		
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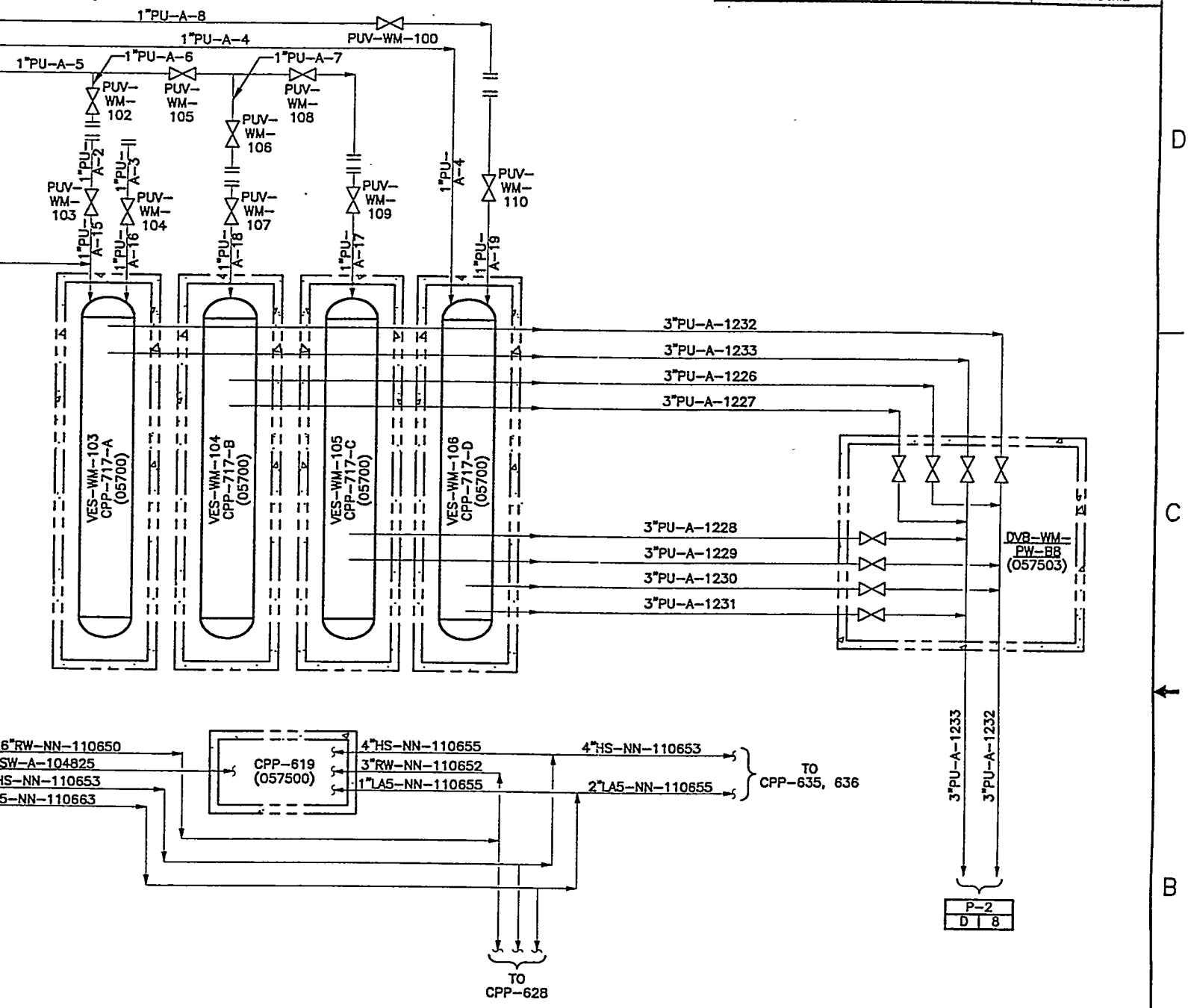
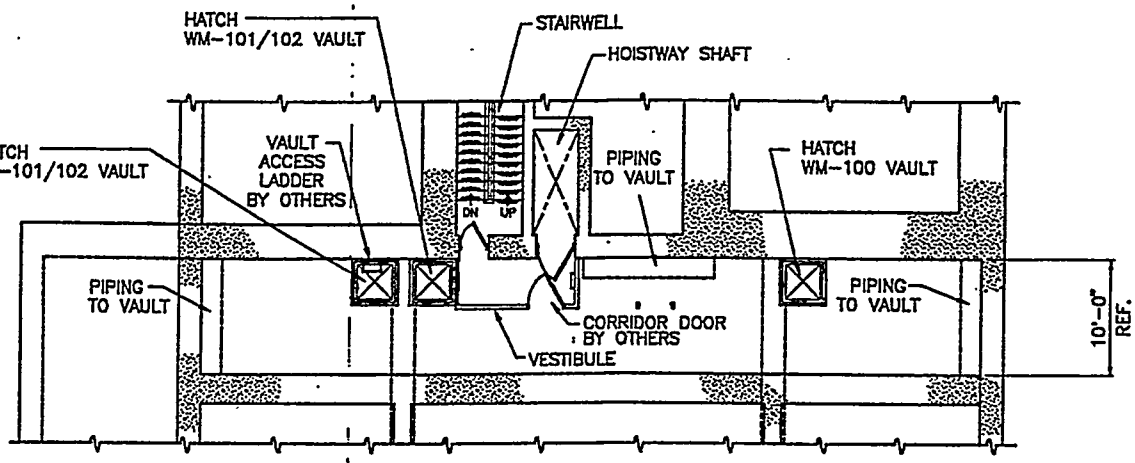


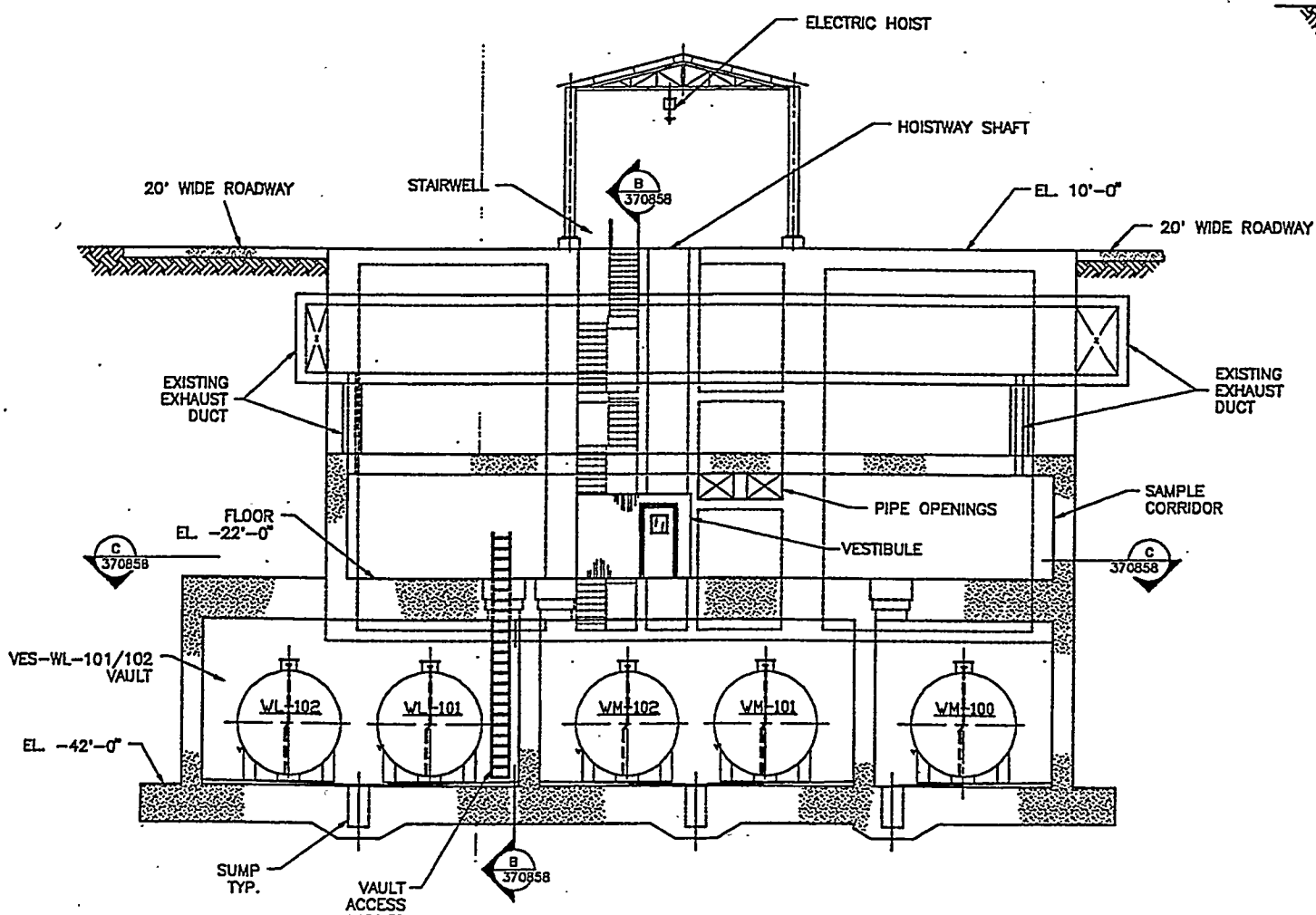
FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
NO SCALE	REQUESTER: CE OLSEN DESIGN: RJ WATERS DRAWN: RA FRIESZ PROJECT NO. SPEC CODE	INTEC NGLW RCRA-COMPLIANT STORAGE STUDY FLOW DIAGRAM
DESIGN PHASE: STUDY QUALITY LEVEL: 3	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO. EFFECTIVE DATE:	SIZE: D CAGE CODE: 01MF3 INDEX CODE NUMBER: AREA 200, TYPE 0100, CL 24, ORG 530 DWG-3638p4 REV SCALE: NONE SHEET P-4



SECTION C
SAMPLE CORRIDOR PLAN VIEW 370858

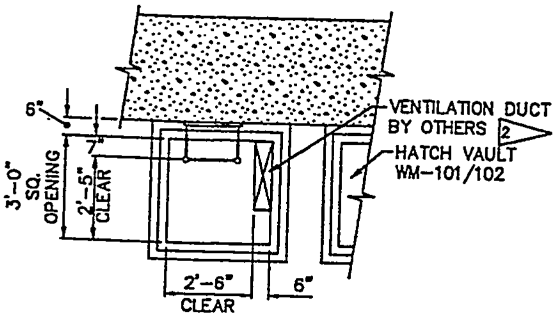
VENTILATION CONTROL BARRIER TO PERMIT ACCESS INTO WL-101/102 VAULT WILL BE PROVIDED BY OTHERS.

GRAD
EL 0'



SECTION A
LOOKING SOUTH 370857

REV.	REVISION DESCRIPTION		APPROVED DATE	UE&C	WINCO
0	AFC		9/30/92	NDA	DLP
1	AS-BUILT				
2	INACTIVATED PER DCN 160559-A815	TULLIS 10/4/95			



PLAN – HATCH VAULT WL-101/102
(ACCESS ENVELOPE)
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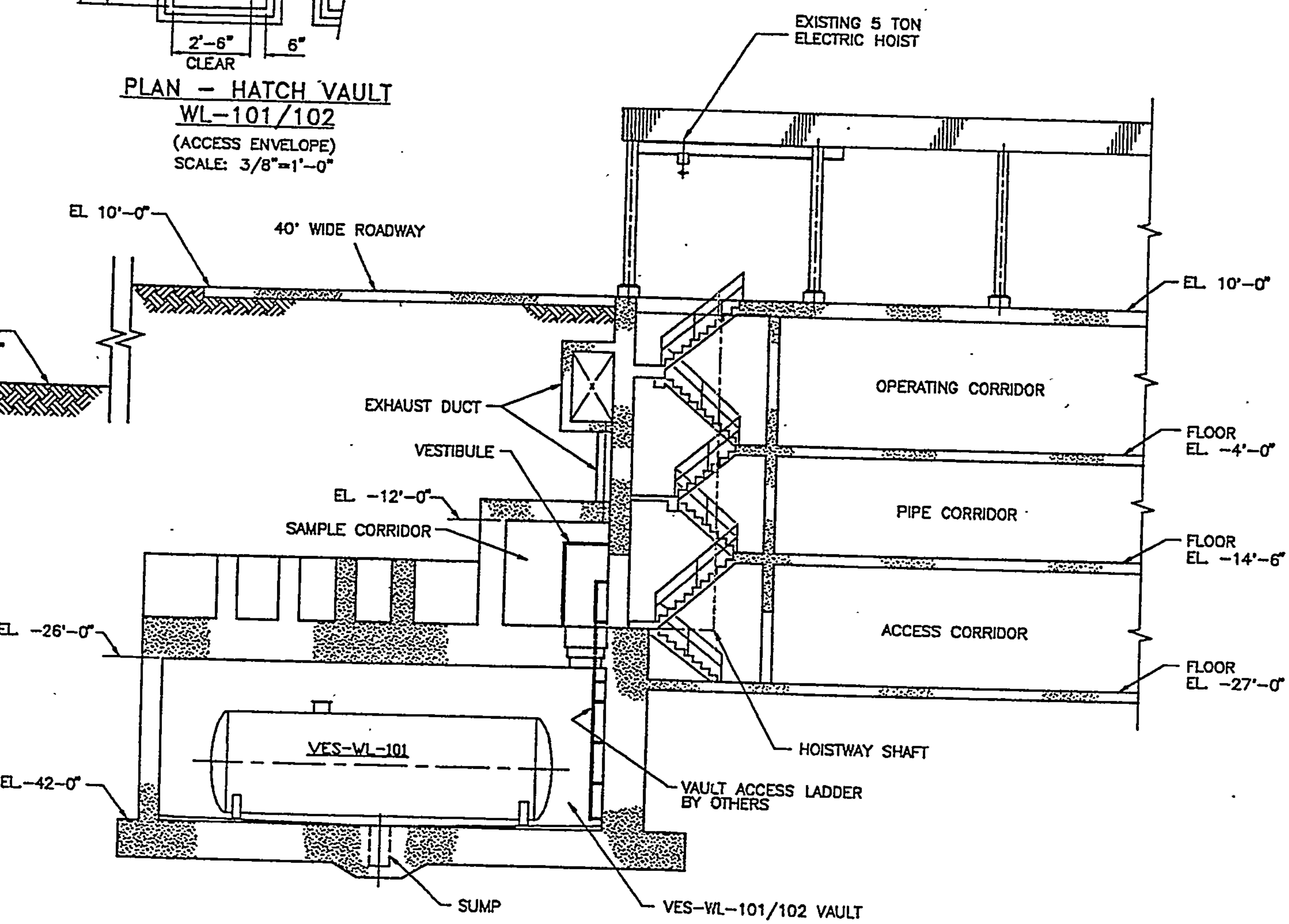


SECTION B 370858
LOOKING EAST

INACTIVE
FOR REF. USE ONLY
This Dwg. Superseded By:
Dwg. No. NONE
Date 10/4/95

REFERENCE DRAWINGS	
DWG. NO.	TITLE
370857	PROJECT LOCATION PLAN & TITLE II DRAWING LIST

A/E ENGINEER OF RECORD
DATE | APPROVED

GENERAL NOTES:

1) SCALE IS PROVIDED FOR REFERENCE ONLY. ACCURACY OF DIMENSIONS IS SUBJECT TO FIELD VERIFICATION.

