5 sto.4

SEP 26 1994

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 607537

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
Plant Engineering	Plant Engineering	
5. Proj./Prog./Dept./Div.:	6. Cog. Engr.:	7. Purchase Order No.:
Waste Management	D. W. Reberger	
8. Originator Remarks: Key Words: Double Shell Tank, Pumping Plan, Emergency Plan, Transfer Routes, Tank Leakage, Emergency Transfer, Leak Detection		9. Equip./Component No.:
		10. System/Bldg./Facility: East Tank Farms
11. Receiver Remarks:		12. Major Assm. Dwg. No.:
		13. Permit/Permit Application No.:
		14. Required Response Date:

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Desig-nator	(G) Reason for Trans-mittal	(H) Origi-nator Dispo-sition	(I) Receiv-er Dispo-sition
1	WHC-SD-WM-AP-031		0	Double Shell Tank Emergency Pumping Plan	Q	2	1	

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 4. Review 2. Release 5. Post-Review 3. Information 6. Dist. (Receipt Acknow. Required)	1. Approved 4. Reviewed no/comment 2. Approved w/comment 5. Reviewed w/comment 3. Disapproved w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)

(G) Reason	(H) Disp	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp
1	1	Cog.Eng. D.W. Reberger		8/18/94	R2-70						
1	1	Cog. Mgr. R.A. Dodd		8/19/94							
1	1	QA J.J. Verderber		8/22/94	61-57						
1	1	Safety L.R. Thomas		9-2-94	R3-08						
		Env.									
1	1	J J BADDEN		9/23/94	35-04						

18. Michael P. Langer
Signature of EDT Originator
Date 7/11/94

19. _____
Authorized Representative for Receiving Organization
Date

20. R A Dodd
Cognizant Manager
Date 9/26/94

21. DOE APPROVAL (if required) Ctrl. No.
[] Approved
[] Approved w/comments
[] Disapproved w/comments

BD-7400-172-2 (04/94) GEF097

BD-7400-172-1 (07/91)

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

RELEASE AUTHORIZATION

Document Number:	WHC-SD-WM-AP-031, REV.0
Document Title:	Double Shell Tanks Emergency Pumping Plan
Release Date:	September 23, 1994

* * * * * * * * * * * * * *

This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

* * * * * * * * * * * * * *

WHC Information Release Administration Specialist:

Kara Broz
(Signature)

September 23, 1994
(Date)

SUPPORTING DOCUMENT

1. Total Pages 86

2. Title	3. Number	4. Rev No.
Double Shell Tanks Emergency Pumping Plan	WHC-SD-WM-AP-031	0

5. Key Words

Double Shell Tank, Pumping Plan, Emergency Plan, Transfer Routes, Tank Leakage, Emergency Transfer, Leak Detection

KMG 9/23/94

APPROVED FOR PUBLIC RELEASE

6. Author

Name: M. J. Tangen

Michael J Tangen
Signature

Organization/Charge Code 7CF10/N1F6B

7. Abstract

This document contains general information about necessary actions to be taken upon the discovery of a leak in one of the double shell tanks. Transfer routes, leak detection equipment, pump information, and hydraulic diagrams are included in the document to aid the transfer process. Watch list tanks are also identified.

8. **PURPOSE AND USE OF DOCUMENT** - This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed.

PATENT STATUS - This document copy, since it is transmitted in advance of patent clearance, is made available in confidence solely for use in performance of work under contracts with the U.S. Department of Energy. This document is not to be published nor its contents otherwise disseminated or used for purposes other than specified above before patent approval for such release or use has been secured, upon request, from the Patent Counsel, U.S. Department of Energy Field Office, Richland, WA.

DISCLAIMER - This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

9. Impact Level Q

10. **RELEASE STAMP**

OFFICIAL RELEASE BY WHC
DATE SEP 26 1994
Sta 4

DOUBLE SHELL TANKS

EMERGENCY PUMPING PLAN

Michael J. Tangen

East Tank Farms Systems Engineering

Prepared for the United States Department of Energy

Westinghouse Hanford Company
P. O. Box 1970
Richland, WA 99352

DOUBLE SHELL TANKS

EMERGENCY PUMPING PLAN

This page intentionally left blank.

DOUBLE SHELL TANKS EMERGENCY PUMPING PLAN
EXECUTIVE SUMMARY

In the event that one of the double shell waste storage tanks begins to leak, a group of emergency action plans for the transfer of the waste from that tank to a designated receiver tank has been developed and incorporated into a single procedure. The tanks included in this plan are those located in AN, AP, AW, AY, and SY farms, with TK-104-AP being named as the designated receiver tank. The AZ tank farm has been purposely omitted at this time due to the high heat waste considerations. Emergency pumping on AZ farm will be included in this report at a later date.

Currently, all of the tanks included in these farms are equipped with transfer pumps with the exception of TK-107-AN and TK-101-SY. Due to the distance and special cross-site pumping considerations involved in the transfers from SY farm, procedures involving these tanks will require the shuffling of waste from TK-102-AY to make these transfers possible. A fluid analysis performed on the transfer routes involved in this plan (Appendix F) has been used to determine that all of the currently installed pumps are adequate to perform the transfer operations as required. Expected head loss values at standard flow rates for all transfer routes are also included in this procedure, which will aid in the sizing of pumps for the two open tanks.

Hydraulic diagrams have been drawn for each farm in an effort to determine the best method of flushing the transfer lines once the transfer is complete. It is hoped that the amount of water flushed back into the leaking tank can be kept at a minimum to avoid additional leakage. If water must be sent into the tank, efforts to maintain the waste level below the leak level should be made. The hydraulic diagrams for each farm are included in their respective appendices, A through E.

The results of the data acquisition and analysis have led to the following conclusions:

1. Waste from tanks 101 and 103-SY will be transferred to tank 102-SY after the waste from 102-SY is sent cross-site to 102-AY. Waste from 102-AY would first be sent to 104-AP.

2. Calculations for the transfer pumps currently installed in tanks 102 and 104-AN initially led to the conclusion that the pumps were inadequate to transfer the tank contents to tank 104-AP. A comparison of the calculated data with the measured performance data for these pumps, however, shows that the pump flow rates will be slower than the rated value, but will still be sufficient. A graph of the performance data and the theoretical data, illustrating the expected performance of the pumps, appears in Appendix I of this report. Both of these pumps, which have identical rating and performance data, will be able to complete the transfers to tank 104-AP at flow rates between 110 and 125 gallons per minute.

3. Tanks 107-AN and 101-SY have no transfer pumps currently installed in their primary pump pits. In the event of a leak, transfer pumps will need to be installed to remove the waste from the primary tanks.

All decisions and courses of action described in this document are in compliance with established safety and regulatory procedures. Several of the tanks are designated watch list tanks for hydrogen/flammable gas (101-SY, 103-SY, 101-AW, 103-AN, 104-AN, and 105-AN), and therefore have additional regulations. According to OSD-T-151-00030, transfers out of these tanks require written approval by Tank Waste Remediation Systems, Waste Tanks Safety Assurance, and the DOE. Any transfers into these tanks require the written approval of the Secretary of Energy.

1.0 INTRODUCTION

At the request of the Department of Energy (DOE), a formal plan for the emergency transfer of waste from a leaking double shell tank to a designated receiver tank has been developed. This plan is in response to the priority 2 safety issue "Response to a leaking double-shell tank" in the DOE Report to Congress, 1991. The plan includes the tanks in four of the east tank farms and one of the west farms. The background information and supporting calculations used for the creation of the emergency plan are discussed in this document.

2.0 OBJECTIVE

This plan will facilitate the process of transferring waste from leaking double shell tanks. By having a pre-written document, tank farm operations will be able to initiate the waste transfers much more quickly than before while maintaining high levels of safe operation.

3.0 SCOPE

The scope of this document is all of the double shell tanks in the AN, AP, AW, AY, and SY farms. The transfer lines, flush pits, and valve pits involved in the transfer of waste between these farms are also included in the scope. Due to the storage of high heat waste, AZ farm is excluded at this time.

4.0 EMERGENCY PLAN DEVELOPMENT

Development of the emergency plan for the double shell tanks involved several steps. First of all, transfer routes for the transfer of waste from each tank needed to be determined. An inventory of the existing transfer pumps followed, leading to an analysis of fluid flow properties of the transfer lines to assess the ability of the existing equipment to complete the transfers. Once the final set of transfer routes was determined, a valve

checklist for each transfer route was established. Finally, the creation of hydraulic diagrams for use in examining flushing procedures was completed.

4.1 DOE Orders

According to DOE order 5820.2A, waste may not be stored in a double shell tank in which a leak has been detected unless double containment can be maintained. This order states that draining a leaking tank to a level below that of the leak provides acceptable double containment, and hence is the plan of action that has been adopted. The DOE order also states that materials released from the primary tank must be removed within 24 hours, or in as timely a manner as is possible. The creation of the emergency transfer plan will aid tank farm operations in beginning the waste transfers as quickly as possible, in accordance with the DOE guidelines.

4.2 Leak Detection

The two methods of leak detection that are used in the double shell tanks are the Continuous Air Monitor (CAM) system, and liquid conductivity sensors. The CAM system works by continuously circulating air from the annulus through its filters and monitoring the level of radiation present. Any increases in the radiation level will trigger alarms that indicate a tank breach may have occurred. If the increase in the vent radiation reading is greater than three times the baseline value and the presence of long half-life isotopes is confirmed, then the tank may be considered a suspected leaker. The second detection system, the liquid conductivity sensors, physically detect the leaking material. When liquid waste from the primary tank comes into contact with one of the sensors, the waste completes an electric circuit which triggers an alarm. The CAM system is the more sensitive of the two, and is the primary detection device. The conductivity sensors are primarily used as backup to the CAM system.

4.3 Transfer Routes

The initial step taken in evaluating the transfer of waste to tank 104-AP was to define the transfer routes that would be used to perform this task. Identification of transfer routes was done through the use of the routing boards at the shift offices of 200 East and West, as well as by referencing existing transfer procedures for these farms. The routing board was also used to determine the specific valve pit nozzles which complete the transfer routes. Appendices A through E contain a summary of the transfer routes for the tanks involved in this study, organized by farm. In addition, the nozzles that are to be used in each valve pit are listed to aid in the installation of necessary jumpers.

Transfers involving the SY farm are a little more complex than the transfers from the other farms due to the cross-site location of the SY farm. For all SY transfers, the first step will be to transfer the waste from tank 102-AY to tank 104-AP. The waste from tank 102-SY will then be sent cross-site to tank 102-AY using the installed cross-site transfer pump. If necessary, waste from either of the other two SY farm tanks can then be transferred to tank 102-SY.

In the event that tank 104-AP should begin to leak before any other waste is pumped into it, the small amount of waste currently in tank 104-AP will need to be pumped into one of the other double shell tanks. This transfer should not be very difficult given the relatively small volume being handled, and can be accomplished with existing procedures. With 104-AP thus out of service, however, a new contingency tank will need to be determined, and this emergency plan will need to be revised accordingly. The same holds true in the event that an emergency transfer is made to tank 104-AP, as that tank will no longer be available as a spare. In this case, the revised plan should also include a route to transfer the waste from tank 104-AP to the newly designated spare tank.

4.4 Compatibility

Compatibility tests are performed on the waste in both the supply and receiver tanks before a transfer takes place to make certain that undesirable chemical reactions do not occur. The document "Data Quality Objectives for the Waste Compatibility Program" (WHC-SD-WM-DQO-001, Rev. 0) discusses the criteria used to assess the compatibility of wastes before they are mixed. Most of the transfers discussed in this plan involve moving waste only to TK-104-AP, which contains roughly 30,000 gallons of a very dilute waste that should pose no compatibility problems. Transfers involving SY farm, however, involve transferring waste into tanks which contain large volumes of high-level waste that may cause a safety concern if mixed.

4.5 Pressure Testing

Pressure testing is required on certain transfer lines to make sure that leaking will not occur during the transfer. These lines are defined in OSD-T-151-00010, and the pressure testing procedure is discussed in TO-140-170. Pressure testing involves filling the transfer line with water and then pressurizing it with air. The pressure in the line is then monitored for a specified period of time to see if any noticeable drop occurs, which would indicate a leak in the line. The allowed pressure loss for transfer lines is discussed in the documents listed above.

4.6 Head Loss Calculations

The head loss calculations for each transfer route are presented in two parts. The first set of calculations represents the head losses expected using the currently installed pumping equipment. The second set of calculations shows the expected head losses for four standard pumping flow rates of 50, 100, 125, and 150 gallons per minute. A detailed explanation of the calculations is presented in Appendix F, while tables showing the resulting figures are presented in Appendices G and H. It is important to mention that losses due

to components such as elbows and valves have been ignored in these calculations since their contributions to the overall head loss in the pipes are insignificant compared to the other sources of loss. Any losses experienced in the two instances where the flow moves from 2 inch diameter pipes to 3 inch diameter pipes are also comparatively small and are therefore ignored. Both of these sets of calculations incorporate frictional and elevation losses.

Head loss values are calculated using both laboratory and engineering data in Bernoulli's equation for pipe flow. Waste material temperatures are assumed to be at an average temperature between 50 and 100 degrees Fahrenheit. Whenever assumptions are warranted, conservative estimates are used. Results are reported in units of feet.

While most of the specific gravity data is available for the tank waste discussed in this report, viscosity data is harder to locate. Based on the known specific gravities for the tank wastes, as well as the fact that the major constituent of the waste is water, values for the viscosities of the tank wastes can be conservatively estimated. Conservative specific gravity values based on the values given for the remainder of the tanks are used for the two tanks which have limited laboratory data on file.

4.7 Salt Well Jet Pumping

The purpose of salt well jet pumping is to remove any interstitial liquid that is trapped between solids in the tank. In the process of salt well jet pumping, a cylindrical screen is inserted into the tank to prevent the solids from clogging the pumping lines. A jet pump working in concert with a centrifugal pump then proceeds to create a circular flow of pumped liquid, part of the liquid priming the pump for the remaining flow. With each cycle, some of the fluid is forced out of the tank, and the rest is recycled into the tank. Pumping continues until all of the interstitial fluid has been forced out of the tank.

Jet pumping in a leaking tank is a very real possibility due to the potential for a leak occurring at or near the bottom of the tank. In the event such a leak should occur, removal of the liquid waste from the solids in the tank will need to be done by salt well jet pumping. Although the flow rates of the jet pumps are very slow (between 0.05 and 4.0 gallons per minute), they are able to transfer waste along the same routes described for the transfer pumps.

Currently, there are no salt well jet pumping systems installed in the double shell tanks. In order to prepare the double shell tanks for pumping, salt well screens need to be installed in each tank. Also, jet pump lengths need to be modified depending on the situation in the tank being pumped.

4.8 Waste in the Annulus

Once a leak has been detected, the waste in the annulus will need to be removed. The plan adopted is to pump this waste back into the primary tank. Waste will be removed from the primary tank at a much greater rate than it will be leaking into the annulus, making this procedure valid. Currently, most of the tanks covered by this plan do not have annulus pumps installed. Tanks 107-AN, 103-AP, and 101-AY each have an annulus pump installed that could serve as the spare for their respective farms. AW and SY farms have no annulus pumps present at this time.

4.9 Flushing Procedures

After all waste transfer operations are complete, the equipment and transfer lines used must be flushed to prevent solids and salts from settling out of the residual waste. Typically, water from one of the existing flush pits is routed into the transfer lines, flushing residual waste from the transfer lines either forward into the receiver tank or back into the supply tank. A concern regarding this particular set of transfers, however, is sending flush water into the leaking tanks, knowing that it will end up leaking into the annulus. The exception is the case where the leaking tank is pumped to a

level below the leak, and addition of the flush water will not raise the waste level above the level of the leak.

