



# System Logic Description for the Direct Feed LAW Effluent Management Facility Process System (DEP)

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Author(s): Ryan Ricono *RR*

Checked by: P. A. Treese *P.A. Treese*

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Approved by: Dennis Huth

Approver's position: DFLAW C&I Engineering Group Supervisor

Approver's signature: *Dennis A. Huth* 9-21-16  
*Signature* *Date*

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River Protection Project  
Waste Treatment Plant  
2435 Stevens Center Place  
Richland, WA 99354  
United States of America  
Tel: 509 371 2000

## **Notice**

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## History Sheet

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## Acronyms

AEA	Atomic Energy Act
DIW	demineralized water
DEP	Direct Feed LAW Effluent Management Facility Process (system)
DOE	US Department of Energy
DWP	Dangerous Waste Permit
EMF	Effluent Management Facility
HS	hand switch
LAH	level alarm high
LAHH	level alarm high-high
LAHHH	level alarm high-high-high
LAL	level alarm low
LALL	level alarm low-low
LAW	low-activity waste (facility)
LE	level element
LI	level indicator
LKY	level rate of change calculation
LOL	lower operating limit
LSH	level switch high
LT	level transmitter
MU	Miscellaneous Unit
P&ID	pipng and instrumentation diagram
PCJ	process control system
PT	pretreatment (facility)
RTD	resistance temperature detector
SBS	submerged bed scrubber
UOL	upper operating limit
WTP	Hanford Tank Waste Treatment and Immobilization Plant

## Glossary

Acquire	Acquire is a command under batch control that reserves a group of equipment for a particular batch control operation.
Actual Volume	Volume of waste/process fluid in any vessel in gallons.
Ancillary Equipment	Any device including, but not limited to, such devices as piping, fittings, flanges, valves, and pumps, that is used to distribute, meter, or control the flow of dangerous waste.
Available Space	Volume of waste/process fluid that any vessel can accommodate and still be lower than the upper operating limit (UOL), in gallons. Available space can be calculated as follows: $Available\ Space = UOL - Actual\ Volume$ .
Available Volume	Volume of waste/process fluid that any vessel can transfer to another vessel and still be above the lower operating limit (LOL), in gallons. Available volume can be calculated as follows: $Available\ Volume = Actual\ Volume - LOL$ .
Batch	Batch is the material that is being produced or that has been produced by a single execution of a batch process.
Batch Control	Batch control refers to control activities and control functions that provide an ordered set of processing activities to complete a batch process.
Batch Process	A batch process is a process that leads to the production of finite quantities of material by subjecting quantities of input materials to an ordered set of processing activities over a finite period of time using one or more pieces of equipment.
Continuous Control	Continuous control refers to automatic control activities in which the controlled quantity is measured continuously and corrections are a continuous function of the deviation.
Control System	Control system refers to electronic processors that perform regulatory and logic control functions necessary for normal plant operation.
Exception Handling	Exception handling refers to those functions that deal with plant or process contingencies and other events that occur outside the normal or desired behavior of batch control.
Foundation Fieldbus	A digital, serial, two-way communication system which was selected to network instrumentation within WTP.
Level Alarm High (LAH)	A vessel high-level setpoint used to stop a transfer-in batch operation to a vessel under normal plant operation.
Level Alarm High-High (LAHH)	Refers to a notification in the control system that is activated when the applicable variable reaches a point that is significantly higher than that expected during normal operation. For the equipment which also utilizes a LAHHH point, LAHH is an intermediate point between LAH and LAHHH where action will be taken to prevent additional fluid injection.
Level Alarm High-High-High (LAHHH)	Refers to a notification in the control system that is activated when the applicable variable reaches a point that is significantly higher than that expected during normal operation. This point signifies the maximum fill level.