2) VENTILATION DUCT WILL BE DESIGNED BY WINCO TO ALLOW LINER, SHIELD AND CRANE INSTALLATION.

DESIGN INTERFACE	INITIAL	DATE
PIPING		
MECHANICAL		
ELECTRICAL		
PROCESS		
STRUCTURAL		
ENVIRONMENTAL		
ARCHITECTURAL		
INSTRUMENTATION		

DRAWING STATUS DESIGN PHASE	DATE APPROVED
90%	9/1/92 DTC
AFC	9/29/92 DTC
QUALITY LEVEL II	

APPROVALS		DATE
ORIGINATOR		
CHECKER		
RESPONSIBLE LDE		
TASK MANAGER		
QA ENGINEER		
CHIEF ENGINEER		
UE&C PROJECT MGR.	NA	9/30/92
M&O PROJECT MGR.	DLP	9/30/92
PROJECT NO. 9354.152		
SUBCONTRACT NO. S292031		
ISSUED FOR CONSTRUCTION		

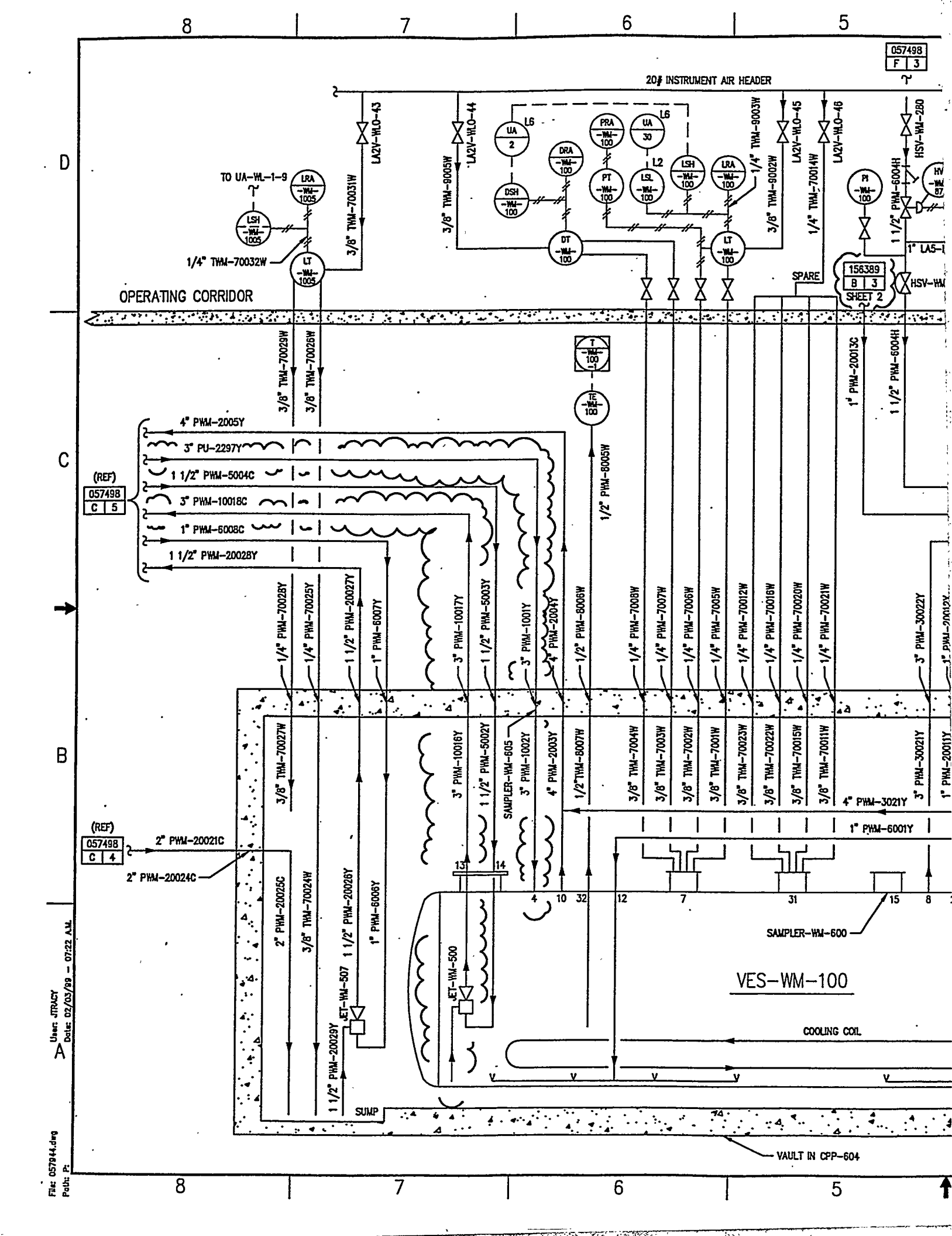
United Engineers & Constructors
Western Operations
FOR
US DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE
IDAHO FALLS, IDAHO

ICPP BLDG. 604
WL-101/102 VAULT PROJECT
BUILDING 604
PLAN & SECTIONS

SIZE	AREA	DWG. TYPE	CL	ORIG	DRAWING NO.	REV.
D	200	0604	60	812	370858	2

SCALE 1/8"=1'-0" | SPEC CODE | A/E SHEET NO.