Any flushing that occurs in the east tank farms will involve the use of the 241-AW flush pit. The hydraulic schematics included in this document (Appendices A through E) illustrate where the water from the 241-AW flush pit will enter the transfer routes, and in which directions the water will have a tendency to flow. The only water that would enter the leaking tank would be drainback from the portion of the transfer line which is higher in elevation than the tank. Since only enough water required to fill the volume of the transfer line is required for flushing the line, the amount of water that would flow into the damaged tank would be minimal.

Another option for flushing transfer lines is to use the method described in procedure TO-020-705, Flush Saltwell Jet Pump Systems and Transfer Routes. This procedure details the process of connecting a water truck to the transfer route at the supply tank and pumping water from there to the receiver tank. The water truck has a pump which enables the flushing. A small amount of water (approximately 20 gallons) is also used to flush the pumping equipment in the supply tank. Using a water truck will not prevent the need for the water in the elevated portion of the transfer line to be drained into the leaking tank.

Using the second method involves incorporating the water truck into the transfer route and isolating the supply tank. This can be accomplished with either a jumper change or the connection of the water truck hose to a flush connection in the supply tank pump pit, thereby completely removing the supply tank from the transfer route. For most instances, the flushing procedure will involve removing the jumper used in the pump pit during the transfer and attaching the water hose to the appropriate nozzle.

4.10 Recommendations

The most time-consuming portion of the transfer procedures discussed in this plan is the installation of necessary equipment that is not already in place. In the event a leak should be confirmed in one of the tanks, an emergency transfer will be expedited if tank farm personnel are able to begin the process without spending time on equipment set-up. Nearly all of the tanks in the five farms covered in this plan do not have annulus pumps currently installed, and two of the tanks do not have transfer pumps installed. Although pump installation is outside of the scope of this document, it is recommended that this issue be addressed in the interest of being better prepared for an emergency transfer.

APPENDIX A: TRANSFER DATA, AN FARM

Transfer Routes

TK-101-AN

Route: Transfer Pump (01A Pit) to SN-261
SN-261 to 241-AN-B Valve Pit
SN-260 from 241-AN-B Valve Pit to TK-102-AZ 02B Pit
SN-600 from TK-102-AZ 02B Pit to 241-AX-A Valve Pit
SN-214/201 from 241-AX-A Valve Pit to 241-A-A Valve Pit
SN-220 from 241-A-A Valve Pit to 241-AW-A Valve Pit
SN-267 from 241-AW-A Valve Pit to TK-102-AW
SN-609 from TK-102-AW to 241-AP Valve Pit
SN-614 from 241-AP Valve Pit to TK-104-AP

Jumpers: Nozzle R-15 to Nozzle R-2 in AN-B Valve Pit
Nozzle U-7 to Nozzle U-5 in 102-AZ 02B Pit
Nozzle L-16 to L-1 in AX-A Valve Pit
Nozzle L-1 to L-2 in A-A Valve Pit
Nozzle L-2 to L-1 in AW-A Valve Pit
Nozzle J to Nozzle V in TK-102-AW Pit
Nozzle 14 to Nozzle 20 in 241-AP Valve Pit

TK-102-AN

Route: Transfer Pump (02A Pit)to SN-262
SN-262 to 241-AN-B Valve Pit
Continue following route for TK-101-AN

Jumpers: Nozzle R-16 to Nozzle R-2 in AN-B Valve Pit
Continue as per TK-101-AN

TK-103-AN

Route: Transfer Pump (03A Pit) to SN-263
SN-263 to 241-AN-B Valve Pit
Continue following route for TK-101-AN

Jumpers: Nozzle R-14 to Nozzle R-2 in AN-B Valve Pit
Continue as per TK-101-AN

TK-104-AN

Route: Transfer Pump (04A Pit) to SN-264
SN-264 to 241-AN-A Valve Pit
SN-268 from 241-AN-A Valve Pit to 241-AN-B Valve Pit
Continue following route for TK-101-AN

Jumpers: Nozzle L-15 to Nozzle L-19 in AN-A Valve Pit
Nozzle R-19 to Nozzle R-2 in AN-B Valve Pit
Continue as per TK-101-AN

TK-105-AN

Route: Transfer Pump (05A Pit) to SN-265
SN-265 to 241-AN-A Valve Pit
SN-268 from 241-AN-A Valve Pit to 241-AN-B Valve Pit
Continue following route for TK-101-AN

Jumpers: Nozzle L-16 to Nozzle L-19 in AN-A Valve Pit
Nozzle R-19 to Nozzle R-2 in AN-B Valve Pit
Continue as per TK-101-AN

TK-106-AN

Route: Transfer Pump (06A Pit) to SN-266
SN-266 to 241-AN-A Valve Pit
SN-268 from 241-AN-A Valve Pit to 241-AN-B Valve Pit
Continue following route for TK-101-AN

Jumpers: Nozzle L-14 to Nozzle L-19 in AN-A Valve Pit
Nozzle R-19 to Nozzle R-2 in AN-B Valve Pit
Continue as per TK-101-AN

TK-107-AN

Route: Transfer Pump (07A Pit) to SN-267
SN-267 to 241-AN-A Valve Pit
SN-268 from 241-AN-A Valve Pit to 241-AN-B Valve Pit
Continue following route for TK-101-AN

Jumpers: Nozzle L-1 to Nozzle L-19 in AN-A Valve Pit
Nozzle R-19 to Nozzle R-2 in AN-B Valve Pit
Continue as per TK-101-AN

Valve Checklists
TK-101-AN TO TK-104-AP VALVE POSITION CHECKLIST

Valve Description	Valve Position
01A (AN-01A Central Pit)	Route flow from pump to Nozzle A, Block flow to Nozzle G
B-18 (241-AN-B Valve Pit)	OPERATE
B-16 (241-AN-B Valve Pit)	Route flow from Nozzle R-15 to Valve B-15, Block flow to Nozzle R-14
B-15 (241-AN-B Valve Pit)	Route flow from Valve B-16 to Valve B-13, Block flow to Nozzle R-16
B-14 (241-AN-B Valve Pit)	CLOSED
B-13 (241-AN-B Valve Pit)	Route flow from Valve B-15 to Nozzle R-2, Block flow to Nozzle R-19
Continue with AN Common Valving Instructions	

TK-102-AN TO TK-104-AP VALVE POSITION CHECKLIST

Valve Description	Valve Position
02A (AN-02A Central Pit)	Route flow from pump to Nozzle A, Block flow to Nozzle G
B-18 (241-AN-B Valve Pit)	OPERATE
B-16 (241-AN-B Valve Pit)	Route flow from Nozzle R-15 to Nozzle R-14, Block flow to Valve B-15
B-15 (241-AN-B Valve Pit)	Route flow from Nozzle R-16 to Valve B-13, Block flow to Valve B-16
B-14 (241-AN-B Valve Pit)	CLOSED
B-13 (241-AN-B Valve Pit)	Route flow from Valve B-15 to Nozzle R-2, Block flow to Nozzle R-19
Continue with AN Common Valving Instructions	

TK-103-AN TO TK-104-AP VALVE POSITION CHECKLIST

Valve Description	Valve Position
03A (AN-03A Central Pit)	Route flow from pump to Nozzle A, Block flow to Nozzle G
B-18 (241-AN-B Valve Pit)	OPERATE
B-16 (241-AN-B Valve Pit)	Route flow from Nozzle R-14 to Valve B-15, Block flow to Nozzle R-15
B-15 (241-AN-B Valve Pit)	Route flow from Valve B-16 to Valve B-13, Block flow to Nozzle R-16
B-14 (241-AN-B Valve Pit)	CLOSED
B-13 (241-AN-B Valve Pit)	Route flow from Valve B-15 to Nozzle R-2, Block flow to Nozzle R-19
Continue with AN Common Valving Instructions	

TK-104-AN TO TK-104-AP VALVE POSITION CHECKLIST

Valve Description	Valve Position
04A (AN-04A Central Pit)	Route flow from pump to Nozzle A, Block flow to Nozzle G
A-18 (241-AN-A Valve Pit)	OPERATE
A-16 (241-AN-A Valve Pit)	Route flow from Nozzle L-15 to Valve A-15, Block flow to Nozzle L-14
A-15 (241-AN-A Valve Pit)	Route flow from Valve A-16 to Valve A-13, Block flow to Nozzle L-16
A-14 (241-AN-A Valve Pit)	CLOSED
A-13 (241-AN-A Valve Pit)	Route flow from Valve A-15 to Nozzle L-19, Block flow to Nozzle L-1
B-18 (241-AN-B Valve Pit)	OPERATE
B-16 (241-AN-B Valve Pit)	Route flow from Nozzle R-14 to Nozzle R-15, Block flow to Valve B-15
B-15 (241-AN-B Valve Pit)	Route flow from Valve B-16 to Nozzle R-16, Block flow to Valve B-13
B-14 (241-AN-B Valve Pit)	CLOSED
B-13 (241-AN-B Valve Pit)	Route flow from Nozzle R-19 to Nozzle R-2, Block flow to Valve B-15
Continue with AN Common Valving Instructions	

TK-105-AN TO TK-104-AP VALVE POSITION CHECKLIST

Valve Description	Valve Position
05A (AN-05A Central Pit)	Route flow from pump to Nozzle A, Block flow to Nozzle G
A-18 (241-AN-A Valve Pit)	OPERATE
A-16 (241-AN-A Valve Pit)	Route flow from Nozzle L-15 to Nozzle L-14, Block flow to Valve A-15
A-15 (241-AN-A Valve Pit)	Route flow from Nozzle L-16 to Valve A-13, Block flow to Valve A-16
A-14 (241-AN-A Valve Pit)	CLOSED
A-13 (241-AN-A Valve Pit)	Route flow from Valve A-15 to Nozzle L-19, Block flow to Nozzle L-1
B-18 (241-AN-B Valve Pit)	OPERATE
B-16 (241-AN-B Valve Pit)	Route flow from Nozzle R-14 to Nozzle R-15, Block flow to Valve B-15
B-15 (241-AN-B Valve Pit)	Route flow from Valve B-16 to Nozzle R-16, Block flow to Valve B-13
B-14 (241-AN-B Valve Pit)	CLOSED
B-13 (241-AN-B Valve Pit)	Route flow from Nozzle R-19 to Nozzle R-2, Block flow to Valve B-15
Continue with AN Common Valving Instructions	

TK-106-AN TO TK-104-AP VALVE POSITION CHECKLIST

Valve Description	Valve Position
06A (AN-06A Central Pit)	Route flow from pump to Nozzle A, Block flow to Nozzle G
A-18 (241-AN-A Valve Pit)	OPERATE
A-16 (241-AN-A Valve Pit)	Route flow from Nozzle L-14 to Valve A-15, Block flow to Nozzle L-15
A-15 (241-AN-A Valve Pit)	Route flow from Valve A-16 to Valve A-13, Block flow to Nozzle L-16
A-14 (241-AN-A Valve Pit)	CLOSED
A-13 (241-AN-A Valve Pit)	Route flow from Valve A-15 to Nozzle L-19, Block flow to Nozzle L-1
B-18 (241-AN-B Valve Pit)	OPERATE
B-16 (241-AN-B Valve Pit)	Route flow from Nozzle R-14 to Nozzle R-15, Block flow to Valve B-15
B-15 (241-AN-B Valve Pit)	Route flow from Valve B-16 to Nozzle R-16, Block flow to Valve B-13
B-14 (241-AN-B Valve Pit)	CLOSED
B-13 (241-AN-B Valve Pit)	Route flow from Nozzle R-19 to Nozzle R-2, Block flow to Valve B-15
Continue with AN Common Valving Instructions	

TK-107-AN TO TK-104-AP VALVE POSITION CHECKLIST

Valve Description	Valve Position
07A (AN-07A Central Pit)	Route flow from pump to Nozzle A, Block flow to Nozzle G
A-18 (241-AN-A Valve Pit)	OPERATE
A-16 (241-AN-A Valve Pit)	Route flow from Nozzle L-14 to Nozzle L-15, Block flow to Valve A-15
A-15 (241-AN-A Valve Pit)	Route flow from Valve A-16 to Nozzle L-16, Block flow to Valve A-13
A-14 (241-AN-A Valve Pit)	CLOSED
A-13 (241-AN-A Valve Pit)	Route flow from Nozzle L-1 to Nozzle L-19, Block flow to Valve A-15
B-18 (241-AN-B Valve Pit)	OPERATE
B-16 (241-AN-B Valve Pit)	Route flow from Nozzle R-14 to Nozzle R-15, Block flow to Valve B-15
B-15 (241-AN-B Valve Pit)	Route flow from Valve B-16 to Nozzle R-16, Block flow to Valve B-13
B-14 (241-AN-B Valve Pit)	CLOSED
B-13 (241-AN-B Valve Pit)	Route flow from Nozzle R-19 to Nozzle R-2, Block flow to Valve B-15
Continue with AN Common Valving Instructions	

AN COMMON VALVING INSTRUCTIONS
CHECKLIST FOR TRANSFERS FROM AN FARM TO TK-104-AP

Valve Designation	Valve Position
14A (241-AW-A Valve Pit)	OPEN
12A (241-AW-A Valve Pit)	OPEN
13A (241-AW-A Valve Pit)	CLOSED
17A (241-AW-A Valve Pit)	OPERATE
V-267-1 (AW-02A Pump Pit)	Route flow from Nozzle J to Nozzle V
V-267-2 (AW-02A Pump Pit)	CLOSED
V-268-1 (AW-02A Pump Pit)	Route flow from Nozzle H to Valve V-268-2
V-268-2 (AW-02A Pump Pit)	CLOSED
02A-2 (AW-02A Pump Pit)	OPERATE
V-609-1	OPEN
V-609-2	OPEN
V-609-3	CLOSED
V-610-1	CLOSED
V-610-2	CLOSED
V-610-3	CLOSED
V-611-1	Route flow from Valve V-613-1 To V-612-1, Block flow to Valve V-611-2
V-611-2	CLOSED
V-612-1	Route flow from Valve V-611-1 to V-614-1, Block flow to Valve V-612-2
V-612-2	CLOSED
V-613-1	Route flow from Valve V-609-2 to V-611-1, Block flow to Valve V-613-2
V-613-2	CLOSED
V-614-1	OPEN
V-615-1	CLOSED
V-616-1	Route flow from Valve V-616-2 to V-618-1, Block flow to Valve V-610-2

V-616-2	CLOSED
V-617-1	Route flow from Valve V-617-2 to V-615-1, Block flow to Valve V-618-1
V-617-2	CLOSED
V-618-1	Block flow to Valve V-616-1
V-618-2	CLOSED
V-FL-1	CLOSED
V-FL-2	CLOSED
V-DR-1	CLOSED
04A (AP-04A Central Pit)	Route flow from Nozzle A to Nozzle E, Block flow to pump

Leak Detection Equipment

101-AN

Type	Location	CBRS Description
LIT-101-AN	TK-101-AN	AN011-2
Manual Tape	TK-101-AN	TK-101-AN Manual Tape
LDE-01A-1 SYS	AN-01A	AN012-1
LDE-VP-AN B S-YS	241-AN-B	AN233-1
LDE-241AN-SN260S-YS	SN-260	AN027-1
LDE-102-18	AZ-02B	AZ055-1
LDE-SN-600	SN-600	AZ198-1
LDE-241-AX-A	241-AX-A	AX177-1
PS-SN-201	SN-201/214	AY188/AY191-1
LDE-241A-A-VP	241-A-A	2R072-1
LDE-241AW-SN220	SN-220	AW068-1
LDE-VP-AW-A	241-AW-A	AW004-1
LDE-241AW-SN267	SN-267 (AW)	AW069-1
LDE-2A-1	AW-02A	AW086-1
LDE-609	SN-609	AP151-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