Level Alarm Low (LAL)	A vessel low-level setpoint used to stop a transfer-out batch operation from a vessel under normal plant operations.
Level Alarm Low-Low (LALL)	Refers to a notification in the control system that is activated when the applicable variable reaches a point that is significantly lower than that expected during normal operation.
Level Rate of Change (LKY)	Refers to a calculation in the control system that monitors how fast the sump is filling with fluid.
Permissive	Interlock that allows a device to change state or a sequence to start. Once a device has changed state or a sequence has started, permissive has no further effect on the device or sequence.
Release	Release is a command under batch control that opens up a group of equipment for any batch control to acquire.
Trip	Interlock that does not allow a device to change state or a sequence to start. Once a device has changed state or a sequence has started, trips continue to have an effect on the device or sequence.

## 1 Introduction

This document describes the instrument control logic for low level waste sumps and pumps in the Direct Feed LAW Effluent Management Facility Process (DEP) system within the LAW effluent process and drain tank buildings. This document has been prepared as one of the documents that provide tank, ancillary equipment, and leak detection system instrumentation control logic narrative description (e.g., plant installed software documentation, descriptions of fail-safe conditions, etc.) to meet the requirements of permit condition III.10.E.9.d.vii.

The narrative for the eight vessels and the evaporator listed in Section 3.2 will be included in a future revision of this document. The low point drain vessel information provided in this revision is preliminary and will be updated, as required, in a future revision of this document.

## 2 Applicable Documents

24590-WTP-M6-50-00001	<i>P&amp;ID Symbols and Legend Sheet 1 of 8</i>
24590-WTP-M6-50-00002	<i>P&amp;ID Symbols and Legend Sheet 2 of 8</i>
24590-WTP-M6-50-00003	<i>P&amp;ID Symbols and Legend Sheet 3 of 8</i>
24590-WTP-M6-50-00004	<i>P&amp;ID Symbols and Legend Sheet 4 of 8</i>
24590-WTP-M6-50-00005	<i>P&amp;ID Symbols and Legend Sheet 5 of 8</i>
24590-WTP-M6-50-00006	<i>P&amp;ID Symbols and Legend Sheet 6 of 8</i>
24590-WTP-M6-50-00007	<i>P&amp;ID Symbols and Legend Sheet 7 of 8</i>
24590-WTP-M6-50-00008	<i>P&amp;ID Symbols and Legend Sheet 8 of 8</i>
24590-BOF-P1-25-00001	<i>Balance of Facilities LAW Effluent Process Bldg &amp; LAW Effluent Drain Tank Bldg General Arrangement Plan at Elev 0'-0"</i>
24590-BOF-M6-DEP-00001001	<i>P&amp;ID – BOF/EMF Direct Feed LAW EMF Process System Low Point Drain Vessel DEP-VSL-00001</i>
24590-BOF-M6-DEP-00001002	<i>P&amp;ID – BOF/EMF Direct Feed LAW EMF Process System Low Point Drain Vessel Pumps DEP-PMP-00001A/B</i>
24590-BOF-M6-DEP-00002006	<i>P&amp;ID – BOF/EMF Direct Feed LAW EMF Process System Evaporator Concentrate / Feed Vessels Law Effluent Cooler DEP-HX-00001</i>
24590-BOF-M6-DEP-00009001	<i>P&amp;ID – BOF/EMF Direct Feed LAW EMF Process System Process Area Sumps DEP-SUMP-00002A/B</i>
24590-BOF-M6-DEP-00009002	<i>P&amp;ID – BOF/EMF Direct Feed LAW EMF Process System Process Vessel Area Sumps DEP-SUMP-00004A/B</i>
24590-BOF-M6-DEP-00009004	<i>P&amp;ID – BOF/EMF Direct Feed LAW EMF Process System Process Area Sumps DEP-SUMP-00003A/B</i>
24590-BOF-M6-DEP-00009005	<i>P&amp;ID – BOF/EMF Direct Feed LAW EMF Process System Process Vessel Area Sumps DEP-SUMP-00005A/B</i>