WL 370858 2



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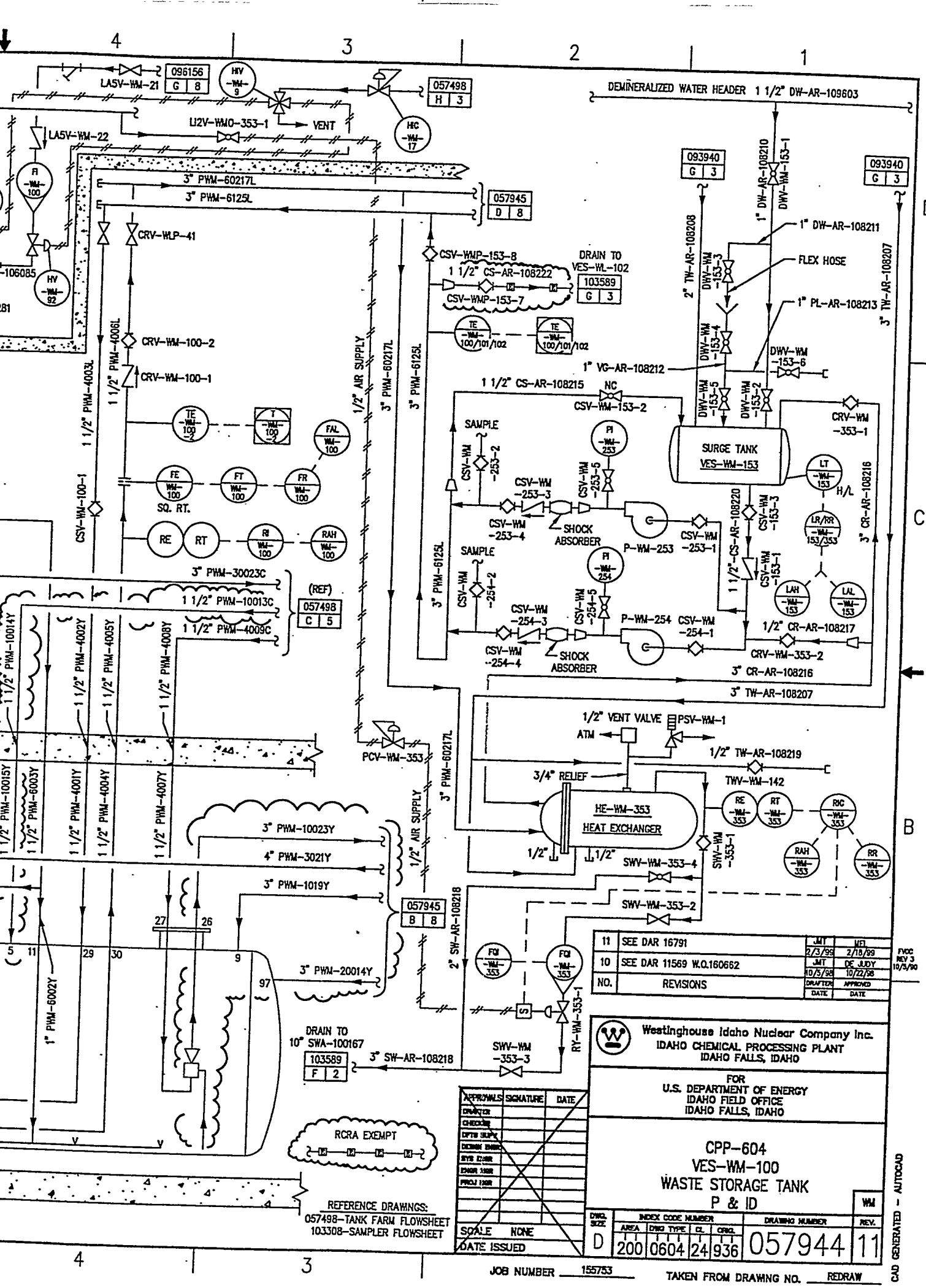
DEMINERALIZED WATER HEADER 1 1/2" DW-AR-109603
LA5V-WM-21
LA5V-WM-22
LI2V-WM0-353-1
VENT
3" PWM-60217L
3" PWM-6125L
CRV-WLP-41
CRV-WM-100-2
CRV-WM-100-1
1 1/2" PWM-4003L
1 1/2" PWM-4006L
CSV-WM-100-1
SQ. RT.
3" PWM-30023C
1 1/2" PWM-10013C
1 1/2" PWM-4009C
1 1/2" PWM-10014Y
1 1/2" PWM-4002Y
1 1/2" PWM-4005Y
1 1/2" PWM-4008Y
1 1/2" PWM-10015Y
1 1/2" PWM-6003Y
1 1/2" PWM-4001Y
1 1/2" PWM-4004Y
1 1/2" PWM-4007Y
3" PWM-10023Y
4" PWM-3021Y
3" PWM-1019Y
3" PWM-20014Y
1" PWM-6002Y
CSV-WMP-153-8
1 1/2" CS-AR-108222
CSV-WMP-153-7
DRAIN TO VES-WL-102
1/2" AIR SUPPLY
1 1/2" CS-AR-108215
CSV-WM-153-2
SURGE TANK VES-WM-153
1" DW-AR-108210
1" DW-AR-108211
FLEX HOSE
1" PL-AR-108213
1" VG-AR-108212
2" TW-AR-108208
3" TW-AR-108207
CRV-WM-353-1
SAMPLE
CSV-WM-253-2
CSV-WM-253-3
CSV-WM-253-4
SHOCK ABSORBER
P-WM-253
CSV-WM-253-1
CSV-WM-253-5
CSV-WM-153-3
1 1/2"-CS-AR-108220
CSV-WM-153-1
3" CR-AR-108216
SAMPLE
CSV-WM-254-2
CSV-WM-254-3
CSV-WM-254-4
P-WM-254
CSV-WM-254-1
CSV-WM-254-5
1/2" CR-AR-108217
CRV-WM-353-2
3" CR-AR-108216
3" TW-AR-108207
1/2" VENT VALVE
PSV-WM-1
ATM
1/2" TW-AR-108219
3/4" RELIEF
HE-WM-353
HEAT EXCHANGER
TWV-WM-142
SWV-WM-353-4
SWV-WM-353-2
SWV-WM-353-1
PCV-WM-353
3" PWM-60217L
2" SW-AR-108218
3" SW-AR-108218
SWV-WM-353-3
RY-WM-353-1
DRAIN TO 10" SWA-100167
RCRA EXEMPT
REFERENCE DRAWINGS:
057498-TANK FARM FLOWSHEET
103308-SAMPLER FLOWSHEET
096156 G 8
057498 H 3
057498 C 5
057945 D 8
057945 B 8
093940 G 3
093940 G 3
103589 G 3
103589 F 2
11 SEE DAR 16791 JMT 2/3/99 MFL 2/18/99
10 SEE DAR 11569 W.O.160662 JMT 10/5/98 DE JUDY 10/22/98
NO. REVISIONS DRAFTER DATE APPROVED DATE
FVOC REV 3 10/5/90
Westinghouse Idaho Nuclear Company Inc.
IDAHO CHEMICAL PROCESSING PLANT
IDAHO FALLS, IDAHO
FOR
U.S. DEPARTMENT OF ENERGY
IDAHO FIELD OFFICE
IDAHO FALLS, IDAHO
CPP-604
VES-WM-100
WASTE STORAGE TANK
P & ID
APPROVALS SIGNATURE DATE
DRAWN
CHECKED
DES SUPV
DESIGN ENGR
SYS ENGR
ENGR MGR
PROJ MGR
SCALE NONE
DATE ISSUED
DWG. SIZE D
INDEX CODE NUMBER AREA 200 DWG TYPE 0604 CI. 24 CRIG. 936
DRAWING NUMBER 057944
REV. 11
WM
JOB NUMBER 155753
TAKEN FROM DRAWING NO. REDRAW
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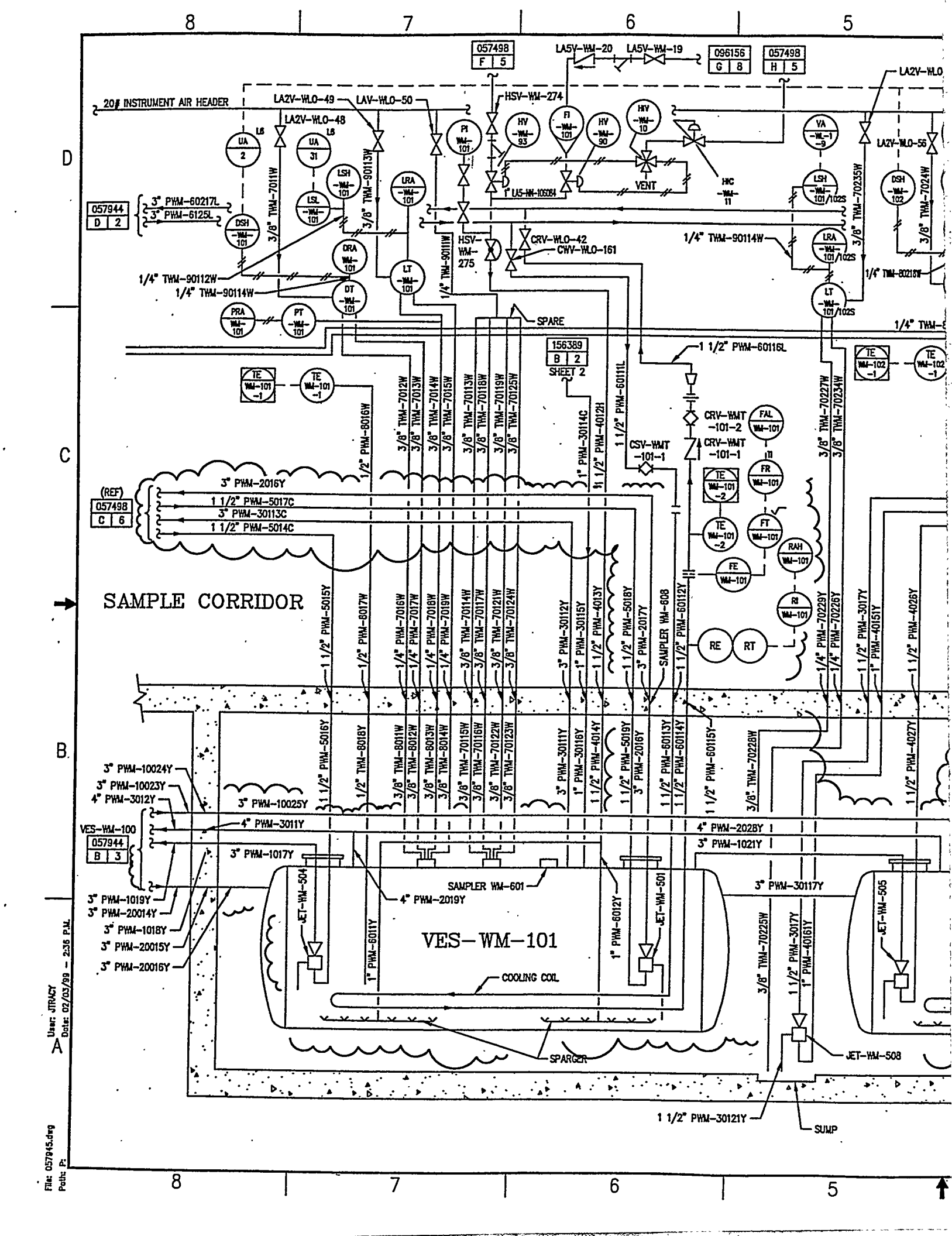
SAMPLE CORRIDOR
VES-WM-101
SAMPLER WM-601
SAMPLER WM-608
20# INSTRUMENT AIR HEADER
LA2V-WLO-49
LAV-WLO-50
LA2V-WLO-48
HSV-WM-274
LA5V-WM-20
LA5V-WM-19
LA2V-WLO-42
CWV-WLO-161
HSV-WM-275
LA2V-WLO-56
1/4" TWM-90112W
1/4" TWM-90114W
1/4" TWM-90113W
3/8" TWM-7011W
3/8" TWM-90113W
3/8" TWM-70235W
3/8" TWM-7024W
1/4" TWM-90114W
1/4" TWM-90218W
3" PWM-60217L
3" PWM-6125L
1 1/2" PWM-60116L
1 1/2" PWM-60111L
1" PWM-30114C
1 1/2" PWM-4012H
CSV-WMT-101-1
CRV-WMT-101-2
CRV-WMT-101-1
3" PWM-2016Y
1 1/2" PWM-5017C
3" PWM-30113C
1 1/2" PWM-5014C
1 1/2" PWM-5015Y
1 1/2" PWM-8017W
1/2" PWM-8016W
1 1/2" PWM-5018Y
1 1/2" PWM-2017Y
1 1/2" PWM-60112Y
1 1/2" PWM-5016Y
1/2" TWM-8018Y
1 1/2" PWM-5019Y
3" PWM-2016Y
1 1/2" PWM-60113Y
1 1/2" PWM-60114Y
1 1/2" PWM-60115Y
3" PWM-10024Y
3" PWM-10023Y
4" PWM-3012Y
3" PWM-10025Y
4" PWM-3011Y
3" PWM-1017Y
4" PWM-2028Y
3" PWM-1021Y
VES-WM-100
3" PWM-1019Y
3" PWM-20014Y
3" PWM-1018Y
3" PWM-20015Y
3" PWM-20016Y
4" PWM-2019Y
3" PWM-30117Y
1" PWM-6011Y
1" PWM-6012Y
COOLING COIL
SPARGER
JET-WM-504
JET-WM-501
JET-WM-505
JET-WM-508
3/8" TWM-70225W
1 1/2" PWM-3017Y
1" PWM-4016Y
1 1/2" PWM-30121Y
SUMP
SPARE
1 1/2" PWM-3017Y
1" PWM-4015Y
1 1/2" PWM-4026Y
1/4" PWM-70229Y
1/4" PWM-70226Y
3/8" TWM-70228W
1 1/2" PWM-4027Y
1 1/2" PWM-30111Y
1" PWM-30116Y
1 1/2" PWM-4014Y
1 1/2" PWM-30112Y
1" PWM-30115Y
1 1/2" PWM-4013Y
3/8" TWM-7012W
3/8" TWM-7013W
3/8" TWM-7014W
3/8" TWM-7015W
3/8" TWM-70113W
3/8" TWM-70116W
3/8" TWM-70119W
3/8" TWM-70125W
3/8" TWM-70227W
3/8" TWM-70234W
1/4" PWM-7016W
1/4" PWM-7017W
1/4" PWM-7018W
1/4" PWM-7019W
3/8" TWM-70114W
3/8" TWM-70117W
3/8" TWM-70121W
3/8" TWM-70124W
3/8" TWM-8011W
3/8" TWM-8012W
3/8" TWM-8013W
3/8" TWM-8014W
3/8" TWM-70115W
3/8" TWM-70118W
3/8" TWM-70122W
3/8" TWM-70123W
(REF) 057498 C 6
057944 D 2
057944 B 3
156389 B 2 SHEET 2
057498 F 5
096156 G 8
057498 H 5
LA2V-WLO
LA5-WM-10504
VENT
HIC -WM- 11
LSH -WM- 101
LSL -WM- 101
LRA -WM- 101
DSH -WM- 101
DRA -WM- 101
LT -WM- 101
DT -WM- 101
PRA -WM- 101
PT -WM- 101
PI -WM- 101
HV -WM- 93
FI -WM- 101
HV -WM- 90
HIV -WM- 10
VA -WM- 1
LSH -WM- 101/102S
LRA -WM- 101/102S
LT -WM- 101/102S
DSH -WM- 103
TE WM-101 -1
TE WM-101 -2
TE WM-102 -1
FAL WM-101
FR WM-101
FT WM-101
RAH WM-101
FE WM-101
RE
RT
UA 2
UA 31
LS
D
C
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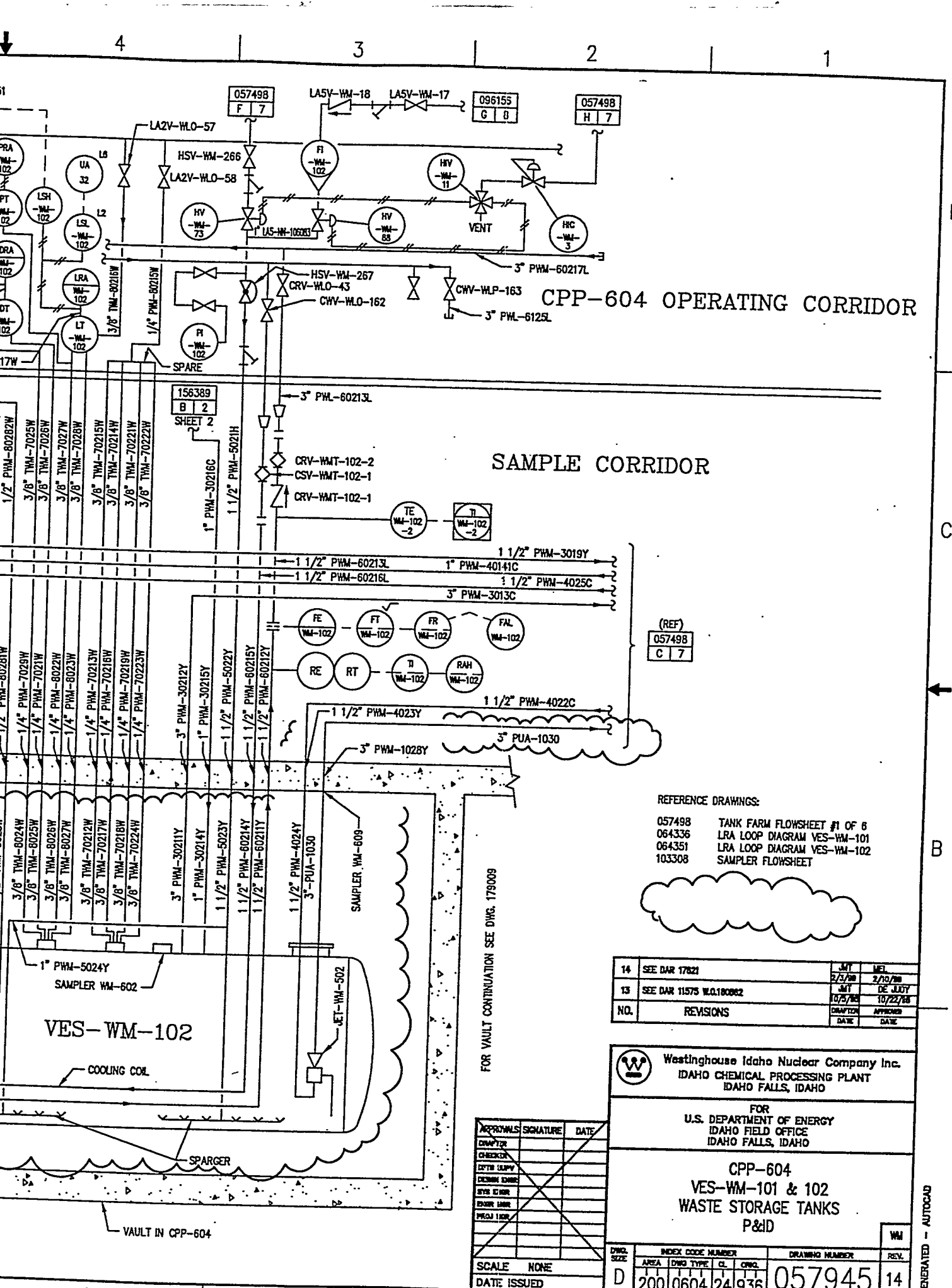
4
3
2
1
D
C
B
057498 F 7
LA5V-WM-18
LA5V-WM-17
096155 G 8
057498 H 7
LA2V-WL0-57
HSV-WM-266
LA2V-WL0-58
FI -WM- 102
HV -WM- 11
VENT
HV -WM- 73
HV -WM- 88
HIC -WM- 3
3" PWM-60217L
HSV-WM-267
CRV-WL0-43
CWV-WL0-162
CWV-WLP-163
3" PWL-6125L
CPP-604 OPERATING CORRIDOR
SPARE
156389 B 2
SHEET 2
3" PWL-60213L
SAMPLE CORRIDOR
CRV-WMT-102-2
CSV-WMT-102-1
CRV-WMT-102-1
TE WM-102 -2
TI WM-102 -2
1 1/2" PWM-3019Y
1" PWM-40141C
1 1/2" PWM-60213L
1 1/2" PWM-60216L
1 1/2" PWM-4025C
3" PWM-3013C
FE WM-102
FT WM-102
FR WM-102
FAL WM-102
RE
RT
TI WM-102
RAH WM-102
(REF) 057498 C 7
1 1/2" PWM-4022C
1 1/2" PWM-4023Y
3" PUA-1030
3" PWM-1028Y
REFERENCE DRAWINGS:
057498 TANK FARM FLOWSHEET #1 OF 6
064336 LRA LOOP DIAGRAM VES-WM-101
064351 LRA LOOP DIAGRAM VES-WM-102
103308 SAMPLER FLOWSHEET
1" PWM-5024Y
SAMPLER WM-602
VES-WM-102
COOLING COIL
SPARGER
VAULT IN CPP-604
JET-WM-502
SAMPLER WM-609
FOR VAULT CONTINUATION SEE DWG. 179009
14 SEE DAR 17821 JMT 2/3/98 MEL 2/10/98
13 SEE DAR 11575 W.O.180862 JMT 10/5/98 DE JUDY 10/22/98
NO. REVISIONS DRAFTER DATE APPROVED DATE
Westinghouse Idaho Nuclear Company Inc.
IDAHO CHEMICAL PROCESSING PLANT
IDAHO FALLS, IDAHO
FOR
U.S. DEPARTMENT OF ENERGY
IDAHO FIELD OFFICE
IDAHO FALLS, IDAHO
CPP-604
VES-WM-101 & 102
WASTE STORAGE TANKS
P&ID
WM
APPROVALS SIGNATURE DATE
DRAFTER
CHECKER
DWG SUPV
DESIGN ENGR
SYS ENGR
ENGR MGR
PROJ MGR
SCALE NONE
DATE ISSUED
DWG. SIZE D
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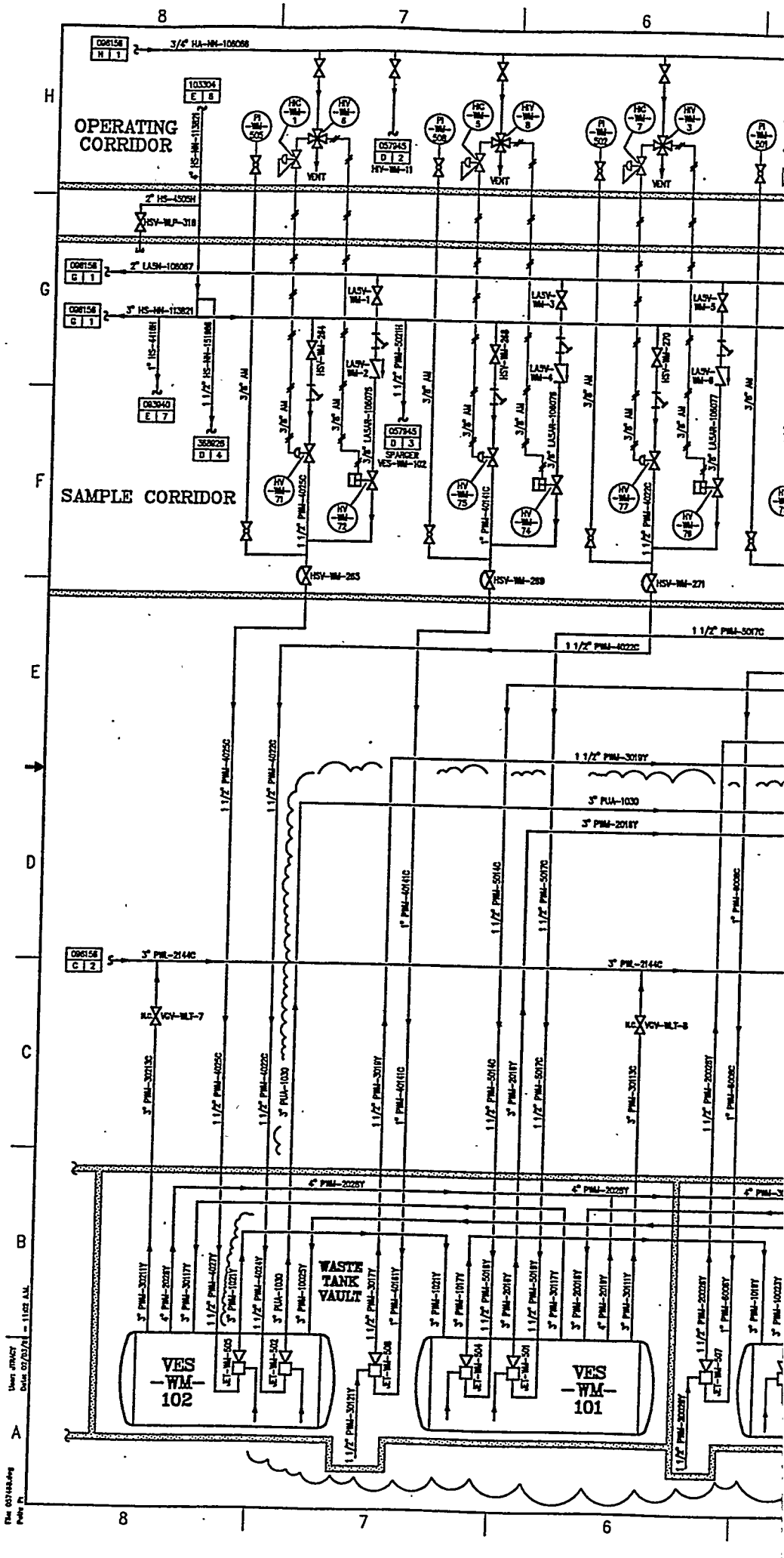
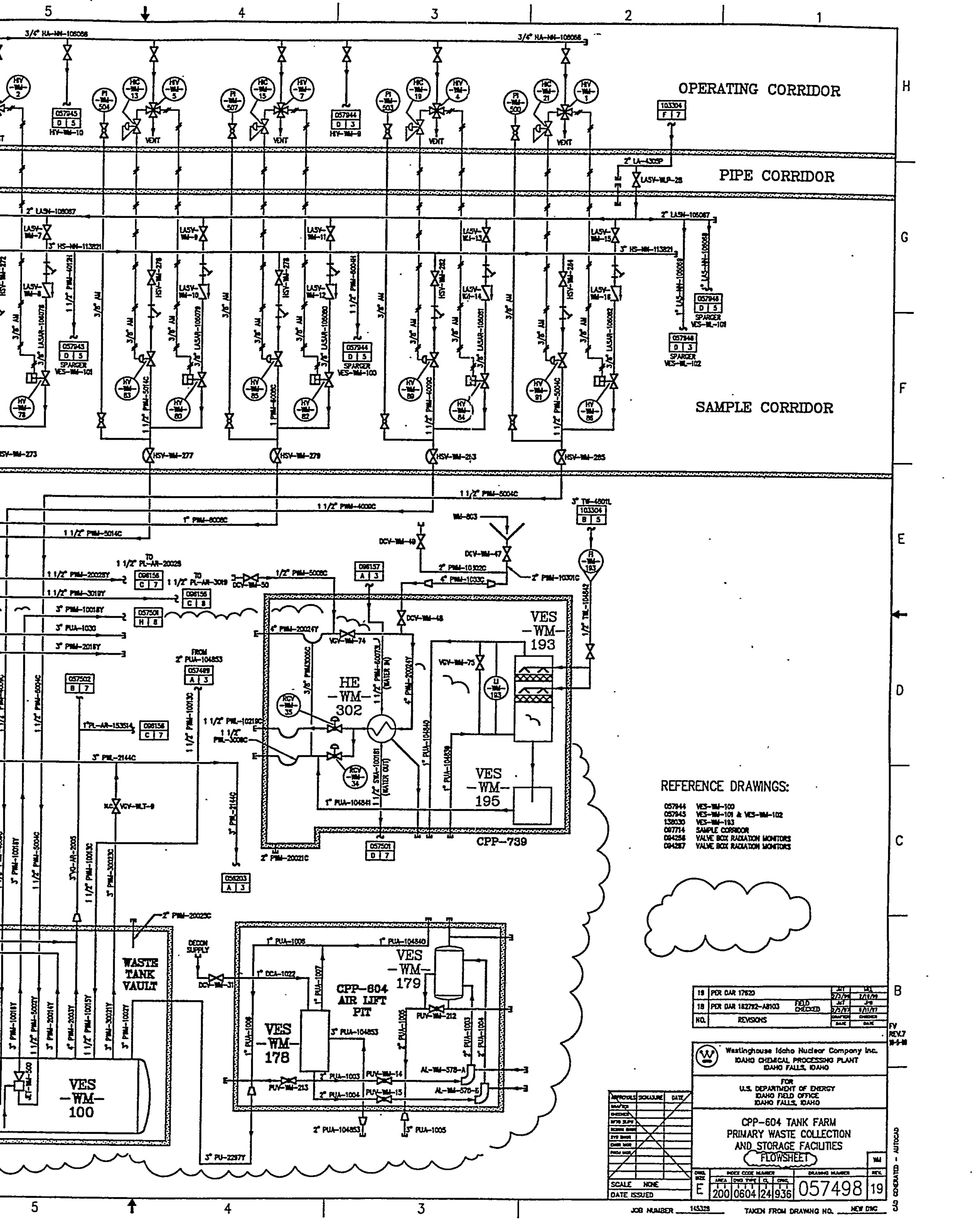