102-AN

LIT-102-AN	TK-102-AN	AN143-2
Manual Tape	TK-102-AN	TK-102-AN Manual Tape
LDE-02A-1 SYS	AN-02A	AN144-1
LDE-VP-AN B S-YS	241-AN-B	AN233-1
LDE-241AN-SN260S-YS	SN-260	AN027-1
LDE-102-18	AZ-02B	AZ055-1
LDE-SN-600	SN-600	AZ198-1
LDE-241-AX-A	241-AX-A	AX177-1
PS-SN-201	SN-201/214	AY188/AY191-1
LDE-241A-A-VP	241-A-A	2R072-1
LDE-241AW-SN220	SN-220	AW068-1
LDE-VP-AW-A	241-AW-A	AW004-1
LDE-241AW-SN267	SN-267 (AW)	AW069-1
LDE-2A-1	AW-02A	AW086-1
LDE-609	SN-609	AP151-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

103-AN

Type	Location	CBRS Description
LIT-103-AN	TK-103-AN	AN165-2
Manual Tape	TK-103-AN	TK-103-AN Manual Tape
LDE-03A-1 SYS	AN-03A	AN166-1
LDE-VP-AN B S-YS	241-AN-B	AN233-1
LDE-241AN-SN260S-YS	SN-260	AN027-1
LDE-102-18	AZ-02B	AZ055-1
LDE-SN-600	SN-600	AZ198-1
LDE-241-AX-A	241-AX-A	AX177-1
PS-SN-201	SN-201/214	AY188/AY191-1
LDE-241A-A-VP	241-A-A	2R072-1
LDE-241AW-SN220	SN-220	AW068-1
LDE-VP-AW-A	241-AW-A	AW004-1
LDE-241AW-SN267	SN-267 (AW)	AW069-1
LDE-2A-1	AW-02A	AW086-1
LDE-609	SN-609	AP151-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

104-AN

LIT-104-AN	TK-104-AN	AN065-2
Manual Tape	TK-104-AN	TK-104-AN Manual Tape
LDE-04A-1 SYS	AN-04A	AN066-1
LDE-VP-AN A S-YS	241-AN-A	AN020-1
LDE-241AN-SN2-68	SN-268 (AN)	AN028-1
LDE-VP-AN B S-YS	241-AN-B	AN233-1
LDE-241AN-SN260S-YS	SN-260	AN027-1
LDE-102-18	AZ-02B	AZ055-1
LDE-SN-600	SN-600	AZ198-1
LDE-241-AX-A	241-AX-A	AX177-1
PS-SN-201	SN-201/214	AY188/AY191-1
LDE-241A-A-VP	241-A-A	2R072-1
LDE-241AW-SN220	SN-220	AW068-1
LDE-VP-AW-A	241-AW-A	AW004-1
LDE-241AW-SN267	SN-267 (AW)	AW069-1
LDE-2A-1	AW-02A	AW086-1
LDE-609	SN-609	AP151-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

105-AN

Type	Location	CBRS Description
LIT-105-AN	TK-105-AN	AN179-2
Manual Tape	TK-105-AN	TK-105-AN Manual Tape
LDE-05A-1 SYS	AN-05A	AN182-1
LDE-VP-AN A S-YS	241-AN-A	AN020-1
LDE-241AN-SN2-68	SN-268 (AN)	AN028-1
LDE-VP-AN B S-YS	241-AN-B	AN233-1
LDE-241AN-SN260S-YS	SN-260	AN027-1
LDE-102-18	AZ-02B	AZ055-1
LDE-SN-600	SN-600	AZ198-1
LDE-241-AX-A	241-AX-A	AX177-1
PS-SN-201	SN-201/214	AY188/AY191-1
LDE-241A-A-VP	241-A-A	2R072-1
LDE-241AW-SN220	SN-220	AW068-1
LDE-VP-AW-A	241-AW-A	AW004-1
LDE-241AW-SN267	SN-267 (AW)	AW069-1
LDE-2A-1	AW-02A	AW086-1
LDE-609	SN-609	AP151-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

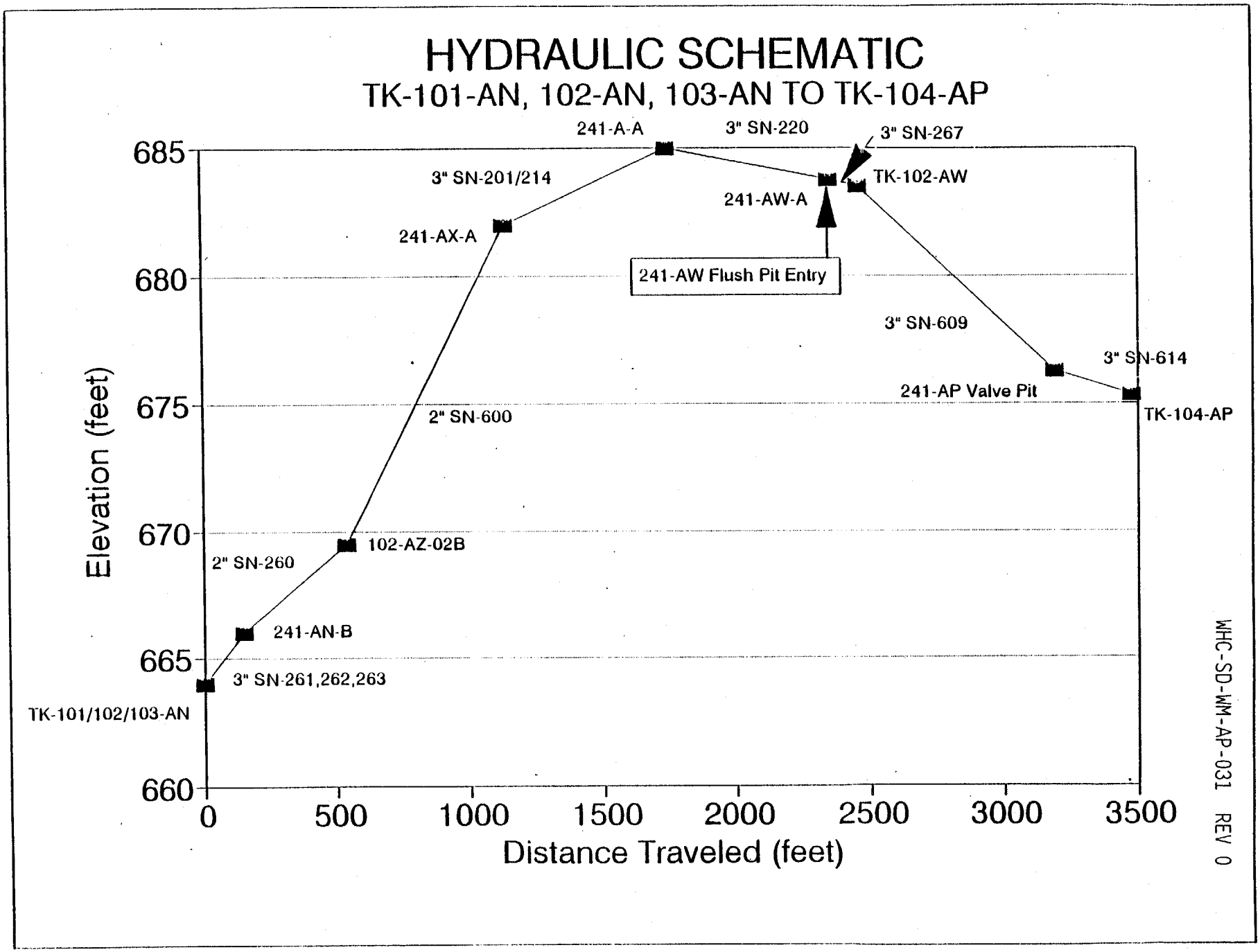
106-AN

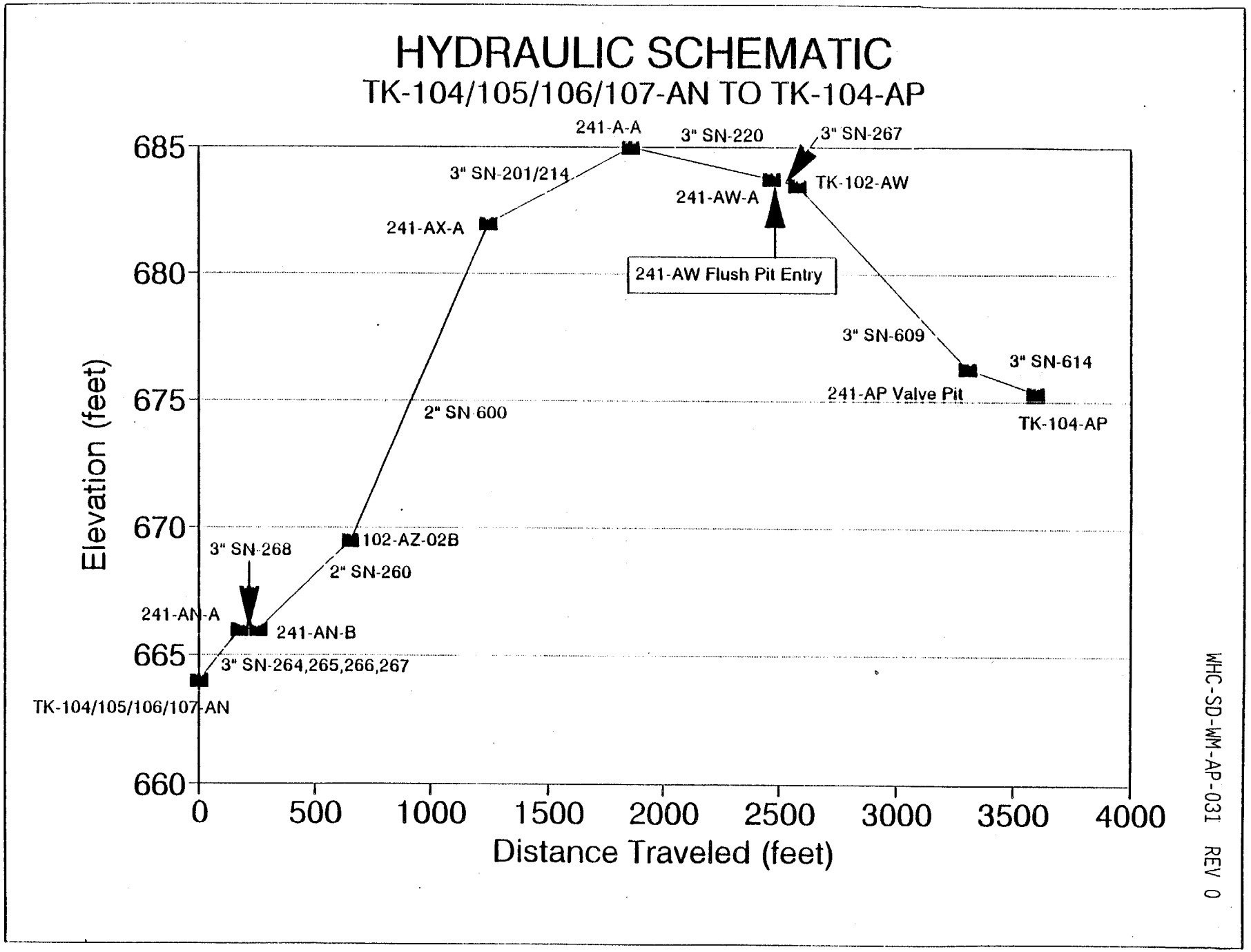
LIT-106-AN	TK-106-AN	AN200-2
Manual Tape	TK-106-AN	TK-106-AN Manual Tape
LDE-06A-1 SYS	AN-06A	AN204-1
LDE-VP-AN A S-YS	241-AN-A	AN020-1
LDE-241AN-SN2-68	SN-268 (AN)	AN028-1
LDE-VP-AN B S-YS	241-AN-B	AN233-1
LDE-241AN-SN260S-YS	SN-260	AN027-1
LDE-102-18	AZ-02B	AZ055-1
LDE-SN-600	SN-600	AZ198-1
LDE-241-AX-A	241-AX-A	AX177-1
PS-SN-201	SN-201/214	AY188/AY191-1
LDE-241A-A-VP	241-A-A	2R072-1
LDE-241AW-SN220	SN-220	AW068-1
LDE-VP-AW-A	241-AW-A	AW004-1
LDE-241AW-SN267	SN-267 (AW)	AW069-1
LDE-2A-1	AW-02A	AW086-1
LDE-609	SN-609	AP151-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

107-AN

Type	Location	CBRS Description
LIT-107-AN	TK-107-AN	AN219-2
Manual Tape	TK-107-AN	TK-107-AN Manual Tape
LDE-07A-A SYS	AN-07A	AN220-1
LDE-VP-AN A S-YS	241-AN-A	AN020-1
LDE-241AN-SN2-68	SN-268 (AN)	AN028-1
LDE-VP-AN B S-YS	241-AN-B	AN233-1
LDE-241AN-SN260S-YS	SN-260	AN027-1
LDE-102-18	AZ-02B	AZ055-1
LDE-SN-600	SN-600	AZ198-1
LDE-241-AX-A	241-AX-A	AX177-1
PS-SN-201	SN-201/214	AY188/AY191-1
LDE-241A-A-VP	241-A-A	2R072-1
LDE-241AW-SN220	SN-220	AW068-1
LDE-VP-AW-A	241-AW-A	AW004-1
LDE-241AW-SN267	SN-267 (AW)	AW069-1
LDE-2A-1	AW-02A	AW086-1
LDE-609	SN-609	AP151-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

Hydraulic Diagrams, AN Farm


HYDRAULIC SCHEMATIC
TK-101-AN, 102-AN, 103-AN TO TK-104-AP
241-A-A
3" SN-220
3" SN-267
3" SN-201/214
TK-102-AW
241-AW-A
241-AX-A
241-AW Flush Pit Entry
3" SN-609
3" SN-614
241-AP Valve Pit
TK-104-AP
2" SN-600
102-AZ-02B
2" SN-260
241-AN-B
3" SN-261,262,263
TK-101/102/103-AN
685
680
675
670
665
660
0
500
1000
1500
2000
2500
3000
3500
Elevation (feet)
Distance Traveled (feet)


HYDRAULIC SCHEMATIC
TK-104/105/106/107-AN TO TK-104-AP
Elevation (feet)
685
680
675
670
665
660
0
500
1000
1500
2000
2500
3000
3500
4000
Distance Traveled (feet)
241-A-A
3" SN-220
3" SN-267
3" SN-201/214
TK-102-AW
241-AW-A
241-AX-A
241-AW Flush Pit Entry
3" SN-609
3" SN-614
241-AP Valve Pit
TK-104-AP
2" SN-600
102-AZ-02B
3" SN-268
2" SN-260
241-AN-A
241-AN-B
3" SN-264,265,266,267
TK-104/105/106/107-AN

APPENDIX B: TRANSFER DATA, AW FARM

Transfer Routes

TK-101-AW

Route: Transfer Pump (01A Pit) to SN-261
SN-261 to 241-AW-A Valve Pit
SN-267 from 241-AW-A Valve Pit to TK-102-AW
SN-609 from TK-102-AW to 241-AP Valve Pit
SN-614 from 241-AP Valve Pit to TK-104-AP

Jumpers: Nozzle L-16 to Nozzle L-1 in AW-A Pit
Nozzle J to Nozzle V in TK-102-AW
Nozzle 14 to Nozzle 20 in 241-AP Valve Pit

TK-102-AW

Route: Transfer Pump (02A Pit) to SN-609
SN-609 to 241-AP Valve Pit
SN-614 from 241-AP Valve Pit to TK-104-AP