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24590-BOF-M6-DEP-00010001 *P&ID – BOF/EMF Direct Feed LAW EMF Process System  
Underground Transfer Lines*

24590-BOF-M6-DEP-00011001 *P&ID – BOF/EMF Direct Feed LAW EMF Process System  
Effluent Facility Leak Detection DEP-LDB-00001 thru DEP-  
LDB-00006*

## 3 Description

The low point drain vessel, described in Section 3.1, provides temporary storage for transfer line flushes, piping drains, and overflow from each of the Effluent Management Facility (EMF) vessels, described within Section 3.2. In addition, effluent from the Lab C3 collection and transfer vessel, as well as the low activity waste (LAW) plant wash, scrubber condensate, and blowdown can be diverted to the drain vessel. A sump (DEP-SUMP-00001) is provided to collect leaks and vessel overflows to support leak detection in the low point drain vessel.

The EMF Dangerous Waste Permit secondary containment sumps provide a means of capturing and transferring leakage or collection of fluids within process rooms and vessel cell areas. EMF DWP sumps are placed throughout the facility in each area which contains process vessels, miscellaneous units (MUs), or process fluids.

### 3.1 Below-Grade System Requirements

The DEP low level waste equipment located below elevation 0 ft includes the following:

#### Vessel

- DEP-VSL-00001 Low point drain vessel

#### Sump

- DEP-SUMP-00001 Low point drain sump

#### Leak Detection Boxes

- DEP-LDB-00001 LAW effluent leak detection box
- DEP-LDB-00002 LAW feed leak detection box
- DEP-LDB-00003 LAW feed leak detection box
- DEP-LDB-00004 SBS/plant wash transfer leak detection box
- DEP-LDB-00005 Scrubber blowdown leak detection box
- DEP-LDB-00006 LAB effluent leak detection box

#### 3.1.1 Low Point Drain Vessel DEP-VSL-00001

The final design of the low point drain vessel will be documented in a future revision of this document. Included within this section is the preliminary low point drain vessel functionality.

The low point drain vessel is used to collect and contain liquid from the sources described in Section 3.2 and forward the collected liquid to the evaporator feed vessel prefilter for processing. An agitator is used to continuously mix the contents of the low point drain vessel to avoid settling of entrained solids. Two vertical pumps transfer the contents to the evaporator feed vessel prefilter (DEP-FILT-00003) and then on to the evaporator feed vessel (DEP-VSL-00002). A rotating spray nozzle supplied with demineralized water will wash the low point drain vessel when empty.

The low point drain vessel (DEP-VSL-00001) is located at elevation -39 ft, within the enclosed room ED-B001. This room is designated as a R5/R3/C5 area. The vessel overflows to sump DEP-SUMP-00001 in the same room<sup>Hold 1</sup>. This sump is evacuated by pump DEP-PMP-00031 and transferred to the evaporator feed vessel prefilter and then on to the evaporator feed vessel (DEP-VSL-00002) at elevation 0 ft.

Hold: <sup>1</sup> Low Point Drain Vessel overflow line and Low Point Drain Sump demineralized water line are on hold pending design change for dipped overflow and basis calculation.

The liquid level in the low point drain vessel (DEP-VSL-00001) is monitored by a level element (LE-8109) and a level transmitter (LT-8109). The transmitter communicates with the process control system (commonly referred to as the PCJ) and provides a control room indication and alarm on high, high-high, low, and low-low level. A discrete software signal will override stop the agitator on low level. A discrete software signal will override stop the two 100% vertical pumps (DEP-PMP-00001A/B) on low-low level. Additionally, a discrete software signal will close the inlet valves to the low point drain on high-high level.

In the event of any sump level detection alarm, the source of the spill will be identified and isolated; notifications, spill response, and waste removal will be completed in accordance with Hanford Tank Waste Treatment and Immobilization Plant (WTP) Operating and Spill Response procedures. Table 2 depicts typical instrumentation associated with the low point drain vessel. Figure 1 depicts the typical DEP control logic functions.