OPERATING CORRIDOR
SAMPLE CORRIDOR
WASTE TANK VAULT
VES -WM- 102
VES -WM- 101
VENT
SPARGER VES-WM-102
3/4" HA-HN-106056
2" HS-4505H
2" LASH-106067
3" HS-HN-113821
1" HS-HN-111861
1 1/2" HS-HN-151866
3" PWL-2144C
3" PUA-1030
3" PWM-2018Y
1 1/2" PWM-5017C
1 1/2" PWM-4022C
1 1/2" PWM-3019Y
1 1/2" PWM-4025C
1" PWM-4011C
1 1/2" PWM-5014C
4" PWM-2028Y
HSV-WM-263
HSV-WM-269
HSV-WM-271
VCV-WLT-7
VCV-WLT-8



OPERATING CORRIDOR
PIPE CORRIDOR
SAMPLE CORRIDOR
VES -WM- 193
HE -WM- 302
VES -WM- 195
CPP-739
WASTE TANK VAULT
CPP-604 AIR LIFT PIT
VES -WM- 179
VES -WM- 178
VES -WM- 100
REFERENCE DRAWINGS:
057944 VES-WM-100
057945 VES-WM-101 & VES-WM-102
132030 VES-WM-193
097714 SAMPLE CORRIDOR
094256 VALVE BOX RADIATION MONITORS
094257 VALVE BOX RADIATION MONITORS
19 PER DAR 17620
18 PER DAR 182792-A8103 FIELD CHECKED
NO. REVISIONS
FV REV.7
Westinghouse Idaho Nuclear Company Inc.
IDAHO CHEMICAL PROCESSING PLANT
IDAHO FALLS, IDAHO
FOR
U.S. DEPARTMENT OF ENERGY
IDAHO FIELD OFFICE
IDAHO FALLS, IDAHO
CPP-604 TANK FARM
PRIMARY WASTE COLLECTION
AND STORAGE FACILITIES
FLOWSHEET
SCALE NONE
DATE ISSUED
E 200 0604 24 936 057498 19
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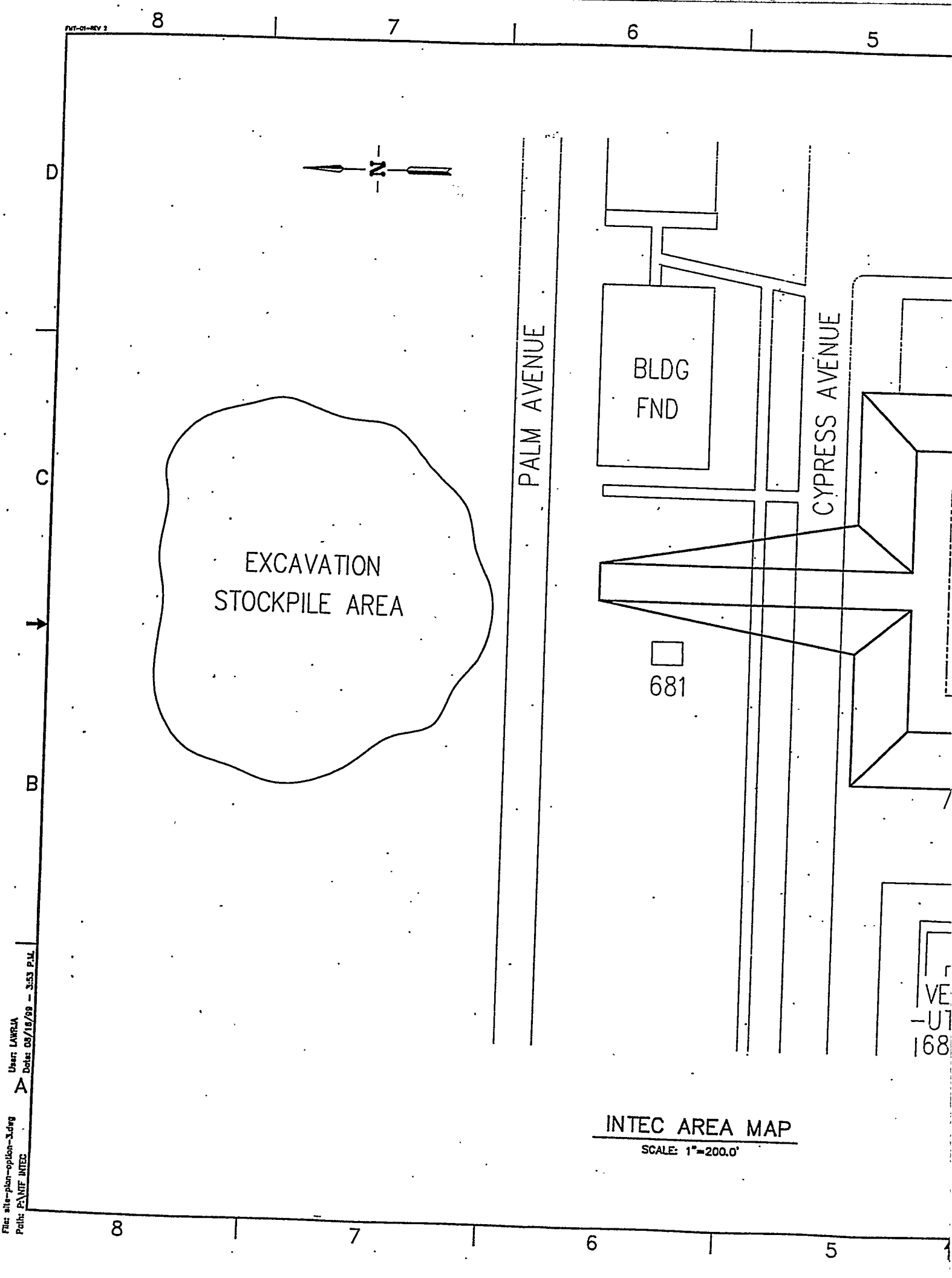
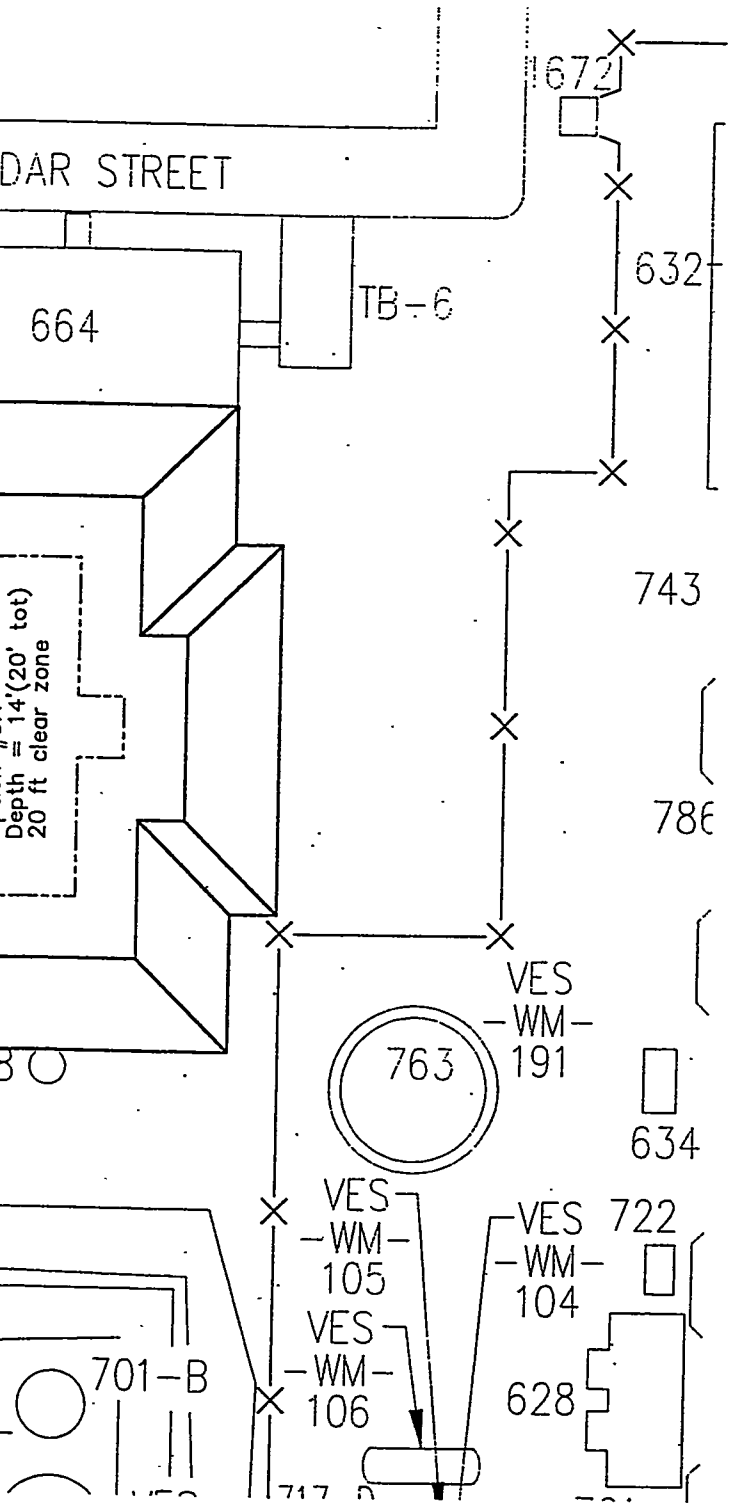