Jumpers: Nozzle 14 to Nozzle 20 in 241-AP Valve Pit

TK-103-AW

Route: Transfer Pump (03A Pit) to SN-263
SN-263 to 241-AW-A Valve Pit
SN-267 from 241-AW-A Valve Pit to TK-102-AW
SN-609 from TK-102-AW to 241-AP Valve Pit
SN-614 from 241-AP Valve Pit to TK-104-AP

Jumpers: Nozzle L-14 to Nozzle L-1 in AW-A Pit
Nozzle J to Nozzle V in TK-102-AW
Nozzle 14 to Nozzle 20 in 241-AP Valve Pit

TK-104-AW

Route: Transfer Pump (04A Pit) to SN-264
SN-264 to 241-AW-B Valve Pit
SN-268 from 241-AW-B Valve Pit to TK-102-AW
SN-610 from TK-102-AW to 241-AP Valve Pit
SN-614 from 241-AP Valve Pit to TK-104-AP

Jumpers: Nozzle R-14 to Nozzle R-1 in AW-B Pit
Nozzle H to Nozzle U in TK-102-AW
Nozzle 13 to Nozzle 20 in 241-AP Valve Pit

TK-105-AW

Route: Transfer Pump (05A Pit) to SN-265
SN-265 to 241-AW-A Valve Pit
SN-267 from 241-AW-A Valve Pit to TK-102-AW
SN-609 from TK-102-AW to 241-AP Valve Pit
SN-614 from 241-AP Valve Pit to TK-104-AP

Jumpers: Nozzle L-15 to Nozzle L-1 in AW-A Pit
Nozzle J to Nozzle V in TK-102-AW
Nozzle 14 to Nozzle 20 in 241-AP Valve Pit

TK-106-AW

Route: Transfer Pump (06A Pit) to SN-266
SN-266 to 241-AW-B Valve Pit
SN-268 from 241-AW-B Valve Pit to TK-102-AW
SN-610 from TK-102-AW to 241-AP Valve Pit
SN-614 from 241-AP Valve Pit to TK-104-AP

Jumpers: Nozzle R-15 to Nozzle R-1 in AW-B Pit
Nozzle H to Nozzle U in TK-102-AW
Nozzle 13 to Nozzle 20 in 241-AP Valve Pit

Valve Checklists

TK-101-AW TO TK-104-AP VALVE POSITION CHECKLIST

Valve Description	Valve Position
01A (AW-01A Central Pit)	Route flow from pump to Nozzle A, Block Flow to Nozzle G
12A (241-AW-A Valve Pit)	OPEN
13A (241-AW-A Valve Pit)	CLOSED
14A (241-AW-A Valve Pit)	OPEN
17A (241-AW-A Valve Pit)	OPERATE
V267-1 (102-AW-02A)	Route flow from Nozzle J to Nozzle V
02A-2 (102-AW-02A Pit)	OPERATE
V267-2 (102-AW-02A)	CLOSED
Continue with AW Common Valving Instructions	

TK-102-AW TO TK-104-AP VALVE POSITION CHECKLIST

Valve Description	Valve Position
Flex Jumper	Install between pump and Nozzle V
V-267-1 (102-AW-02A Pit)	Block flow to Nozzle V
V-267-2 (102-AW-02A Pit)	CLOSED
02A-2 (AW-02A Pump Pit)	OPERATE

TK-103-AW TO TK-104-AP VALVE POSITION CHECKLIST

Valve Description	Valve Position
03A (AW-03A Central Pit)	Route flow from pump to Nozzle A, Block flow to Nozzle G
12A (241-AW-A Valve Pit)	OPEN
13A (241-AW-A Valve Pit)	CLOSED
14A (241-AW-A Valve Pit)	OPEN
17A (241-AW-A Valve Pit)	OPERATE
02A-2 (102-AW-02A Pit)	OPERATE
V267-1 (102-AW-02A)	Route flow from Nozzle J to Nozzle V
V267-2 (102-AW-02A)	CLOSED
Continue with AW Common Valving Instructions	

TK-104-AW TO TK-104-AP VALVE POSITION CHECKLIST

Valve Description	Valve Position
04A (AW-04A Central Pit)	Route flow from pump to Nozzle A, Block flow to Nozzle G
12B (241-AW-B Valve Pit)	OPEN
13B (241-AW-B Valve Pit)	CLOSED
14B (241-AW-B Valve Pit)	OPEN
17B (241-AW-B Valve Pit)	OPERATE
V268-1 (102-AW-02A Valve Pit)	Route flow from Nozzle H to Nozzle U
V268-2 (102-AW-02A Valve Pit)	CLOSED
02A-2 (102-AW-02A Pit)	OPERATE
V-609-1 (241-AP Valve Pit)	CLOSED
V-609-2 (241-AP Valve Pit)	OPEN
V-609-3 (241-AP Valve Pit)	OPEN
V-610-1 (241-AP Valve Pit)	OPEN
V-610-2 (241-AP Valve Pit)	CLOSED
V-610-3 (241-AP Valve Pit)	OPEN
V-611-1 (241-AP Valve Pit)	Route flow from Valve V-613-1 To V-612-1, Block flow to Valve V-611-2
V-611-2 (241-AP Valve Pit)	CLOSED
V-612-1 (241-AP Valve Pit)	Route flow from Valve V-611-1 to V-614-1, Block flow to Valve V-612-2
V-612-2 (241-AP Valve Pit)	CLOSED
V-613-1 (241-AP Valve Pit)	Route flow from Valve V-609-2 to V-611-1, Block flow to Valve V-613-2
V-613-2 (241-AP Valve Pit)	CLOSED
V-614-1 (241-AP Valve Pit)	OPEN
V-615-1 (241-AP Valve Pit)	CLOSED
V-616-1 (241-AP Valve Pit)	Route flow from Valve V-616-2 to V-618-1, Block flow to Valve V-610-2
V-616-2 (241-AP Valve Pit)	CLOSED

V-617-1 (241-AP Valve Pit)	Route flow from Valve V-617-2 to V-615-1, Block flow to Valve V-618-1
V-617-2 (241-AP Valve Pit)	CLOSED
V-618-1 (241-AP Valve Pit)	Route flow from Valve V-616-1 to V-617-1, Block flow to Valve V-618-2
V-618-2 (241-AP Valve Pit)	CLOSED
V-FL-1 (241-AP Valve Pit)	CLOSED
V-FL-2 (241-AP Valve Pit)	CLOSED
V-DR-1 (241-AP Valve Pit)	CLOSED
04A (AP-04A Central Pit)	Route flow from Nozzle A to Nozzle E, Block flow to pump

TK-105-AW TO TK-104-AP VALVE POSITION CHECKLIST

Valve Description	Valve Position
05A (AW-05A Central Pit)	Route flow from pump to Nozzle A, Block flow to Nozzle G
12A (241-AW-A Valve Pit)	OPEN
13A (241-AW-A Valve Pit)	CLOSED
14A (241-AW-A Valve Pit)	OPEN
17A (241-AW-A Valve Pit)	OPERATE
02A-2 (102-AW-02A Pit)	OPERATE
V267-1 (102-AW-02A)	Route flow from Nozzle J to Nozzle V
V267-2 (102-AW-02A)	CLOSED
Continue with AW Common Valving Instructions	

TK-106-AW TO TK-104-AP VALVE POSITION CHECKLIST

Valve Description	Valve Position
06A (AW-06A Central Pit)	Route flow from pump to Nozzle A, Block flow to Nozzle G
12B (241-AW-B Valve Pit)	OPEN
13B (241-AW-B Valve Pit)	CLOSED
14B (241-AW-B Valve Pit)	OPEN
17B (241-AW-B Valve Pit)	OPERATE
02A-2 (102-AW-02A Pit)	OPERATE
V268-1 (102-AW-02A Valve Pit)	Route flow from Nozzle H to Nozzle U
V268-2 (102-AW-02A Valve Pit)	CLOSED
V-609-1 (241-AP Valve Pit)	CLOSED
V-609-2 (241-AP Valve Pit)	OPEN
V-609-3 (241-AP Valve Pit)	OPEN
V-610-1 (241-AP Valve Pit)	OPEN
V-610-2 (241-AP Valve Pit)	CLOSED
V-610-3 (241-AP Valve Pit)	OPEN
V-611-1 (241-AP Valve Pit)	Route flow from Valve V-613-1 To V-612-1, Block flow to Valve V-611-2
V-611-2 (241-AP Valve Pit)	CLOSED
V-612-1 (241-AP Valve Pit)	Route flow from Valve V-611-1 to V-614-1, Block flow to Valve V-612-2
V-612-2 (241-AP Valve Pit)	CLOSED
V-613-1 (241-AP Valve Pit)	Route flow from Valve V-609-2 to V-611-1, Block flow to Valve V-613-2
V-613-2 (241-AP Valve Pit)	CLOSED
V-614-1 (241-AP Valve Pit)	OPEN
V-615-1 (241-AP Valve Pit)	CLOSED
V-616-1 (241-AP Valve Pit)	Route flow from Valve V-616-2 to V-618-1, Block flow to Valve V-610-2
V-616-2 (241-AP Valve Pit)	CLOSED

V-617-1 (241-AP Valve Pit)	Route flow from Valve V-617-2 to V-615-1, Block flow to Valve V-618-1
V-617-2 (241-AP Valve Pit)	CLOSED
V-618-1 (241-AP Valve Pit)	Route flow from Valve V-616-1 to V-617-1, Block flow to Valve V-618-2
V-618-2 (241-AP Valve Pit)	CLOSED
V-FL-1 (241-AP Valve Pit)	CLOSED
V-FL-2 (241-AP Valve Pit)	CLOSED
V-DR-1 (241-AP Valve Pit)	CLOSED
04A (AP-04A Central Pit)	Route flow from Nozzle A to Nozzle E, Block flow to pump

AW COMMON VALVING INSTRUCTIONS
CHECKLIST FOR TRANSFERS FROM AW-101, -102, -103, -105 TO TK-104-AP

Valve Designation	Valve Position
V-609-1 (241-AP Valve Pit)	OPEN
V-609-2 (241-AP Valve Pit)	OPEN
V-609-3 (241-AP Valve Pit)	CLOSED
V-610-1 (241-AP Valve Pit)	CLOSED
V-610-2 (241-AP Valve Pit)	CLOSED
V-610-3 (241-AP Valve Pit)	CLOSED
V-611-1 (241-AP Valve Pit)	Route flow from Valve V-613-1 To V-612-1, Block flow to Valve V-611-2
V-611-2 (241-AP Valve Pit)	CLOSED
V-612-1 (241-AP Valve Pit)	Route flow from Valve V-611-1 to V-614-1, Block flow to Valve V-612-2
V-612-2 (241-AP Valve Pit)	CLOSED
V-613-1 (241-AP Valve Pit)	Route flow from Valve V-609-2 to V-611-1, Block flow to Valve V-613-2
V-613-2 (241-AP Valve Pit)	CLOSED
V-614-1 (241-AP Valve Pit)	OPEN
V-615-1 (241-AP Valve Pit)	CLOSED
V-616-1 (241-AP Valve Pit)	Route flow from Valve V-616-2 to V-618-1, Block flow to Valve V-610-2
V-616-2 (241-AP Valve Pit)	CLOSED
V-617-1 (241-AP Valve Pit)	Route flow from Valve V-617-2 to V-615-1, Block flow to Valve V-618-1
V-617-2 (241-AP Valve Pit)	CLOSED
V-618-1 (241-AP Valve Pit)	Block flow to Valve V-616-1
V-618-2 (241-AP Valve Pit)	CLOSED
V-FL-1 (241-AP Valve Pit)	CLOSED
V-FL-2 (241-AP Valve Pit)	CLOSED
V-DR-1 (241-AP Valve Pit)	CLOSED
04A (AP-04A Central Pit)	Route flow from Nozzle A to Nozzle E, Block flow to pump

Leak Detection Equipment

101-AW

Type	Location	CBRS Description
LIT-101-1	TK-101-AW	AW062-2
Manual Tape	TK-101-AW	TK-101-AW Manual Tape
LDE-1A-1	AW-01A	AW063-1
LDE-VP-AW-A	241-AW-A	AW004-1
LDE-241AW-SN267	SN-267 (AW)	AW069-1
LDE-2A-1	AW-02A	AW086-1
LDE-609	SN-609	AP151-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

102-AW

LIT-102-1	TK-102-AW	AW088-2
Manual Tape	TK-102-AW	TK-102-AW Manual Tape
LDE-2A-1	AW-02A	AW086-1
LDE-609	SN-609	AP151-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

103-AW

LIT-103-1	TK-103-AW	AW094-2
Manual Tape	TK-103-AW	TK-103-AW Manual Tape
LDE-3A-1	AW-03A	AW096-1
LDE-VP-AW-A	241-AW-A	AW004-1
LDE-241AW-SN267	SN-267 (AW)	AW069-1
LDE-2A-1	AW-02A	AW086-1
LDE-609	SN-609	AP151-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

104-AW

Type	Location	CBRS Description
LIT-104-1	TK-104-AW	AW095-2
Manual Tape	TK-104-AW	TK-104-AW Manual Tape
LDE-4A-1	AW-04A	AW097-1
LDE-VP-AW-B	241-AW-B	AW005-1
LDE-241AW-SN268	SN-268 (AW)	AW070-1
LDE-2A-1	AW-02A	AW086-1
LDE-609	SN-609	AP151-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

105-AW

LIT	TK-105-AW	AW117-2
Manual Tape	TK-105-AW	TK-105-AW Manual Tape
LDE	AW-05A	AW119-1
LDE-VP-AW-A	241-AW-A	AW004-1
LDE-241AW-SN267	SN-267 (AW)	AW069-1
LDE-2A-1	AW-02A	AW086-1
LDE-609	SN-609	AP151-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