INTEC AREA MAP

SCALE: 1"=200.0'

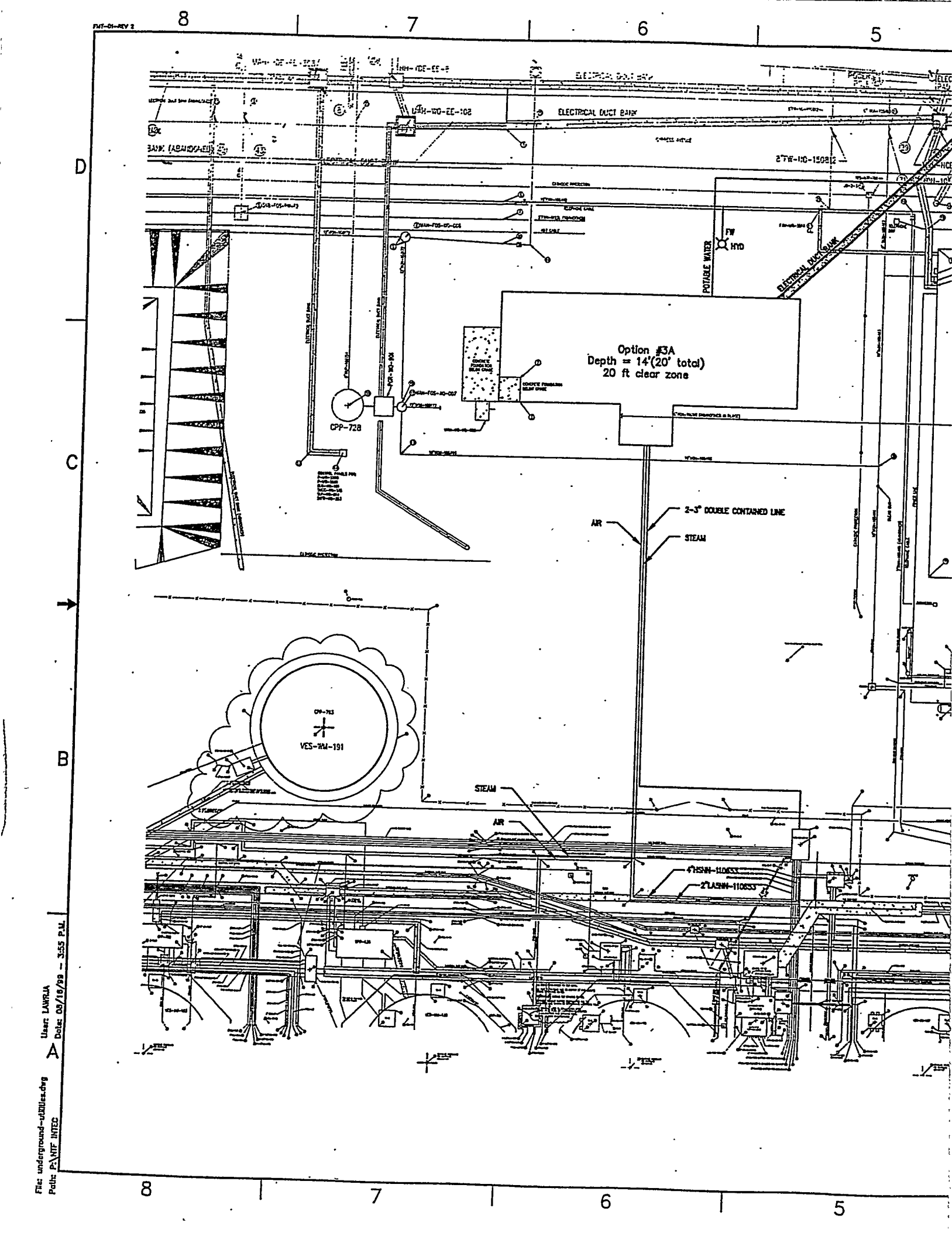
REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:

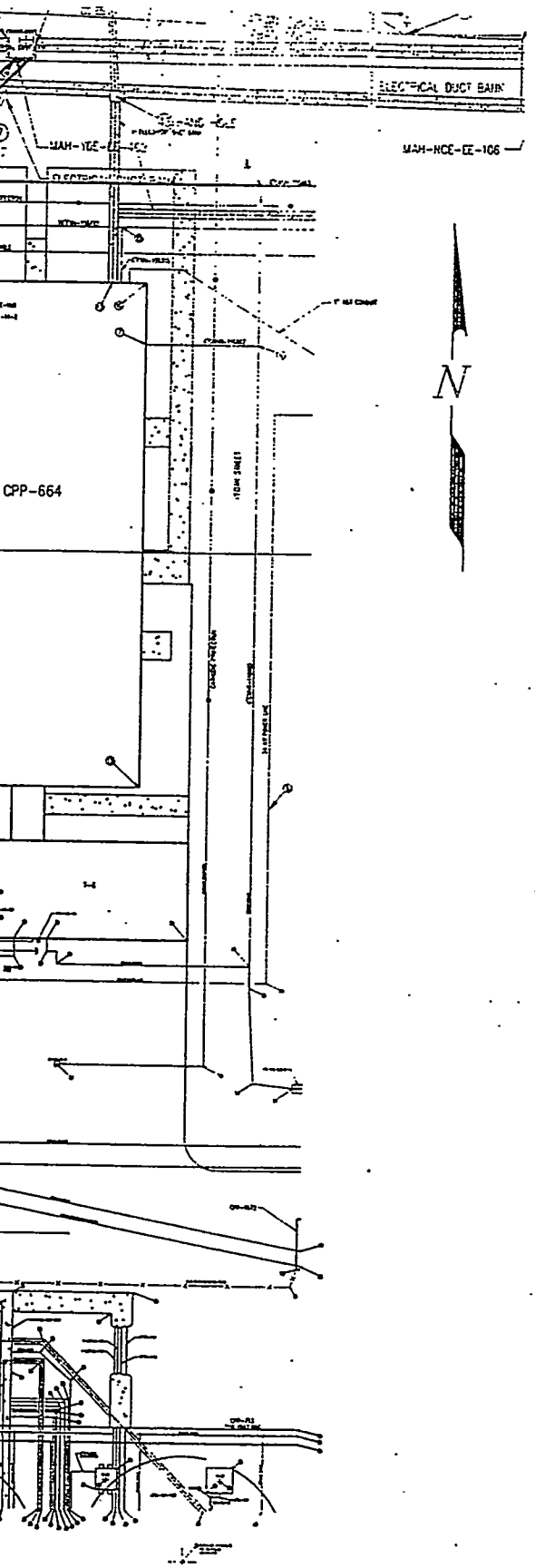


NOTES:

1. CUT VOLUME 17,736 CUBIC YARDS.

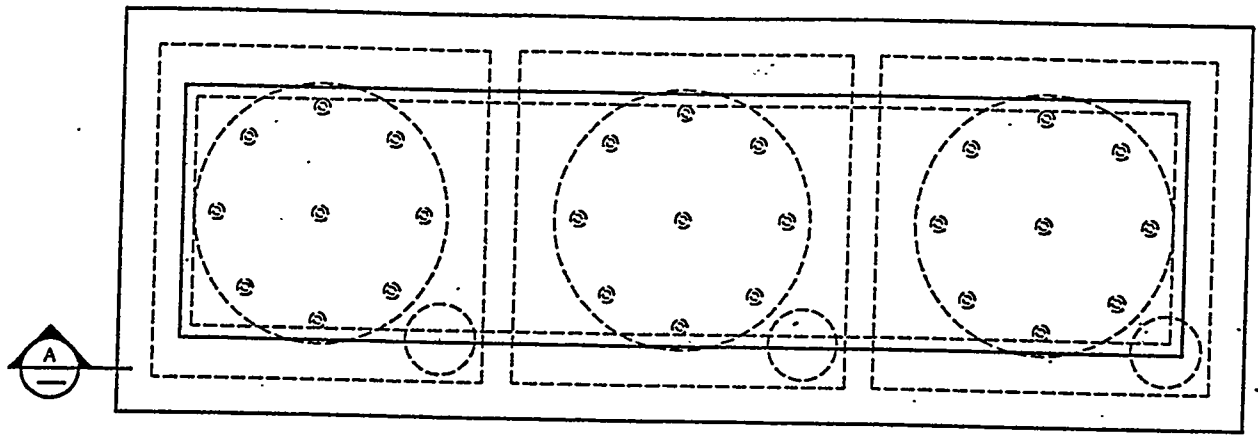
FOR DRAWING INDEX SEE DRAWING NO. T-1	SUBCONTRACT NO.	LOCKHEED MARTIN
200' 100' 50' 0 200' SCALE: 1" = 200.0'	REQUESTER:	INTEC NEW TANK FARM FEASIBILITY STUDY
	DESIGN:	
	DRAWN: J.A. LAWRENCE	OPTION #3A EXCAVATION/SITE PLAN
	PROJECT NO.	
	SPEC CODE	
DESIGN PHASE: FEASIBILITY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	SIZE D; CAGE CODE 01MF3; INDEX CODE NUMBER AREA 200 TYPE 0100 CI 01 ORG 530; DWG-; REV
QUALITY LEVEL:	EFFECTIVE DATE:	SCALE: NOTED; SHEET C-1


Option #3A
Depth = 14'(20' total)
20 ft clear zone
ELECTRICAL DUCT BANK
POTABLE WATER
FW
HYD
CPP-728
VES-WM-191
2-3" DOUBLE CONTAINED LINE
AIR
STEAM
4"HSNN-110633
2"LASNN-110633
8
7
6
5
D
C
B
A

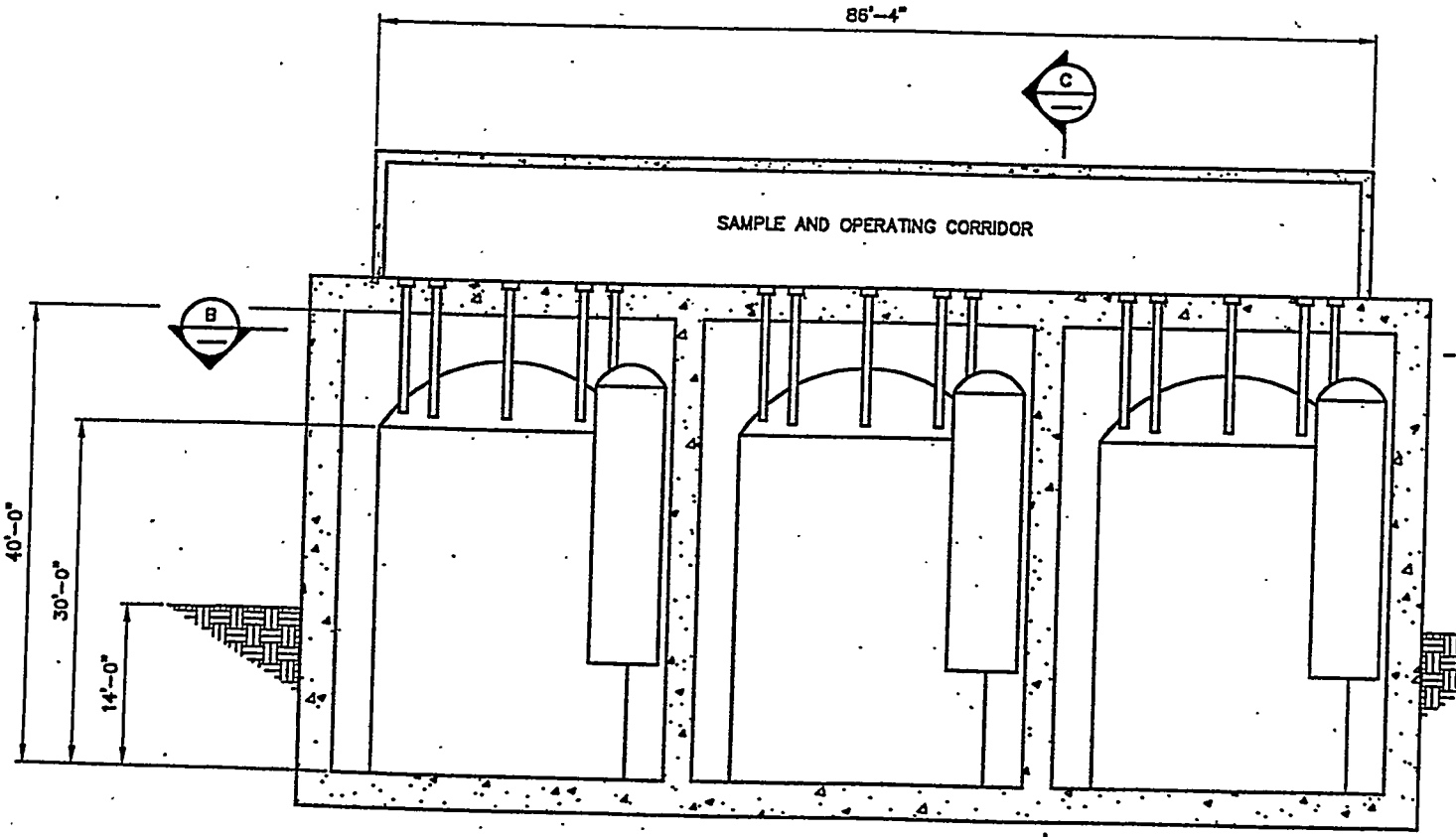


REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:

FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
NO SCALE	REQUESTER:	INTEC. NEW TANK FARM FEASIBILITY STUDY
	DESIGN:	
	DRAWN: J.A. LAWRENCE	OPTION #3A SITE PLAN
	PROJECT NO.	
	SPEC CODE	
DESIGN PHASE:	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	SIZE: D; CAGE CODE: 01MF3; INDEX CODE NUMBER: AREA, TYPE, CI, ORG: 530; DWG-; REV
QUALITY LEVEL:	EFFECTIVE DATE:	SCALE: 1"=20'-0"; SHEET C-2

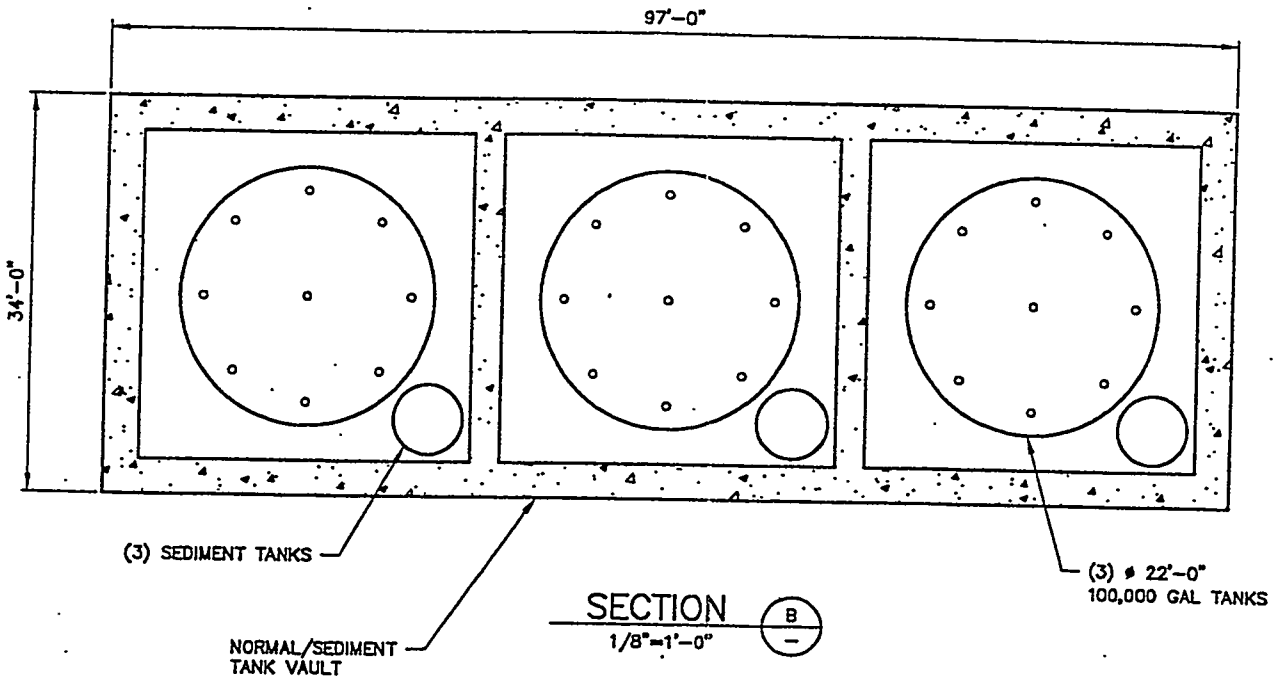


PLAN VIEW
SCALE: 1/8"=1'-0"

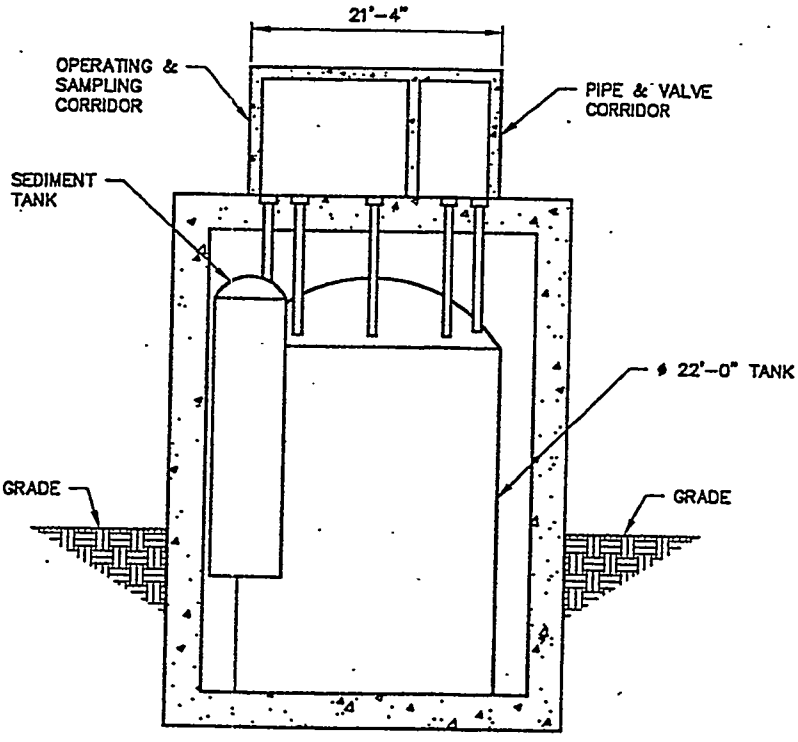


SECTION A
1/8"=1'-0"

REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:



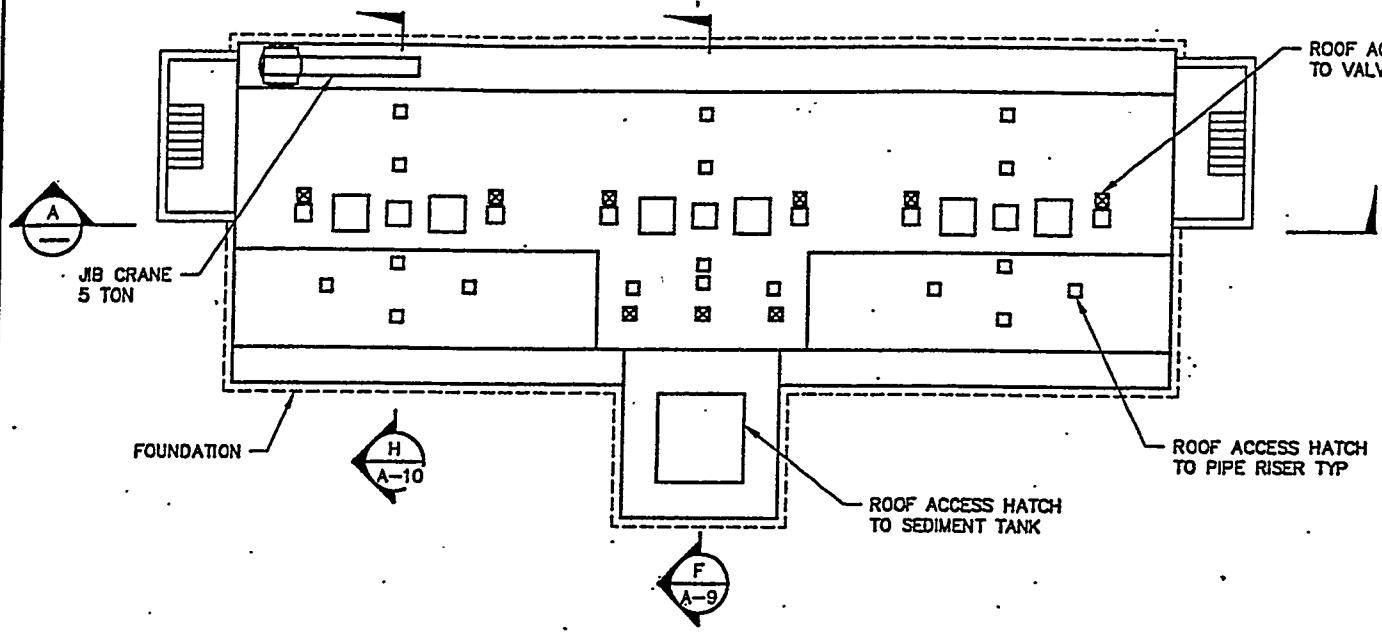
SECTION B
1/8"=1'-0"



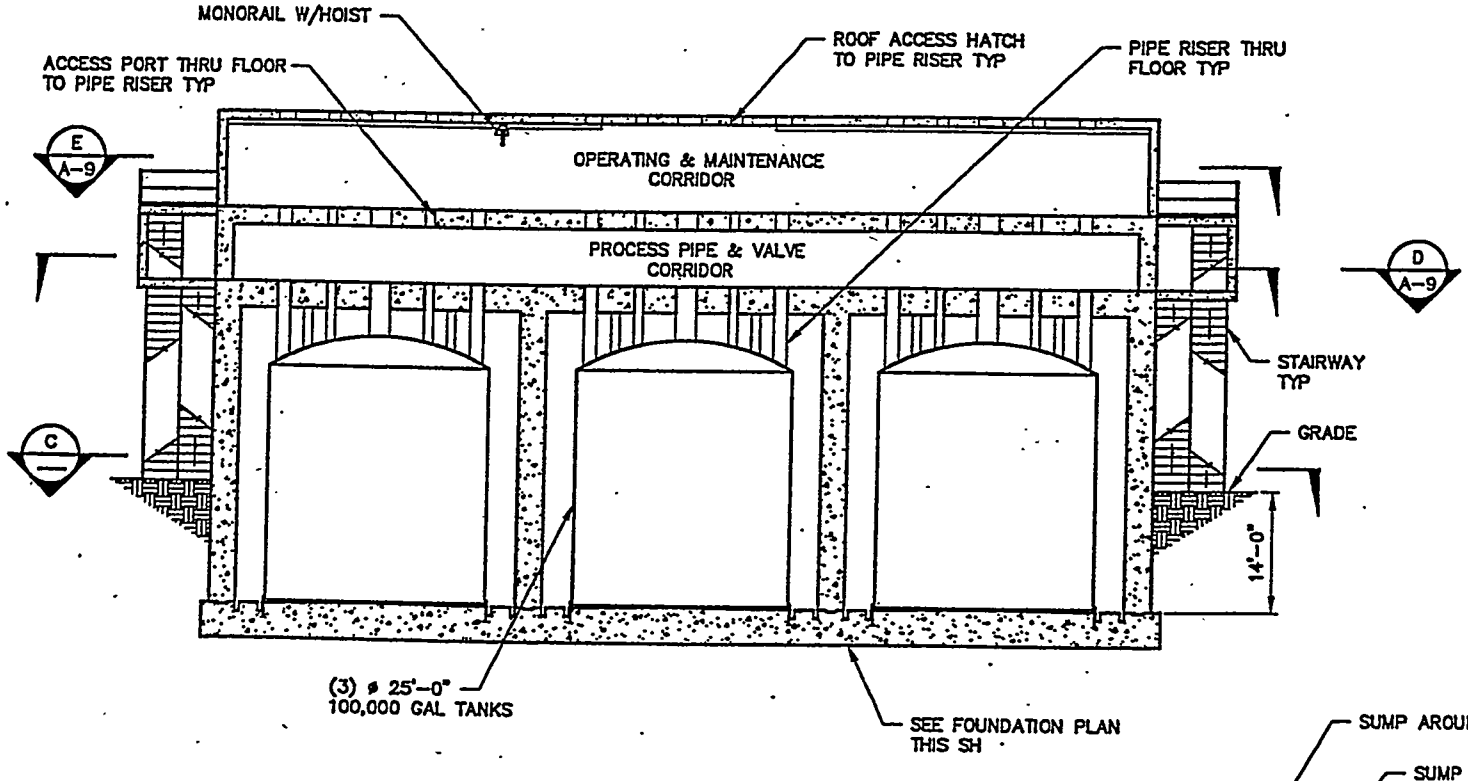
SECTION C
1/8"=1'-0"