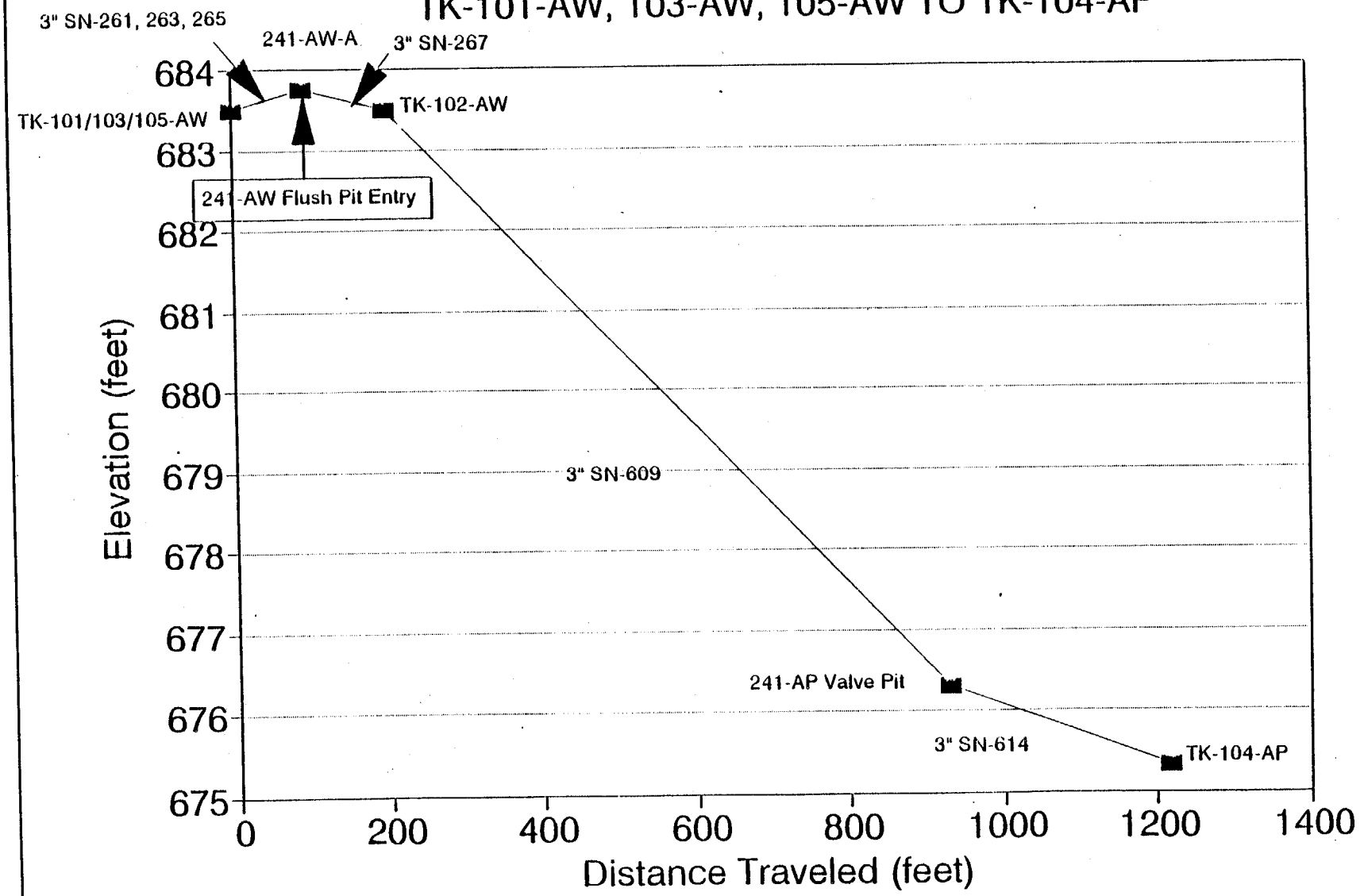
106-AW

LIT	TK-106-AW	AW118-2
Manual Tape	TK-106-AW	TK-106-AW Manual Tape
LDE	AW-06A	AW120-1
LDE-VP-AW-B	241-AW-B	AW005-1
LDE-241AW-SN268	SN-268 (AW)	AW070-1
LDE-2A-1	AW-02A	AW086-1
LDE-609	SN-609	AP151-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

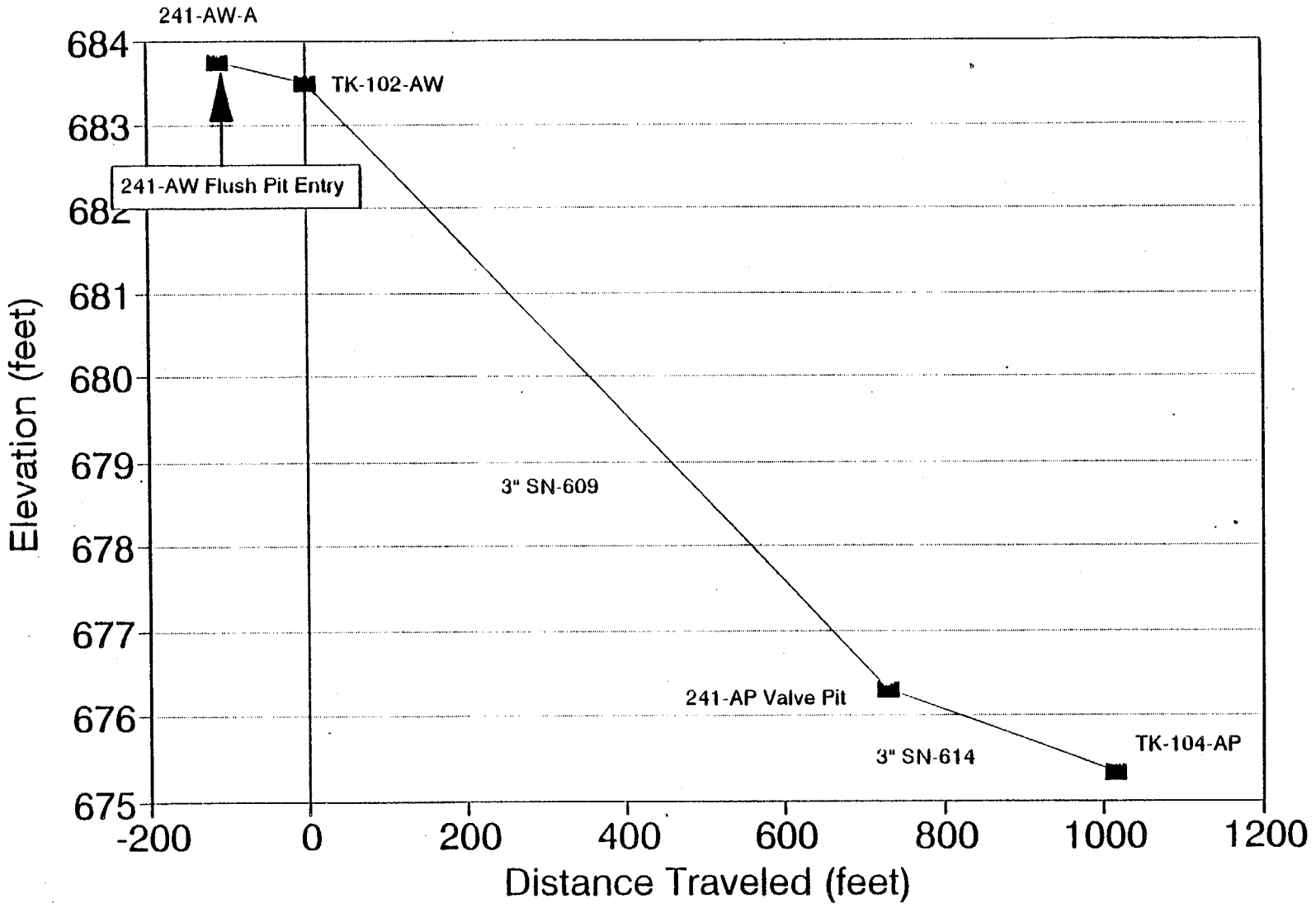
Hydraulic Diagrams, AW Farm

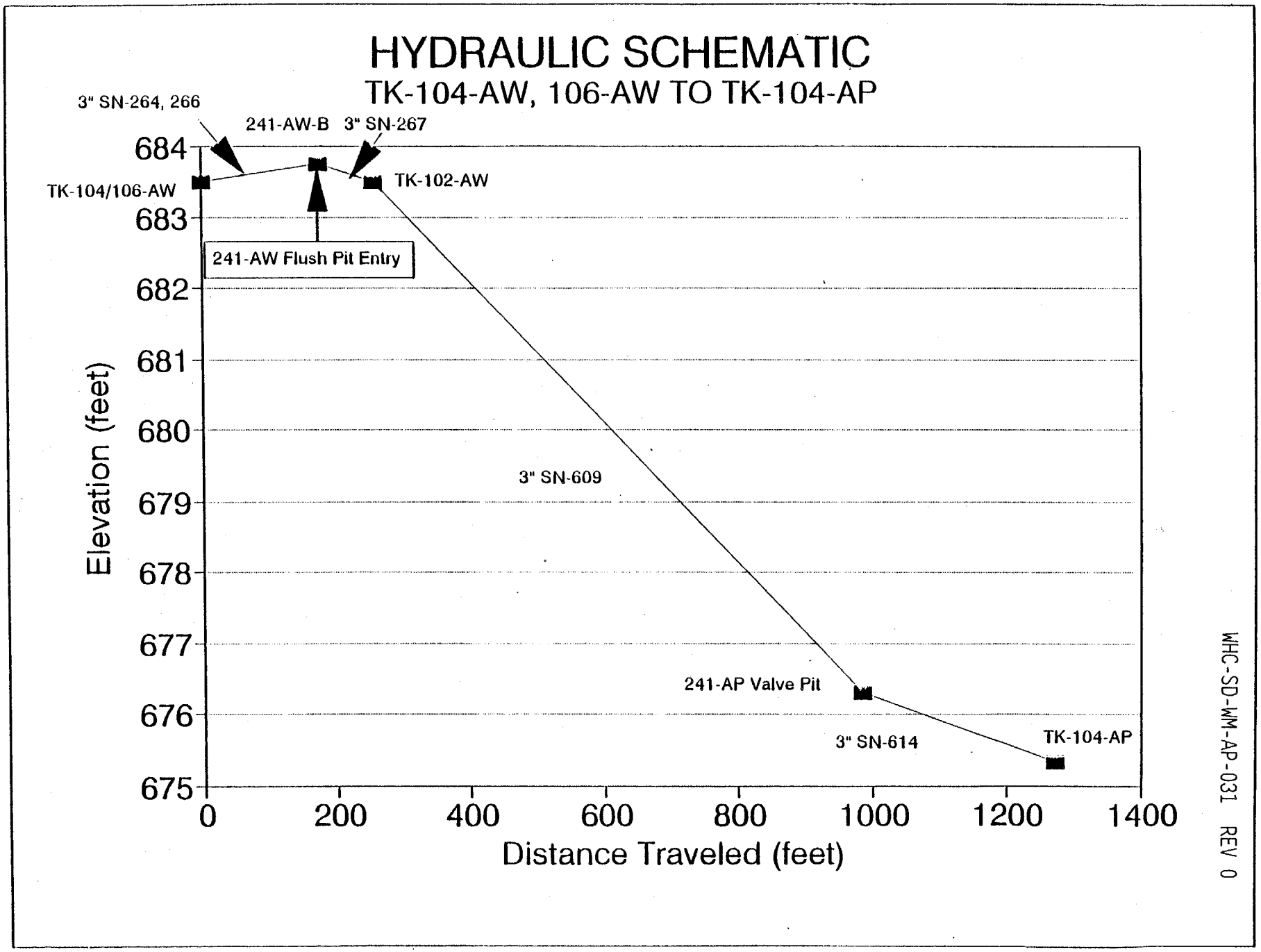
HYDRAULIC SCHEMATIC

TK-101-AW, 103-AW, 105-AW TO TK-104-AP



HYDRAULIC SCHEMATIC
TK-102-AW TO TK-104-AP




HYDRAULIC SCHEMATIC
TK-104-AW, 106-AW TO TK-104-AP
3" SN-264, 266
241-AW-B
3" SN-267
TK-104/106-AW
TK-102-AW
241-AW Flush Pit Entry
3" SN-609
241-AP Valve Pit
3" SN-614
TK-104-AP
Elevation (feet)
684
683
682
681
680
679
678
677
676
675
0
200
400
600
800
1000
1200
1400
Distance Traveled (feet)

APPENDIX C: TRANSFER DATA, AP FARM

Transfer Routes

TK-101-AP

Route: Transfer Pump (01A Pit) to SN-611
SN-611 to 241-AP Valve Pit
SN-614 from 241-AP Valve Pit to TK-104-AP

Jumpers: Nozzle 18 to Nozzle 20 in 241-AP Valve Pit

TK-102-AP

Route: Transfer Pump (02A Pit) to SN-612
SN-612 to 241-AP Valve Pit
SN-614 from 241-AP Valve Pit to TK-104-AP

Jumpers: Nozzle 19 to Nozzle 20 in 241-AP Valve Pit

TK-103-AP

Route: Transfer Pump (03A Pit) to SN-613
SN-613 to 241-AP Valve Pit
SN-614 from 241-AP Valve Pit to TK-104-AP

Jumpers: Nozzle 17 to Nozzle 20 in 241-AP Valve Pit

TK-105-AP

Route: Transfer Pump (05A Pit) to SN-615
SN-615 to 241-AP Valve Pit
SN-614 from 241-AP Valve Pit to TK-104-AP

Jumpers: Nozzle 24 to Nozzle 20 in 241-AP Valve Pit

TK-106-AP

Route: Transfer Pump (06A Pit) to SN-616
SN-616 to 241-AP Valve Pit
SN-614 from 241-AP Valve Pit to TK-104-AP

Jumpers: Nozzle 21 to Nozzle 20 in 241-AP Valve Pit

TK-107-AP

Route: Transfer Pump (07A Pit) to SN-617
SN-617 to 241-AP Valve Pit
SN-614 from 241-AP Valve Pit to TK-104-AP

Jumpers: Nozzle 23 to Nozzle 20 in 241-AP Valve Pit

TK-108-AP

Route: Transfer Pump (08A Pit) to SN-618
SN-618 to 241-AP Valve Pit
SN-614 from 241-AP Valve Pit to TK-104-AP

Jumpers: Nozzle 22 to Nozzle 20 in 241-AP Valve Pit

Valve Checklists

TK-101-AP TO TK-104-AP VALVE POSITION CHECKLIST

Valve Designation (241-AP)	Valve Position
01A (AP-01A Central Pit)	Route flow from Pump to Nozzle A, Block flow to Nozzle E
V-609-1	CLOSED
V-609-2	CLOSED
V-609-3	CLOSED
V-610-1	CLOSED
V-610-2	CLOSED
V-610-3	CLOSED
V-611-1	Route flow from Valve V-611-2 To V-612-1, Block flow to Valve V-613-1
V-611-2	OPEN
V-612-1	Route flow from Valve V-611-1 to V-614-1, Block flow to Valve V-612-2
V-612-2	CLOSED
V-613-1	Route flow from Valve V-613-2 to V-609-2, Block flow to Valve V-611-1
V-613-2	CLOSED
V-614-1	OPEN
V-615-1	CLOSED
V-616-1	Route flow from Valve V-616-2 to V-618-1, Block flow to Valve V-610-2
V-616-2	CLOSED
V-617-1	Route flow from Valve V-617-2 to V-615-1, Block flow to Valve V-618-1
V-617-2	CLOSED
V-618-1	Route flow from Valve V-616-1 to V-617-1, Block flow to Valve V-618-2
V-618-2	CLOSED
V-FL-1	CLOSED
V-FL-2	CLOSED
V-DR-1	CLOSED
04A (AP-04A Central Pit)	Route flow from Nozzle A to Nozzle E, Block flow to pump

TK-102-AP TO TK-104-AP VALVE POSITION CHECKLIST

Valve Designation (241-AP)	Valve Position
02A (AP-02A Central Pit)	Route flow from Pump to Nozzle A, Block flow to Nozzle E
V-609-1	CLOSED
V-609-2	CLOSED
V-609-3	CLOSED
V-610-1	CLOSED
V-610-2	CLOSED
V-610-3	CLOSED
V-611-1	Route flow from Valve V-611-2 To V-613-1, Block flow to Valve V-612-1
V-611-2	CLOSED
V-612-1	Route flow from Valve V-612-2 to V-614-1, Block flow to Valve V-611-1
V-612-2	OPEN
V-613-1	Route flow from Valve V-613-2 to V-609-2, Block flow to Valve V-611-1
V-613-2	CLOSED
V-614-1	OPEN
V-615-1	CLOSED
V-616-1	Route flow from Valve V-616-2 to V-618-1, Block flow to Valve V-610-2
V-616-2	CLOSED
V-617-1	Route flow from Valve V-617-2 to V-615-1, Block flow to Valve V-618-1
V-617-2	CLOSED
V-618-1	Route flow from Valve V-616-1 to V-617-1, Block flow to Valve V-618-2
V-618-2	CLOSED
V-FL-1	CLOSED
V-FL-2	CLOSED
V-DR-1	CLOSED
04A (AP-04A Central Pit)	Route flow from Nozzle A to Nozzle E, Block flow to pump