GRADE

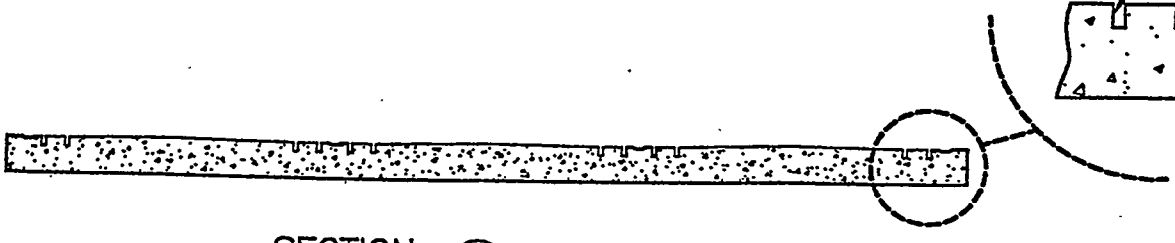
FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
SCALE: NOTED	REQUESTER:	INTEC NEW TANK FARM FEASIBILITY STUDY PRELIMINARY OPTION #3A THREE 100,000 GAL TANKS
	DESIGN:	
	DRAWN: ROB HERGESHEIMER	
	PROJECT NO.	
	SPEC CODE	
DESIGN PHASE: FEASIBILITY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	SIZE D; CAGE CODE 01MF3; INDEX CODE NUMBER AREA TYPE CI ORG 530; DWG-; REV
QUALITY LEVEL:	EFFECTIVE DATE:	SCALE: NOTED; SHEET A-4



ROOF PLAN
SCALE: 1/16"=1'-0"



SECTION A
3/32"=1'-0"



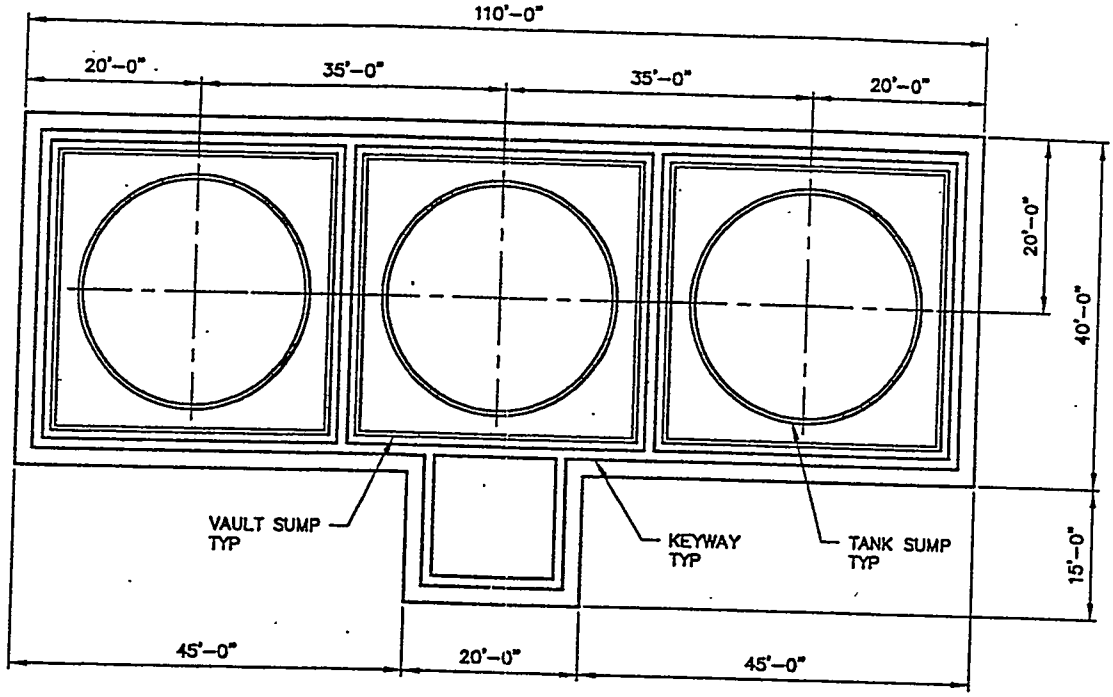
SECTION B
3/32"=1'-0"

SEE NOTE 1

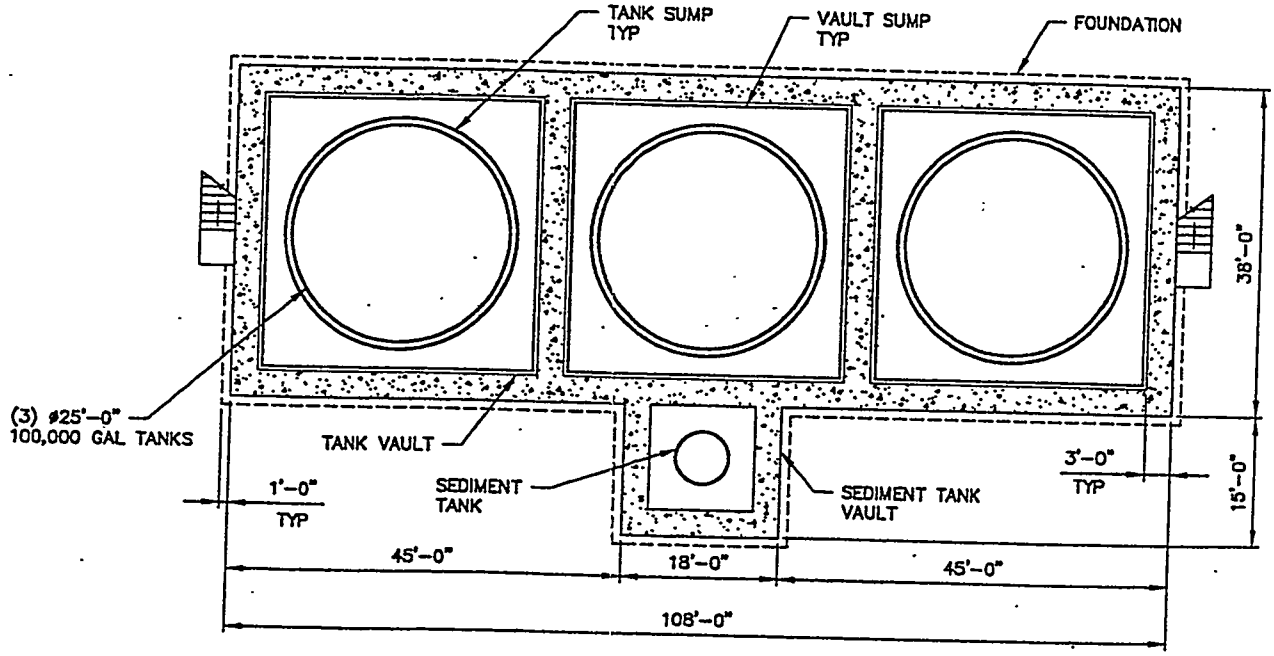
NOTE

1. FOR
SEE

REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:



FOUNDATION PLAN
SCALE: 3/32"=1'-0"

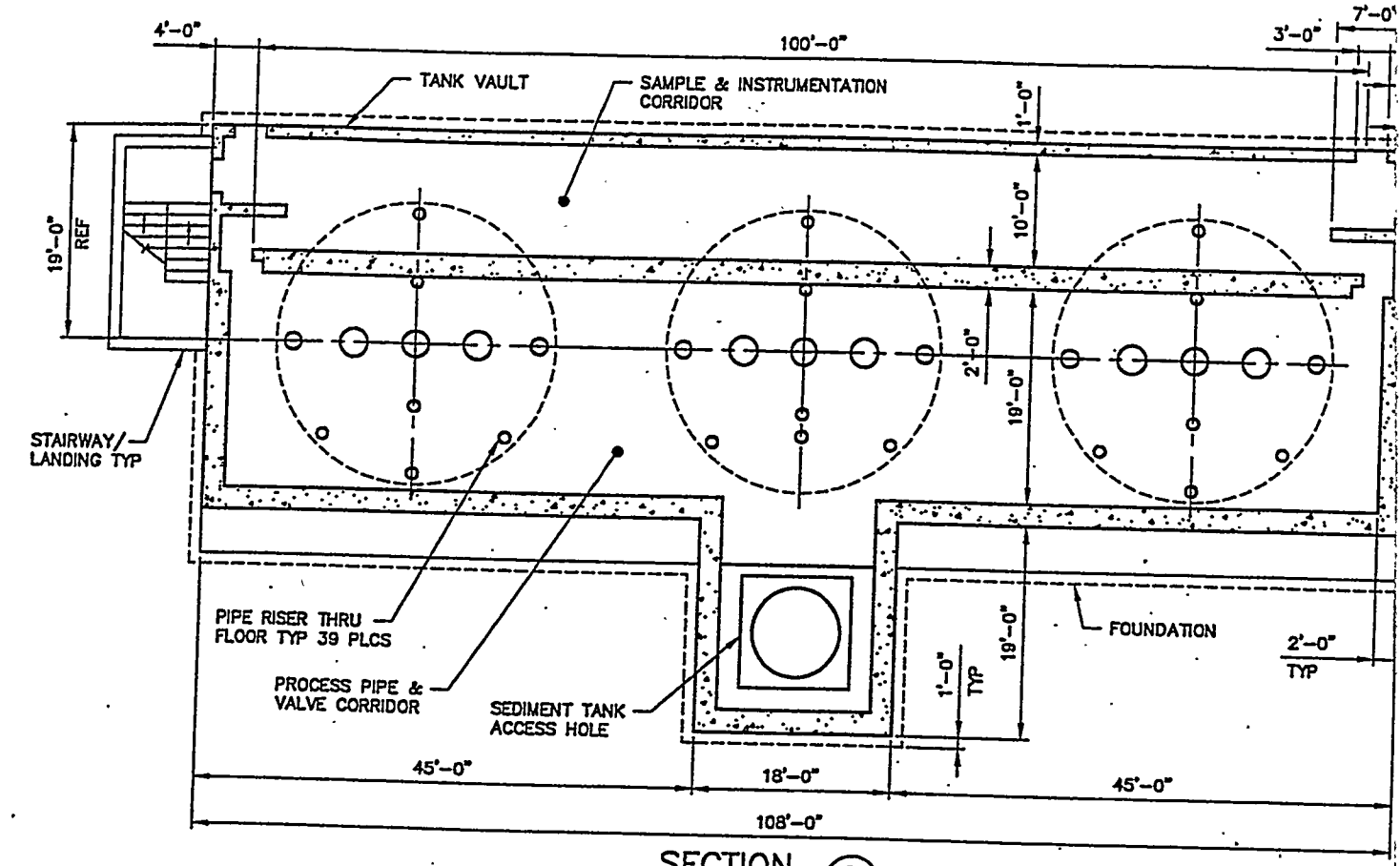


SECTION (C) BASEMENT LEVEL
3/32"=1'-0"

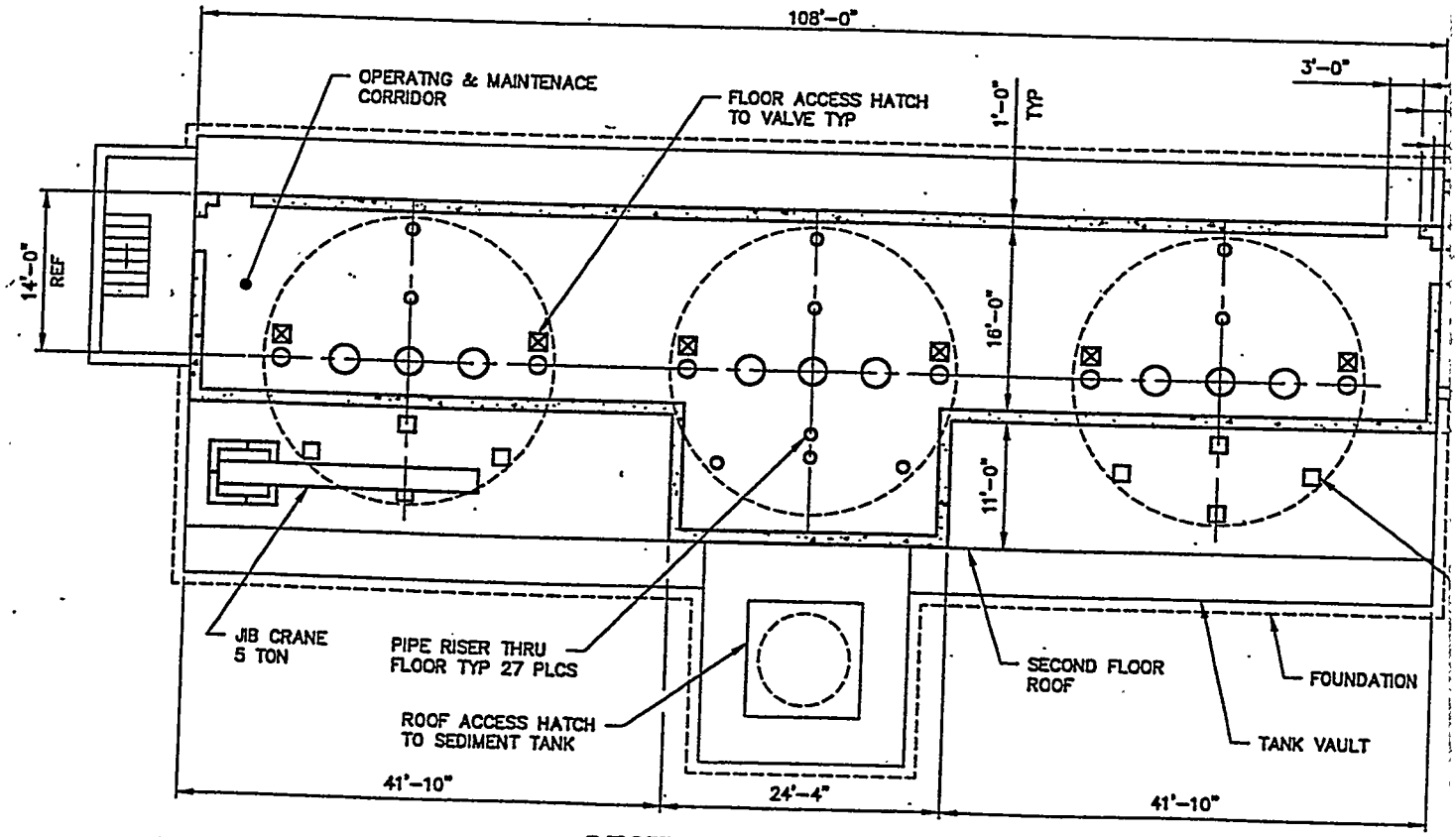
S:

TAILS OF TANK FLOORING AND SUMP CONSTRUCTION
G XXXXXX

FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
SCALE: 1/16" = 1'-0" / SCALE: 3/32" = 1'-0"	REQUESTER:	INTEC TANK NEW TANK FARM FEASIBILITY STUDY OPTION #3A THREE 100,000 GAL TANKS
	DESIGN:	
	DRAWN: ROB HERGESHEIMER	
	PROJECT NO.	
	SPEC CODE	
DESIGN PHASE: FEASIBILITY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	SIZE: D; CAGE CODE: 01MF3; INDEX CODE NUMBER: AREA / TYPE / CI / SEQ 530; DWG-; REV
QUALITY LEVEL:	EFFECTIVE DATE:	SCALE: NOTED; SHEET A-8

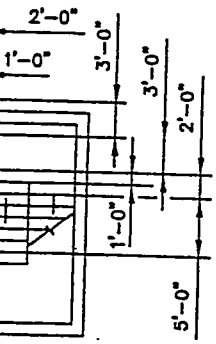


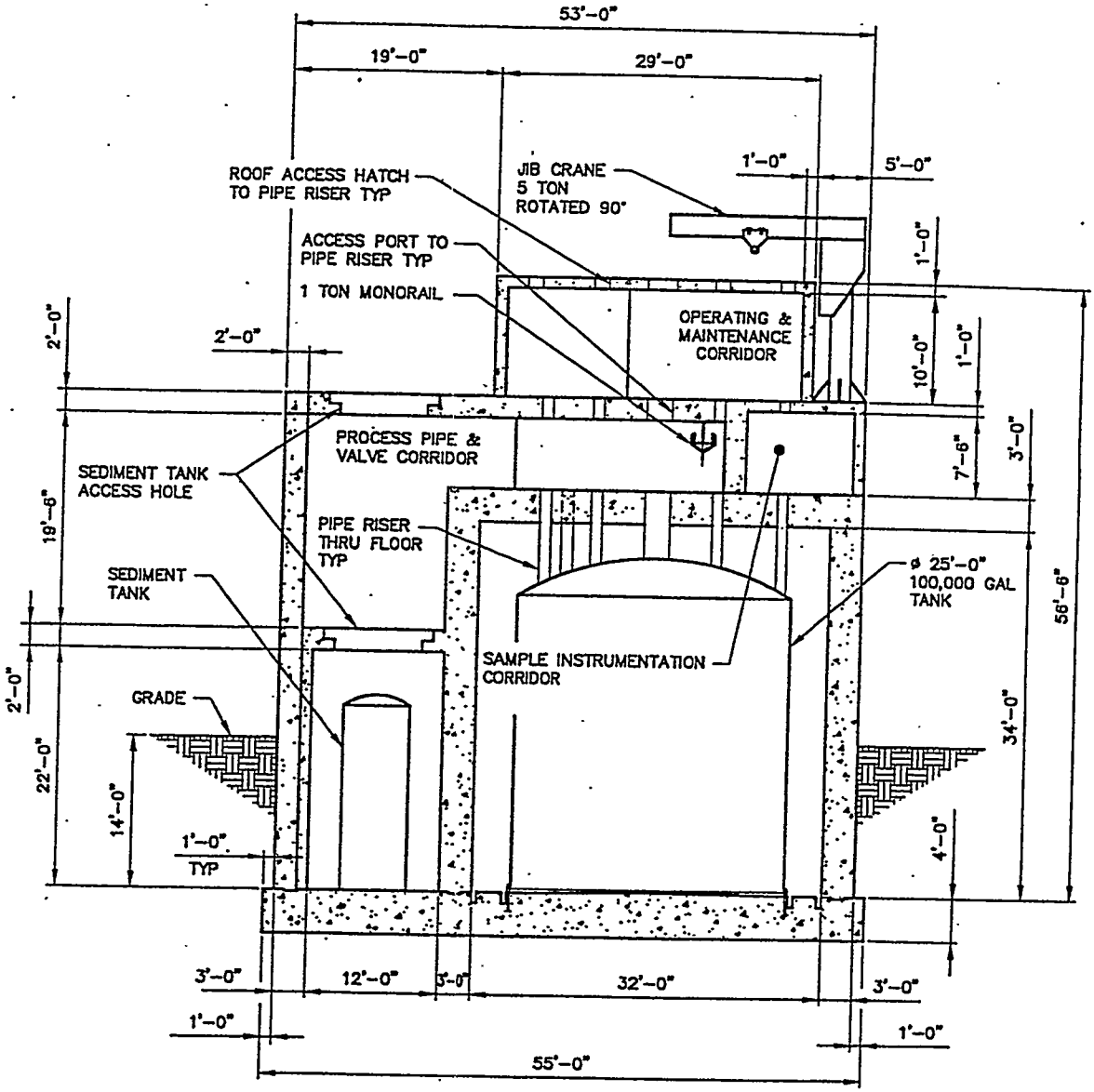
SECTION D 1/8"=1'-0" A-8 — SECOND FLOOR PROCESS PIPE & VALVE/ INSTRUMENTATION CORRIDOR

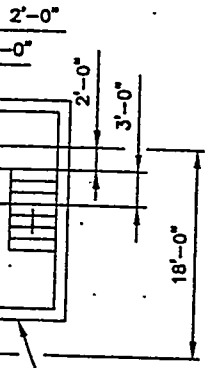


SECTION E 1/8"=1'-0" A-8 — THIRD FLOOR OPERATING & MAINTENANCE CORRIDOR

REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:





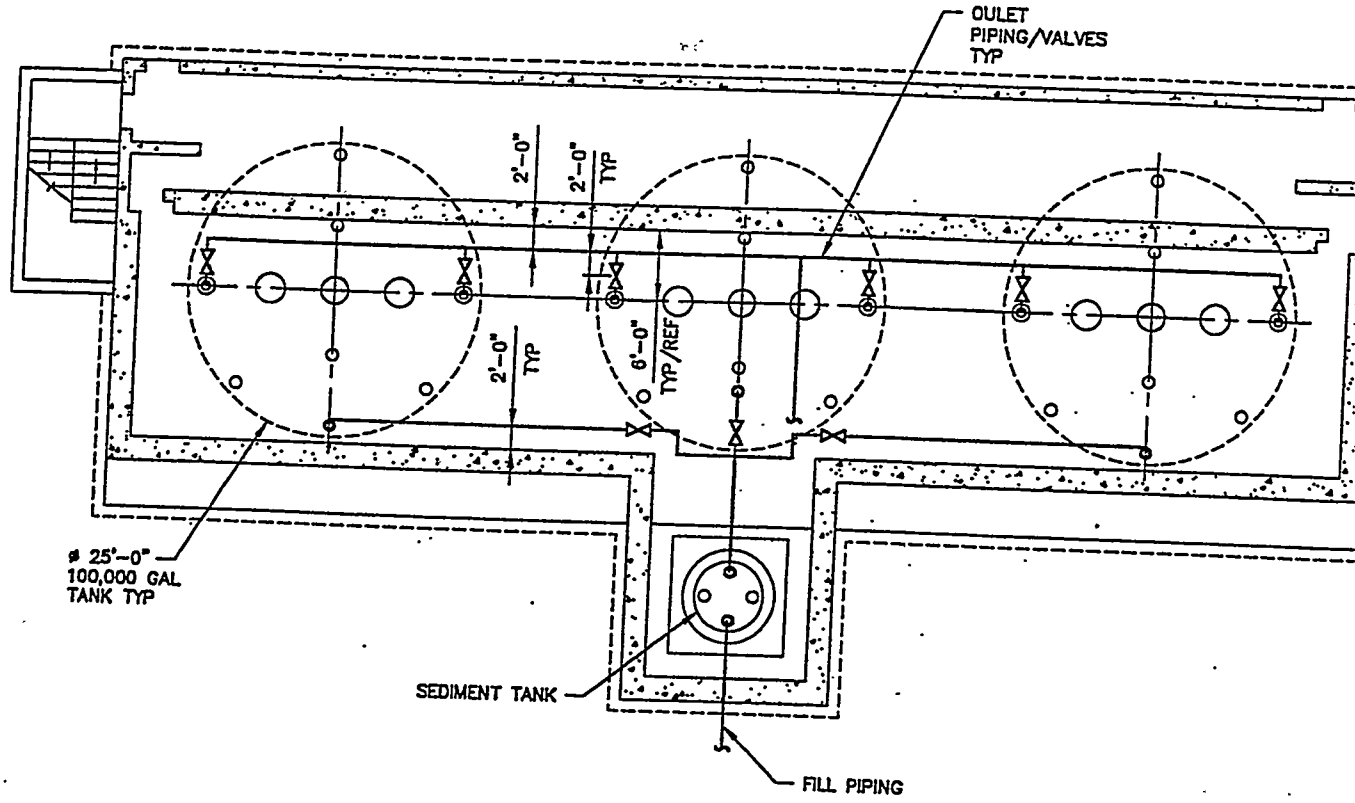


STAIRWAY/LANDING TYP

ROOF ACCESS HATCH TO PIPE RISER TYP

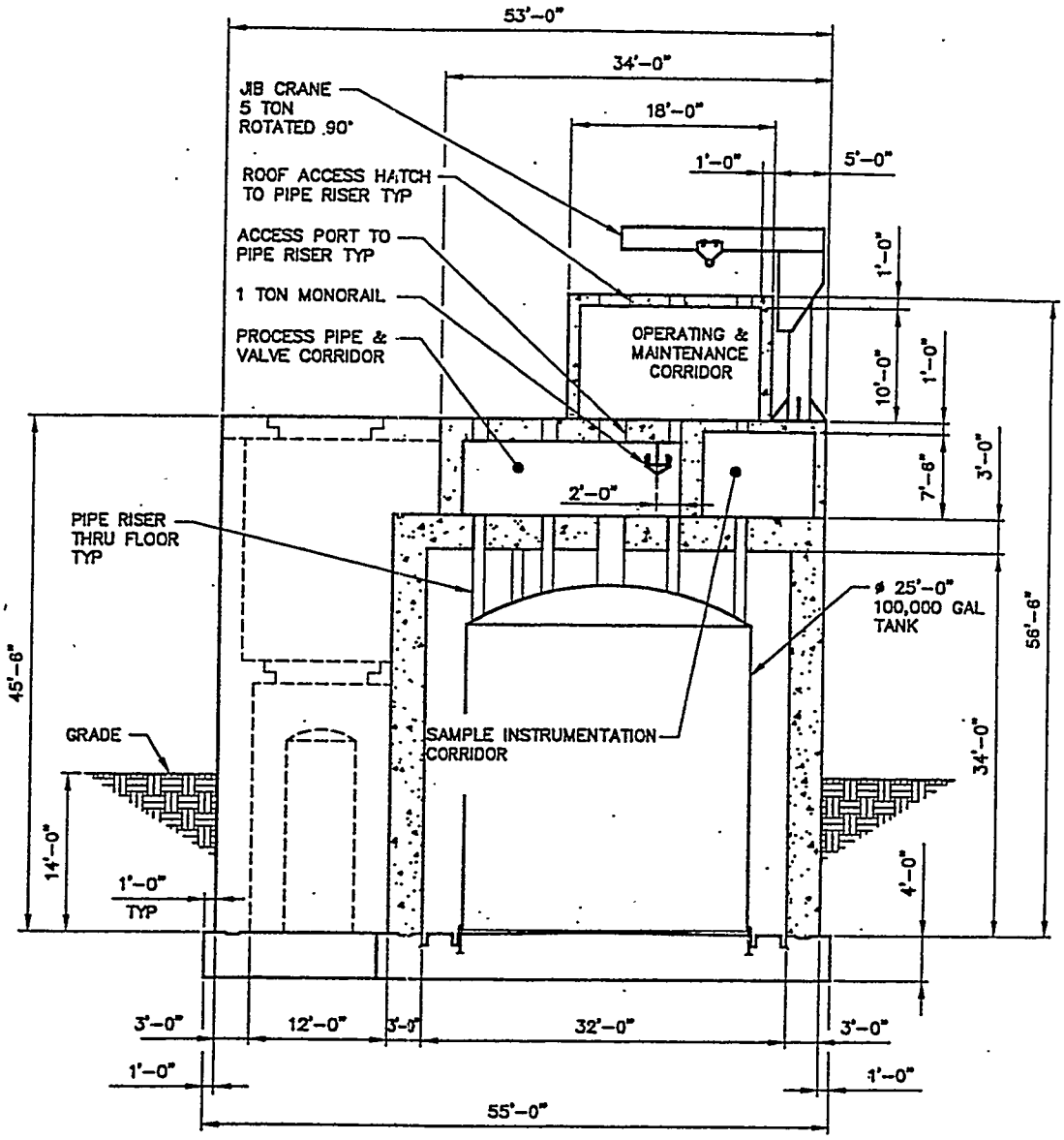
SECTION F
1/8"=1'-0"
A-8

FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN	
SCALE: 1/8" = 1'-0"	REQUESTER:	INTEC TANK NEW TANK FARM FEASIBILITY STUDY OPTION #3A THREE 100,000 GAL TANKS	
	DESIGN:		
	DRAWN: ROB HERGESHEIMER		
	PROJECT NO.		
	SPEC CODE		
DESIGN PHASE: FEASIBILITY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	SIZE: D; CAGE CODE: 01MF3; INDEX CODE NUMBER: AREA / TYPE / CI / 530; DWG-; REV	
QUALITY LEVEL:	EFFECTIVE DATE:	SCALE: NOTED	SHEET A-9



SECTION D — SECOND FLOOR PROCESS PIPE/VALVE LAYOUT
1/8"=1'-0" A-8

REVISIONS		
REV	DESCRIPTION	EFFECTIVE DATE:



SECTION H
1/8"=1'-0" A-8

FOR DRAWING INDEX SEE DRAWING NO.	SUBCONTRACT NO.	LOCKHEED MARTIN
SCALE: 1/8" = 1'-0"	REQUESTER:	INTEC TANK NEW TANK FARM FEASIBILITY STUDY OPTION #3A THREE 100,000 GAL TANKS
	DESIGN:	
	DRAWN: ROB HERGESHEIMER	
	PROJECT NO.	
	SPEC CODE	
DESIGN PHASE: FEASIBILITY	FOR REVIEW/APPROVAL SIGNATURES SEE DAR NO.	SIZE D; CAGE CODE 01MF3; INDEX CODE NUMBER AREA TYPE Q. DISC 530; DWG-; REV
QUALITY LEVEL:	EFFECTIVE DATE:	SCALE: NOTED; SHEET A-10