TK-103-AP TO TK-104-AP VALVE POSITION CHECKLIST

Valve Designation (241-AP)	Valve Position
03A (AP-03A Central Pit)	Route flow from Pump to Nozzle A, Block flow to Nozzle E
V-609-1	CLOSED
V-609-2	CLOSED
V-609-3	CLOSED
V-610-1	CLOSED
V-610-2	CLOSED
V-610-3	CLOSED
V-611-1	Route flow from Valve V-613-1 To V-612-1, Block flow to Valve V-611-2
V-611-2	CLOSED
V-612-1	Route flow from Valve V-611-1 to V-614-1, Block flow to Valve V-612-2
V-612-2	CLOSED
V-613-1	Route flow from Valve V-613-2 to V-611-1, Block flow to Valve V-609-2
V-613-2	OPEN
V-614-1	OPEN
V-615-1	CLOSED
V-616-1	Route flow from Valve V-616-2 to V-618-1, Block flow to Valve V-610-2
V-616-2	CLOSED
V-617-1	Route flow from Valve V-617-2 to V-615-1, Block flow to Valve V-618-1
V-617-2	CLOSED
V-618-1	Route flow from Valve V-616-1 to V-617-1, Block flow to Valve V-618-2
V-618-2	CLOSED
V-FL-1	CLOSED
V-FL-2	CLOSED
V-DR-1	CLOSED
04A (AP-04A Central Pit)	Route flow from Nozzle A to Nozzle E, Block flow to Pump

TK-105-AP TO TK-104-AP VALVE POSITION CHECKLIST

Valve Designation (241-AP)	Valve Position
05A (AP-05A Central Pit)	Route flow from Pump to Nozzle A, Block flow to Nozzle E
V-609-1	CLOSED
V-609-2	OPEN
V-609-3	OPEN
V-610-1	CLOSED
V-610-2	OPEN
V-610-3	OPEN
V-611-1	Route flow from Valve V-613-1 To V-612-1, Block flow to Valve V-611-2
V-611-2	CLOSED
V-612-1	Route flow from Valve V-611-1 to V-614-1, Block flow to Valve V-612-2
V-612-2	CLOSED
V-613-1	Route flow from Valve V-609-2 to V-611-1, Block flow to Valve V-613-2
V-613-2	CLOSED
V-614-1	OPEN
V-615-1	OPEN
V-616-1	Route flow from Valve V-618-1 to V-610-2, Block flow to Valve V-616-2
V-616-2	CLOSED
V-617-1	Route flow from Valve V-615-1 to V-618-1, Block flow to Valve V-617-2
V-617-2	CLOSED
V-618-1	Route flow from Valve V-617-1 to V-616-1, Block flow to Valve V-618-2
V-618-2	CLOSED
V-FL-1	CLOSED
V-FL-2	CLOSED
V-DR-1	CLOSED
04A (AP-04A Central Pit)	Route flow from Nozzle A to Nozzle E, Block flow to Pump

TK-106-AP TO TK-104-AP VALVE POSITION CHECKLIST

Valve Designation (241-AP)	Valve Position
06A (AP-06A Central Pit)	Route flow from Pump to Nozzle A, Block flow to Nozzle E
V-609-1	CLOSED
V-609-2	OPEN
V-609-3	OPEN
V-610-1	CLOSED
V-610-2	OPEN
V-610-3	OPEN
V-611-1	Route flow from Valve V-613-1 To V-612-1, Block flow to Valve V-611-2
V-611-2	CLOSED
V-612-1	Route flow from Valve V-611-1 to V-614-1, Block flow to Valve V-612-2
V-612-2	CLOSED
V-613-1	Route flow from Valve V-609-2 to V-611-1, Block flow to Valve V-613-2
V-613-2	CLOSED
V-614-1	OPEN
V-615-1	CLOSED
V-616-1	Route flow from Valve V-616-2 to V-610-2, Block flow to Valve V-618-1
V-616-2	OPEN
V-617-1	Route flow from Valve V-615-1 to V-618-1, Block flow to Valve V-617-2
V-617-2	CLOSED
V-618-1	Route flow from Valve V-617-1 to V-616-1, Block flow to Valve V-618-2
V-618-2	CLOSED
V-FL-1	CLOSED
V-FL-2	CLOSED
V-DR-1	CLOSED
04A (AP-04A Central Pit)	Route flow from Nozzle A to Nozzle E, Block flow to pump

TK-107-AP TO TK-104-AP VALVE POSITION CHECKLIST

Valve Designation (241-AP)	Valve Position
07A (AP-07A Central Pit)	Route flow from pump to Nozzle A, Block flow to Nozzle E
V-609-1	CLOSED
V-609-2	OPEN
V-609-3	OPEN
V-610-1	CLOSED
V-610-2	OPEN
V-610-3	OPEN
V-611-1	Route flow from Valve V-613-1 To V-612-1, Block flow to Valve V-611-2
V-611-2	CLOSED
V-612-1	Route flow from Valve V-611-1 to V-614-1, Block flow to Valve V-612-2
V-612-2	CLOSED
V-613-1	Route flow from Valve V-609-2 to V-611-1, Block flow to Valve V-613-2
V-613-2	CLOSED
V-614-1	OPEN
V-615-1	CLOSED
V-616-1	Route flow from Valve V-618-1 to V-610-2, Block flow to Valve V-616-2
V-616-2	CLOSED
V-617-1	Route flow from Valve V-617-2 to V-618-1, Block flow to Valve V-615-1
V-617-2	OPEN
V-618-1	Route flow from Valve V-617-1 to V-616-1, Block flow to Valve V-618-2
V-618-2	CLOSED
V-FL-1	CLOSED
V-FL-2	CLOSED
V-DR-1	CLOSED
04A (AP-04A Central Pit)	Route flow from Nozzle A to Nozzle E, Block flow to pump

TK-108-AP TO TK-104-AP VALVE POSITION CHECKLIST

Valve Designation (241-AP)	Valve Position
08A (AP-08A Central Pit)	Route flow from pump to Nozzle A, Block flow to Nozzle E
V-609-1	CLOSED
V-609-2	OPEN
V-609-3	OPEN
V-610-1	CLOSED
V-610-2	OPEN
V-610-3	OPEN
V-611-1	Route flow from Valve V-613-1 To V-612-1, Block flow to Valve V-611-2
V-611-2	CLOSED
V-612-1	Route flow from Valve V-611-1 to V-614-1, Block flow to Valve V-612-2
V-612-2	CLOSED
V-613-1	Route flow from Valve V-609-2 to V-611-1, Block flow to Valve V-613-2
V-613-2	CLOSED
V-614-1	OPEN
V-615-1	CLOSED
V-616-1	Route flow from Valve V-618-1 to V-610-2, Block flow to Valve V-616-2
V-616-2	CLOSED
V-617-1	Route flow from Valve V-617-2 to V-615-1, Block flow to Valve V-618-1
V-617-2	CLOSED
V-618-1	Route flow from Valve V-618-2 to V-616-1, Block flow to Valve V-617-1
V-618-2	OPEN
V-FL-1	CLOSED
V-FL-2	CLOSED
V-DR-1	CLOSED
04A (AP-04A Central Pit)	Route flow from Nozzle A to Nozzle E, Block flow to pump

Leak Detection Equipment

101-AP

Type	Location	CBRS Description
LIT-101-1	TK-101-AP	AP102-2
Manual Tape	TK-101-AP	TK-101-AP Manual Tape
LDE-01A-1	AP-01A	AP153-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

102-AP

LIT-102-1	TK-102-AP	AP103-2
Manual Tape	TK-102-AP	TK-102-AP Manual Tape
LDE-02A-1	AP-02A	AP156-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

103-AP

LIT-103-1	TK-103-AP	AP104-2
Manual Tape	TK-103-AP	TK-103-AP Manual Tape
LDE-03A-1	AP-03A	AP159-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

105-AP

LIT-105-1	TK-105-AP	AP106-2
Manual Tape	TK-105-AP	TK-105-AP Manual Tape
LDE-05A-1	AP-05A	AP168-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

106-AP

Type	Location	CBRS Description
LIT-106-1	TK-106-AP	AP107-2
Manual Tape	TK-106-AP	TK-106-AP Manual Tape
LDE-06A-1	AP-06A	AP173-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

107-AP

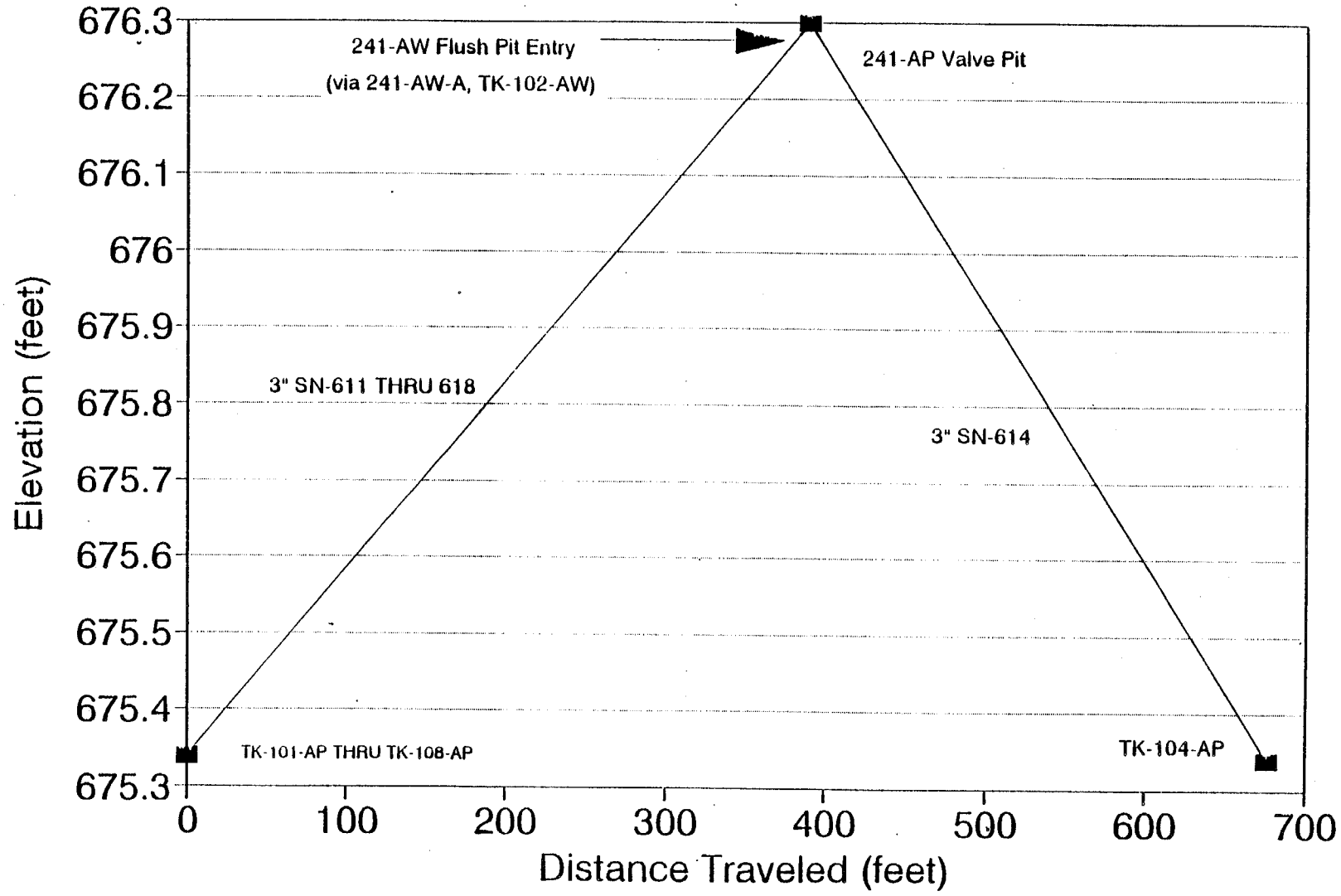
LIT-107-1	TK-107-AP	AP108-2
Manual Tape	TK-107-AP	TK-107-AP Manual Tape
LDE-07A-1	AP-07A	AP176-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

108-AP

LIT-108-1	TK-108-AP	AP109-2
Manual Tape	TK-108-AP	TK-108-AP Manual Tape
LDE-08A-1	AP-08A	AP179-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

Hydraulic Diagram, AP Farm

HYDRAULIC SCHEMATIC
AP FARM TO TK-104-AP



APPENDIX D: TRANSFER DATA, AY FARM

Transfer Routes

TK-101-AY
Route: Transfer Pump (01A Pit) to SL-504
SL-504 to 02A Pit
SL-503 to 02D Pit
Continue with Procedure for transfer from TK-102-AY to TK-104-AP, WTWP-94-0009

Jumpers: Flex jumper from pump to Nozzle U-2 in 01A Pit
Nozzle U-8 to Nozzle U-3 in 02A Pit
Nozzle U-2 to Nozzle U-3 in 02D Pit
Continue with Procedure for transfer from TK-102-AY to TK-104-AP, WTWP-94-0009

TK-102-AY
Route: Follow procedure WTWP-94-0009

Jumpers: Follow procedure WTWP-94-0009

Valve Checklists

TK-101-AY TO TK-104-AP VALVE POSITION CHECKLIST

Valve Description	Valve Position
AY-01D Pit	Jumper from pump to Nozzle U-2
V-02A (AY-02A Pit)	Route flow from Nozzle U-8 to Nozzle U-3, Block Distributor
V-02D (AY-02D Pit)	Route flow from Nozzle U-2 to Nozzle U-3, Block flow to the pump
Continue with the procedure for TK-102-AY to TK-104-AP transfer	

TK-102-AY TO TK-104-AP VALVE POSITION CHECKLIST

Valve Description	Valve Position
V-02A (241-AY-02A Pump Pit)	Route flow from Distributor to Nozzle U-8
V-02D (241-AY-02D Pump Pit)	Route flow from pump to Nozzle U-3
SL-502 Encasement Drain (241-AY-02D Pump Pit)	OPERATE
SN-201/214 Encasement Drain A-21 (241-AX-A Valve Pit)	SEAL LOOP
14A (241-AW-A Valve Pit)	OPEN
12A (241-AW-A Valve Pit)	OPEN
13A (241-AW-A Valve Pit)	CLOSED
SN-220 Encasement Drain A-17 (241-AW-A Valve Pit)	OPERATE
B-5 (241-AW-Flush Pit)	Block flow from valve B-4
B-3 (241-AW Flush Pit)	Block flow from valve B-4
B-1 (241-AW Flush Pit)	CLOSED
B-7 (241-AW Flush Pit)	CLOSED
B-8 (241-AW Flush Pit)	CLOSED
B-9 (241-AW Flush Pit)	CLOSED
B-10 (241-AW Flush Pit)	CLOSED
B-11 (241-AW Flush Pit)	CLOSED
B-12 (241-AW Flush Pit)	CLOSED
B-14 (241-AW Flush Pit)	CLOSED
B-4 (241-AW Flush Pit)	Route flow from valve B-3 to valve B-10
V-267-1 (241-AW-02A Pump Pit)	Route flow from Nozzle J to Nozzle V
V-267-2 (241-AW-02A Pump Pit)	CLOSED
V-268-1 (241-AW-02A Pump Pit)	Route flow from Nozzle H to Valve V-268-2
V-268-2 (241-AW-02A Pump Pit)	CLOSED
SN-267 Encasement Drain 02A-2 (241-AW-02A Pump Pit)	OPERATE
V-609-1	OPEN
V-609-2	OPEN
V-609-3	CLOSED
V-610-1	CLOSED

V-610-2	CLOSED
V-610-3	CLOSED
V-611-1	Route flow from Valve V-613-1 To V-612-1, Block flow to Valve V-611-2
V-611-2	CLOSED
V-612-1	Route flow from Valve V-611-1 to V-614-1, Block flow to Valve V-612-2
V-612-2	CLOSED
V-613-1	Route flow from Valve V-609-2 to V-611-1, Block flow to Valve V-613-2
V-613-2	CLOSED
V-614-1	OPEN
V-615-1	CLOSED
V-616-1	Route flow from Valve V-616-2 to V-618-1, Block flow to Valve V-610-2
V-616-2	CLOSED
V-617-1	Route flow from Valve V-617-2 to V-615-1, Block flow to Valve V-618-1
V-617-2	CLOSED
V-618-1	Block flow to Valve V-616-1
V-618-2	CLOSED
V-FL-1	CLOSED
V-FL-2	CLOSED
V-DR-1	CLOSED
04A (241-AP-04A Pump Pit)	Route flow from Nozzle A to Nozzle E, Block flow to pump
V-4 Seal Loop (241-AP-Valve Pit)	OPERATE

Leak Detection Equipment

101-AY

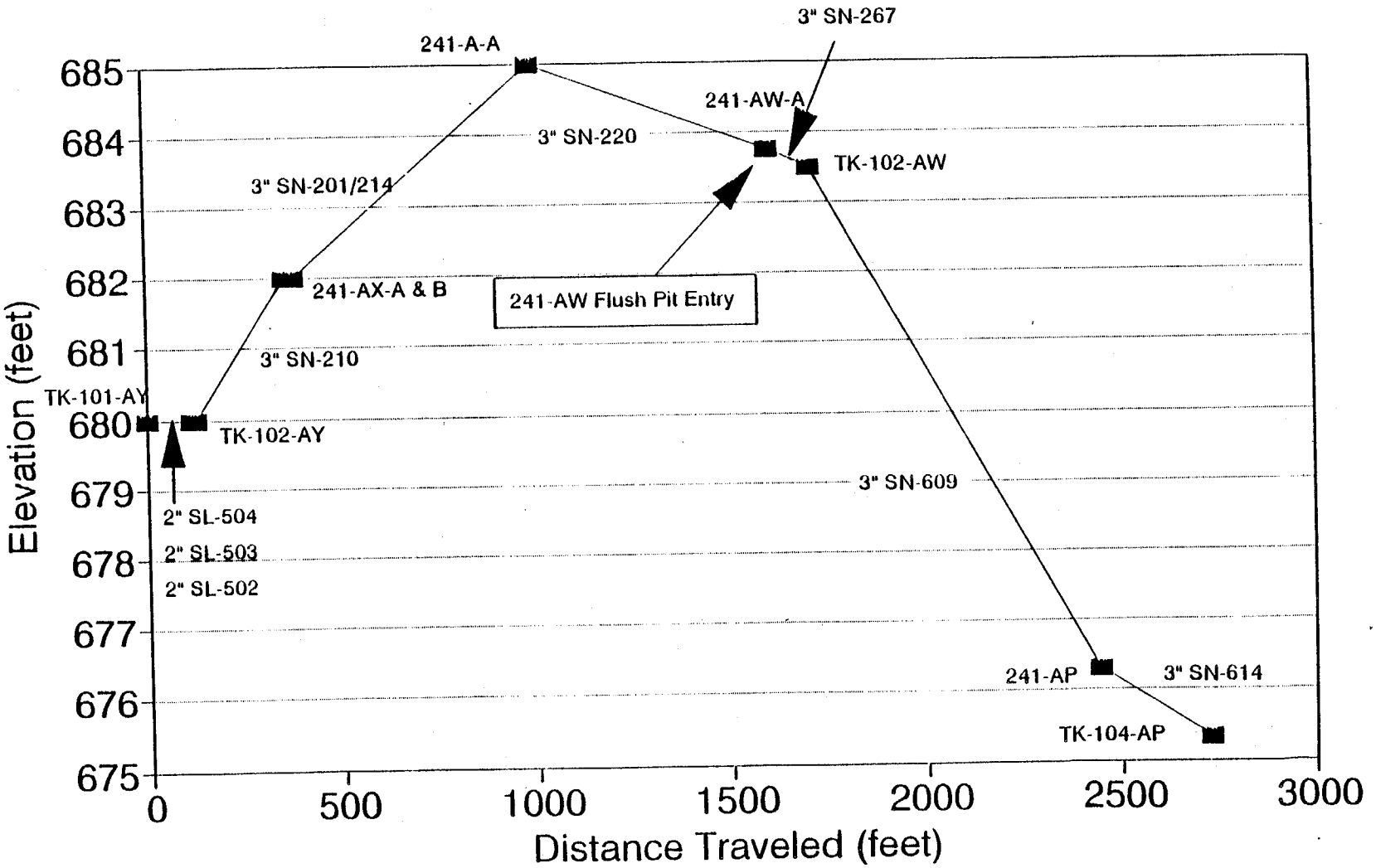
Type	Location	CBRS Description
LIT-101-AY	TK-101-AY	AY085-1
Manual Tape	TK-101-AY	TK-101-AY Manual Tape
LDE-101-20	AY-01D	AY075-1
LDE-SL-504	SL-504	AY036-1
LDE-102-22	AY-02A	AY033-1
LDE-SL-503	SL-503	AY035-1
LDE-102-20	AY-02D	AY027-1
LDE-SL-502	SL-502	AY088-1
LDE-241-AX-B	241-AX-B	AX178-1
LDE-241-AX-A	241-AX-A	AX177-1
PS-SN-214	SN-214/201	AY191/AY188-1
LDE-241-A-A-VP	241-A-A	2R072-1
WFT-350-1	A-350 Catch Tank	AE073-4
LDE-241AW-SN-220	SN-220	AW068-1
LDE-VP-AW-A	241-AW-A	AW004-1
LDE-241AW-SN267	SN-267 (AW)	AW069-1
LDE-2A-1	AW-02A	AW086-1
LDE-609	SN-609	AP151-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

102-AY

LIT-102-AY	TK-102-AY	AY040-1
Manual Tape	TK-102-AY	TK-102-AY Manual Tape
LDE-102-22	AY-02A	AY033-1
LDE-SL-503	SL-503	AY035-1
LDE-102-20	AY-02D	AY027-1
LDE-SL-502	SL-502	AY088-1
LDE-241-AX-B	241-AX-B	AX178-1
LDE-241-AX-A	241-AX-A	AX177-1
PS-SN-214	SN-214/201	AY191/AY188-1
LDE-241-A-A-VP	241-A-A	2R072-1
WFT-350-1	A-350 Catch Tank	AE073-4
LDE-241AW-SN-220	SN-220	AW068-1
LDE-VP-AW-A	241-AW-A	AW004-1
LDE-241AW-SN267	SN-267 (AW)	AW069-1
LDE-2A-1	AW-02A	AW086-1
LDE-609	SN-609	AP151-1
LDE-VP-1	241-AP VP	AP801-1
LDE-04A-1	AP-04A	AP165-1
Manual Tape	TK-104-AP	TK-104-AP
LIT-104-1	TK-104-AP	AP105-2

Hydraulic Diagrams, AY Farm

HYDRAULIC SCHEMATIC
TK-101-AY, TK-102-AY TO TK-104-AP



APPENDIX E: TRANSFER DATA, SY FARM

Transfer Routes

TK-101-SY (to 102-SY)

Route: Transfer Pump (01A Pit) to SN-278
SN-278 from TK-101-SY to 241-SY-B
SN-286 from 241-SY-B to 102-SY-02A Pit

Jumpers: Nozzle R-16 to R-11 in 241-SY-B Valve Pit

TK-102-SY

Route: Transfer Pump (02A Pit) to SN-285
SN-285 from TK-102-SY to 241-SY-A
SN-280 from 241-SY-A to 241-SY-B
V-561 from 241-SY-B to 244-S Catch Station
V-522 from 244-S Catch Station to 241-S-151 Diversion Box
V-503 (4700) from 241-S-151 Diversion Box to 241-UX-154
V-360 from 241-UX-154 to 241-ER-151
V-228 from 241-ER-151 to 241-ER-153
SN-232 from 241-ER-153 to 244A Lift Station
SN-215 from 244A Lift Station to 241-A-A
SN-204 from 241-A-A Valve Pit to 241-A-B Valve Pit
SN-213/200 from 241-A-B Valve Pit to 241-AX-B-Valve Pit
SL-502 from 241-AX-B Valve Pit to TK-102-AY

Jumpers: Nozzle L-11 to Nozzle L-19 in 241-SY-A Valve pit
Nozzle R-19 to R-15 in 241-SY-B Valve Pit
Nozzle 4 to Nozzle 5 in 244-S Catch Station
Nozzle C-1 to Nozzle U-1 in 241-S-151 Diversion Box
Nozzle L-8 to Nozzle L-1 in 241 UX-154 Diversion Box
Vent Valve V-360 in 241-EW-151 Vent Station
Nozzle U-2 to Nozzle U-10 in 241-ER-151 Diversion Box
Nozzle 2 to Nozzle 3 in 241-ER-153 Diversion Box
Nozzle P-3 to Nozzle P-7 in 244-A Lift Station
Nozzle L-16 to Nozzle L-19 in 241-A-A Valve Pit
Nozzle R-19 to Nozzle R-1 in 241-A-B Valve Pit
Nozzle R-1 to Nozzle R-16 in 241-AX-B Valve Pit

TK-103-SY (to 102-SY)

Route: Transfer Pump (03A Pit) to SN-279
SN-279 from TK-103-SY to 241-SY-B
SN-286 from 241-SY-B to 102-SY-02A Pit

Jumpers: Nozzle R-14 to R-11 in 241-SY-B Valve Pit

Valve Checklists

TK-101-SY TO TK-102-SY VALVE POSITION CHECKLIST

Valve Description	Valve Position
101-SY-01A Pit	Install Jumper from pump to Nozzle A
B-15 (241-SY-B Valve Pit)	Route flow from Valve R-16 to Valve B-16, Block flow to Nozzle R-19
B-16 (241-SY-B Valve Pit)	Route flow from Valve B-15 to Nozzle R-11, Block flow to Nozzle R-14
B-25 (241-SY-B Valve Pit)	OPEN
B-26 (241-SY-B Valve Pit)	CLOSED
A-4 (102-SY-02A Pit)	Route flow from Nozzle H to Tank, Block Valve A-3
A-3 (102-SY-02A Pit)	CLOSED
A-5 (102-SY-02A Pit)	OPEN

TK-102-SY TO TK-102-AY VALVE POSITION CHECKLIST

Valve Designation	Valve Position
A-4 (244-S Catch Station)	Route flow from Nozzle 4 to Nozzle 5
DOV SY-102-A (102-SY-02A Pump Pit)	Close by setting FC-SY 102-A to 0%
A-3 (102-SY-02A Pump Pit)	CLOSED
A-1 (102-SY-02A Pump Pit)	Route flow from Valve A-2 to DOV
A-2 (102-SY-02A Pump Pit)	OPEN
A-18 (SY-A Valve Pit)	CLOSED
A-13 (SY-A Valve Pit)	CLOSED
A-25 (SY-A Valve Pit)	Route flow from Nozzle L-11 to Nozzle L-19
B-15 (SY-B Valve Pit)	Route flow from Nozzle R-19 to Nozzle R-15
B-16 (SY-B Valve Pit)	Route flow from Nozzle R-14 to Nozzle R-11, Block flow from Valve B-15
B-25 (SY-B Valve Pit)	CLOSED
B-26 (SY-B Valve Pit)	CLOSED
V-360 (241-EW-151 Vent Station)	CLOSED
MS-MOV-2 (244-A Lift Station)	Route flow from Nozzle P-3 to Nozzle P-7 (Set to "flow through")
B-14 (241-AX-B)	CLOSED
B-13 (241-AX-B)	OPEN
B-15 (241-AX-B)	Route flow from Valve B-13 to Nozzle R-16
Pump Discharge Valve (TK-102-AY 02D Pit)	Route flow from Nozzle U-3 to Nozzle U-2
Distributor Valve (TK-102-AY 02A Pit)	Route flow from Nozzle U-3 to distributor

TK-103-SY TO TK-102-SY VALVE POSITION CHECKLIST

Valve Description	Valve Position
103-SY-03A Pit	Install Jumper from pump to Nozzle A
B-15 (241-SY-B Valve Pit)	Route flow from Valve R-16 to Nozzle R-19, Block flow to Valve B-16
B-16 (241-SY-B Valve Pit)	Route flow from Nozzle R-14 to Nozzle R-11, Block Valve B-15
B-25 (241-SY-B Valve Pit)	OPEN
B-26 (241-SY-B Valve Pit)	CLOSED
A-4 (102-SY-02A Pit)	Route flow from Nozzle H to Tank, Block Valve A-3
A-3 (102-SY-02A Pit)	CLOSED
A-5 (102-SY-02A Pit)	OPEN

Leak Detection Equipment

101-SY

Type	Location	CBRS Description
LIT-101-1	TK-101-SY	SY042-2
Manual Tape	TK-101-SY	TK-101-SY Manual Tape
LDE-01A-A SYS	SY-01A	SY046-1
LDE-02A-1 SYS	SY-02A	SY022-1
LDE-02D-1 SYS	SY-02D	SY041-1
Manual Tape	TK-102-SY	TK-102-SY Manual Tape
LIT-101-1	TK-102-SY	SY089-2

102-SY

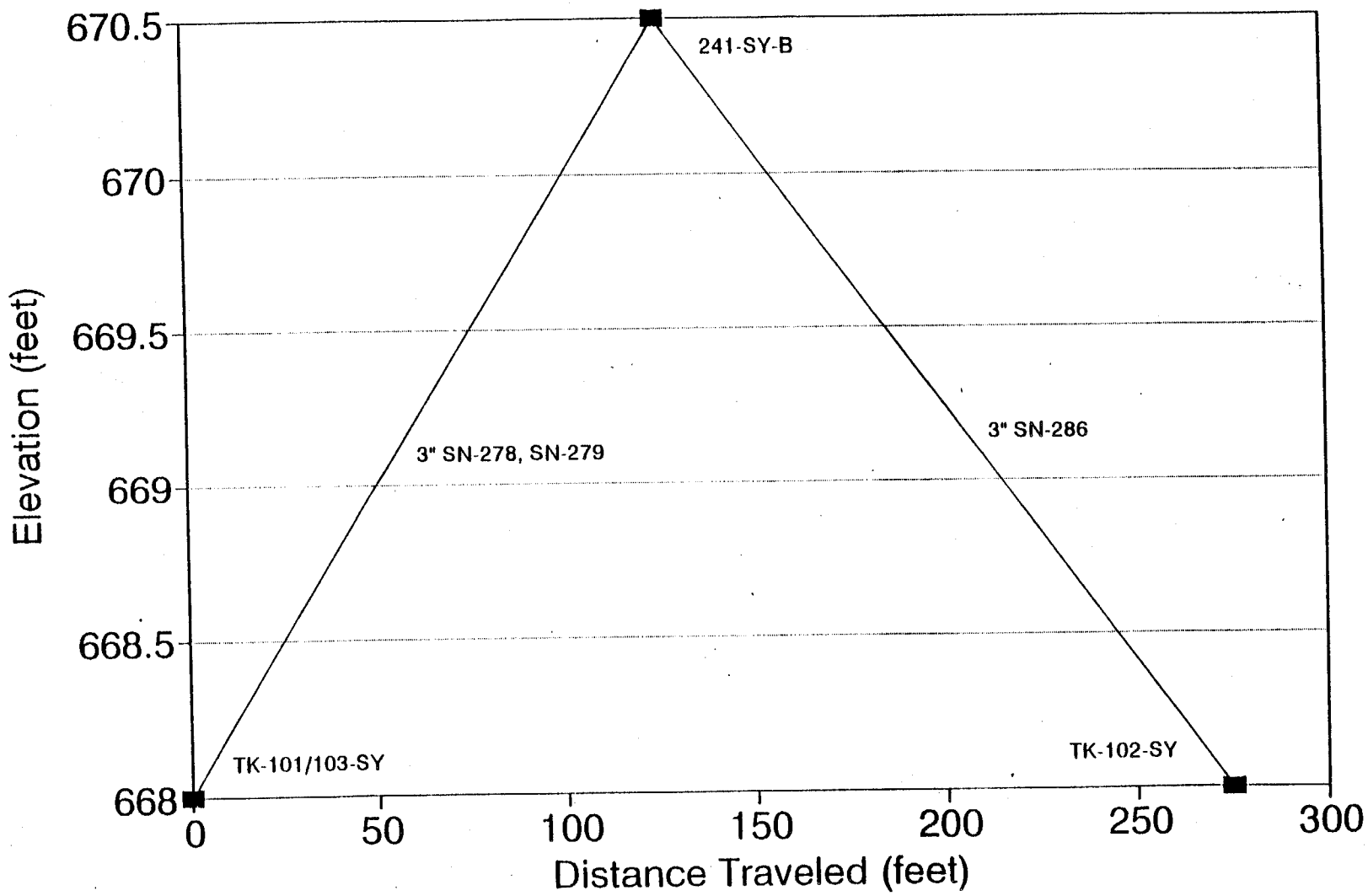
LIT-102-1	TK-102-SY	SY089-2
Manual Tape	TK-102-SY	TK-102-SY Manual Tape
LDE-02A-1 SYS	SY-02A	SY022-1
LDE-02D-1 SYS	SY-02D	SY041-1
LDE-VP-SY-A SYS	241-SY-A	SY036-1
LDE-VP-SY-B SYS	241-SY-B	SY037-1
LDE-V561-SYS	V-561	4S003-1
WFR	244-S Catch Station	SE008-1
LDE-V522-SYS	V-522	4S004-1
LDE-DB S-151 SY-S	241-S-151	SS001-1
LDE-DB UX-154 SY-S	241-UX-154	U0006-1
LDE-ER-151	241-ER-151	ER320-1
LDE-ER-153	241-ER-153	ER340-1
PS-SN-232	SN-232	4A034-2
LDE-PP-SYS	244-A	4A017-1
PS-SN-215	SN-215	AY193-1
LDE-241-A-A-VP	241-A-A	2R072-1
LDE-VP241-A-B-1	241-A-B	A0242-1
PS-SN-213	SN-213/200	AY189/AY186-1
LDE-241-AX-B	241-AX-B	AX178-1
LDE-SL-502	SL-502	AY088-1
LDE-101-20	AY-01D	AY075-1
Manual Tape	TK-102-AY	TK-102-AY Manual Tape
LIT-102-AY	TK-102-AY	AY040-1

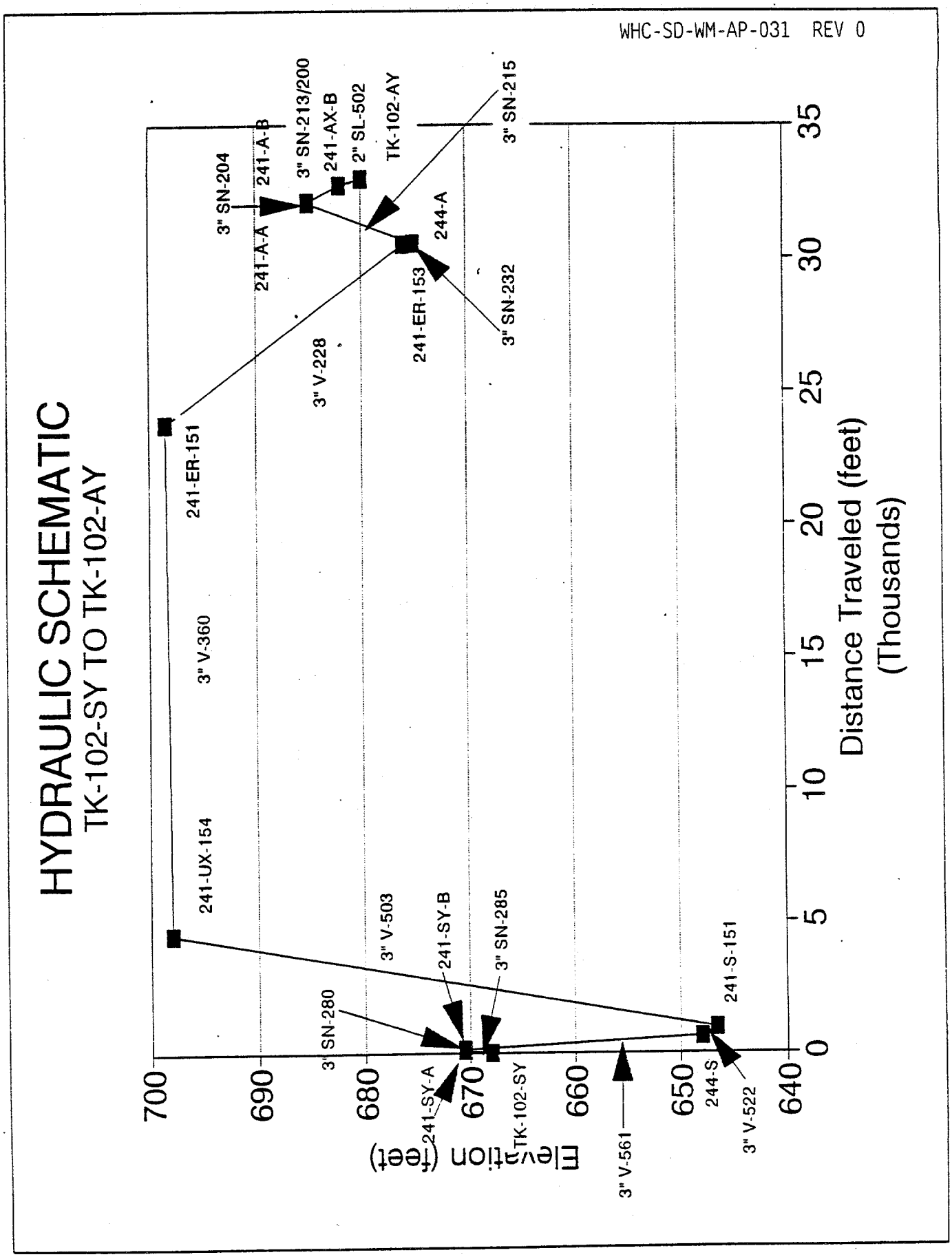
103-SY

Type	Location	CBRS Description
LIT-103-1	TK-103-SY	SY122-2
Manual Tape	TK-103-SY	TK-103-SY Manual Tape
LDE-03A-1 SYS	SY-03A	SY128-1
LDE-02A-1 SYS	SY-02A	SY022-1
LDE-02D-1 SYS	SY-02D	SY041-1
Manual Tape	TK-102-SY	TK-102-SY Manual Tape
LIT-102-1	TK-102-SY	SY089-2

Hydraulic Diagrams, SY Farm

HYDRAULIC SCHEMATIC
TK-101-SY, TK-103-SY TO TK-102-SY




HYDRAULIC SCHEMATIC
TK-102-SY TO TK-102-AY
Elevation (feet)
Distance Traveled (feet)
(Thousands)
700
690
680
670
660
650
640
0
5
10
15
20
25
30
35
241-UX-154
241-ER-151
3" V-360
3" SN-204
241-A-A
241-A-B
3" SN-213/200
241-AX-B
2" SL-502
TK-102-AY
3" SN-215
3" V-228
241-ER-153
244-A
3" SN-232
3" V-503
241-SY-B
3" SN-285
3" SN-280
241-SY-A
TK-102-SY
3" V-561
241-S-151
244-S
3" V-522

APPENDIX F: Head Loss Calculations

Calculations for the head loss in the transfer lines are derived from Bernoulli's equation for pipe flow.

$$P_1 - P_2 = \frac{\rho}{144}\left(Z_2 - Z_1 + \left(\frac{v_2^2}{2} - \frac{v_1^2}{2}\right)\frac{1}{g} + h_L\right)$$

where

P_1, P_2 = initial and final pressures of the fluid
ρ = density of the fluid
Z_1, Z_2 = initial and final heights of the fluid
v_1, v_2 = initial and final velocities of the fluid
g = acceleration due to gravity
h_L = head loss (in feet).

Head loss for the system is calculated from the frictional loss, and is defined by the equation

$$h_L = \frac{K}{d^4}(0.00259)Q^2$$

where

Q = fluid flow rate
d = internal diameter of the pipe
K = resistance coefficient.

A value for the resistance coefficient can be obtained by using the expression

$$K = \frac{12}{d} fL$$

for which

L = length of pipe
f = friction factor.

The friction factor is based on Reynold's Number, calculated by applying the formula

$$Re = \frac{Q\rho}{d\mu} \quad (50.6)$$

where

μ = viscosity.

Using the Reynold's number, the friction factor can be found on a chart for fluid flowing through commercial pipe, which is the type of pipe used in the transfer lines.

APPENDIX G: Results of Head Loss Calculations (Currently Installed Pumps)

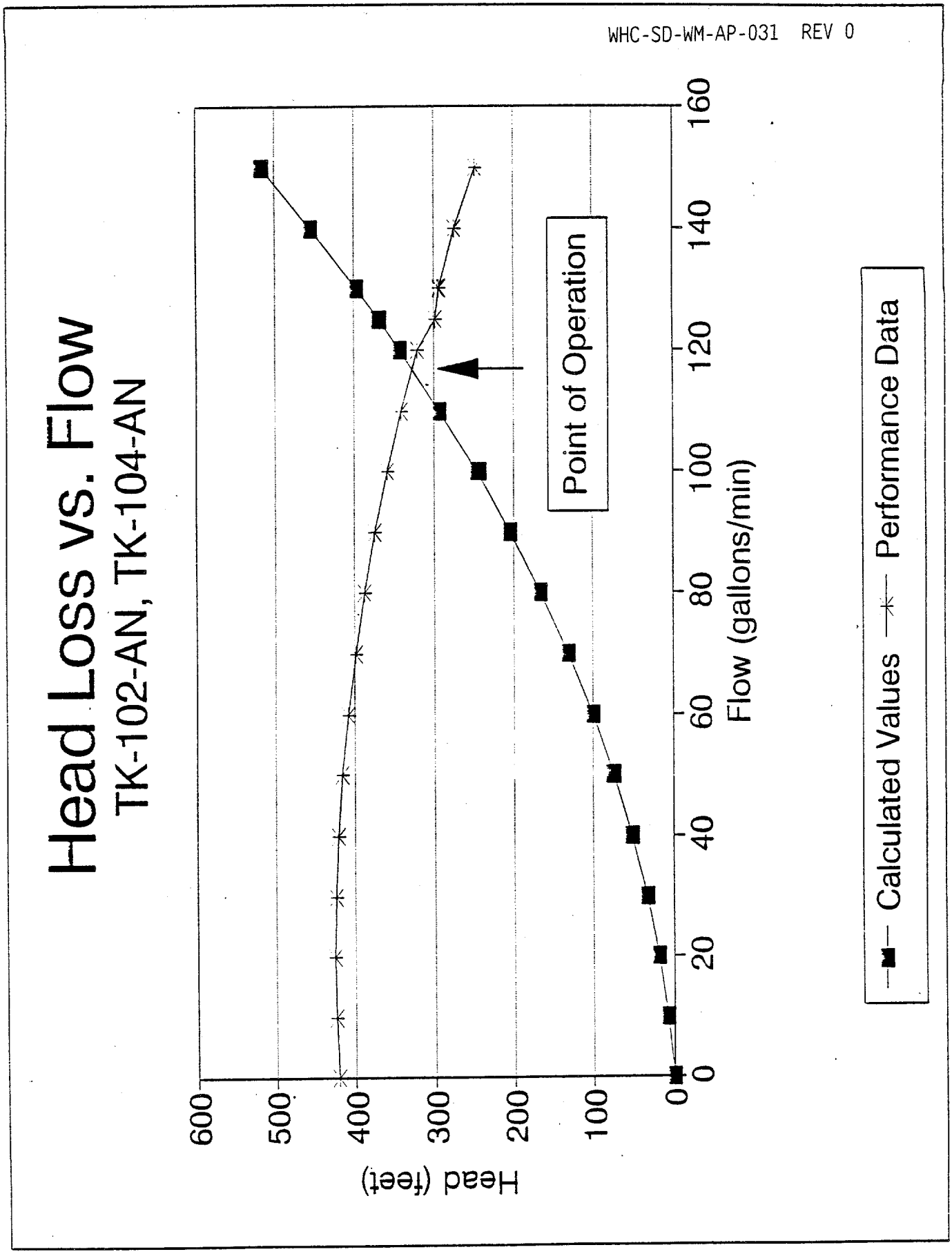
Tank	Friction Loss	Elev. Loss	Total Loss	Pump Rating
101 AN	171	12	183	300
102 AN	503	12	**515**	250
103 AN	185	12	197	280
104 AN	510	12	**522**	250
105 AN	229	12	241	250
106 AN	229	12	241	300
107 AN				OPEN
101 AP	23	0	23	290
102 AP	13	0	13	280
103 AP	23	0	23	240
105 AP	39	0	39	220
106 AP	37	0	37	250
107 AP	45	0	45	250
108 AP	47	0	47	250
101 AW	24	-8	16	300
102 AW	20	-8	12	280
103 AW	25	-8	17	300
104 AW	25	-8	17	300
105 AW	30	-8	22	300
106 AW	26	-8	18	280
101 SY**		12		OPEN
102 SY*	321	12	333	340
103 SY**	8	12	20	115
101 AY	71	-4	67	115
102 AY	46	-4	42	300

*The data for this pump is based on transfer to TK-102-AY
**These pumps transfer to TK-102-SY

APPENDIX H: Calculated Head Losses for Standard Pipe Flow Rates

Tank	Loss @ 50 GPM (FEET)	Loss @ 100 GPM (FEET)	Loss @ 125 GPM (FEET)	Loss @ 150 GPM (FEET)
101 AN	78	245	382	534
102 AN	77	243	369	517
103 AN	77	246	368	517
104 AN	76	249	376	524
105 AN	77	243	371	520
106 AN	77	243	371	520
107 AN	78	250	374	525
101 AP	4.5	16.3	25.0	35.5
102 AP	4.6	16.6	25.6	36.4
103 AP	3.8	13.8	21.1	29.9
105 AP	5.7	20.6	31.7	44.9
106 AP	4.1	14.8	22.5	32.2
107 AP	4.5	16.4	25.3	35.9
108 AP	4.7	17.0	26.1	37.2
101 AW	13.2	34.2	49.2	69.2
102 AW	11.2	29.2	43.2	59.2
103 AW	13.2	35.2	49.2	70.2
104 AW	13.7	35.6	51.8	71.2
105 AW	13.6	35.2	51.9	70.6
106 AW	14.1	37.1	53.5	74.4
101 SY	14	19	24	29
102 SY	235	828	1274	1777
103 SY	14	20	24	29
101 AY	36	134	198	275
102 AY	28	106	162	230

APPENDIX I: Calculated and Measured Head Loss vs. Flow Values for 102-AN and 104-AN


Head Loss vs. Flow
TK-102-AN, TK-104-AN
Head (feet)
600
500
400
300
200
100
0
0
20
40
60
80
100
120
140
160
Flow (gallons/min)
Point of Operation
Calculated Values
Performance Data

APPENDIX J: Other Interconnected Tanks

TANK	CBRS INFORMATION	CONNECTED TO
A-350-CT	WFT-350-1, AE073-4	241-A-A, 241-A-B
S-302-A CT	LDE-S-302A S-YS, S3002-1	241-S-151
311-ER CT	LDE-ER-311 SY-S, ER302-1	241-ER-151
UX-302A CT	LDE-UX 30-2A SYS, UX302-1	241-UX-154