### **3.1.2 Low Point Drain Sump DEP-SUMP-00001**

The low point drain sump (DEP-SUMP-00001), located within the same R5/R3/C5 room as the low point drain vessel at elevation -39 ft, is used to capture overflow from the low point drain vessel (DEP-VSL-00001). In addition, the transfer line leak detection box drain will discharge to the sump.

The leak detection boxes (see section 3.1.3) will drain into the low point drain sump through the feed line DEP-ZS-00043-S11C-01. Additionally, Table 1 lists the process transfer lines which utilize coaxial piping, each draining an inner pipe leak to the low point drain sump. The sump is equipped with an air driven pump (DEP-PMP-00031) which will transfer the fluid to the evaporator feed vessel prefilter and then on to the evaporator feed vessel (DEP-VSL-00002).

The liquid level in the sump is monitored by a level element (LE-8112) and a level transmitter (LT-8112). The transmitter communicates with the PCJ and provides a control room indication and alarm on high and high-high-high level.

Sump level instrumentation has four alarm points. The first alarm, high level, assumes that the sump starts out completely dry. It alerts the operator at or before the level in the sump reaches 2.4 gallons based on a leak of 0.1 gallons per hour within 24 hours, as provided in permit condition III.10.E.9.e.ii. Once the alarm is received, the sump liquids are transferred by the operator from the sump to the appropriate downstream vessel.

The second alarm point, high level rate of change function (LKY), will calculate any change in fluid level above the first alarm setpoint. The LKY control function shown in Figure 2 detects a change in sump liquid levels. A normally closed pneumatically actuated open/close valve (YV-8117) is used to maintain the level in the loop seal with demineralized water as required<sup>Hold 1</sup>. The manually controlled YV-8117 valve has a discrete software signal to close the valve on the third alarm point, high-high sump level<sup>Hold 1</sup>.

The fourth alarm, high-high-high level, will alert the operator that the sump has reached its maximum volume. The operator will investigate the source of the alarm and will transfer any effluent from the sump. The transfer will be stopped by the operator or if the level in the sump reaches its low-low level functional logic control point.

In the event of any sump level detection alarm, the source of the spill will be identified and isolated; notifications, spill response, and waste removal will be completed in accordance with WTP Operating and Spill Response procedures.

Hold: <sup>1</sup> Low Point Drain Vessel overflow line and Low Point Drain Sump demineralized water line are on hold pending design change for dipped overflow and basis calculation.

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Table 1 lists the coaxial lines outer wall which drains to the low point drain sump (DEP-SUMP-00001).

The *Process line description* column provides information for the purpose of the line, the *Process line tag number* column provides the tag number provided for the process line, the *Coaxial line tag number* column provides the tag number provided for the coaxial line within the process stream, and the *Piping line tag number to DEP-SUMP-00001* column provides the piping line tag number associated with the drain line from the associated coaxial line.

**Table 1 Coaxial piping number and description draining into DEP-SUMP-00001**

<b>P&amp;ID</b>	<b>Process line description</b>	<b>Process line tag number</b>	<b>Coaxial line tag number</b>	<b>Piping line tag number to DEP-SUMP-00001</b>
24590-BOF-M6-DEP-00001001	LAB effluent from RLD-VSL-00164	DEP-WU-00001-S11E-03	DEP-WU-00008-W31A-03	DEP-WU-00009-S11E-01
	Sump pump discharge DEP-PMP-00032A/B, 34A/B, 38	DEP-ZS-00266-S11C-03	DEP-ZS-20231-W31A-03	DEP-ZS-20234-S11C-01
	Sampling line return	DEP-ZS-00275-S11C-02	DEP-ZS-20236-W31A-02	DEP-ZS-20238-S11C-01
	Vessel DEP-VSL-00002, 3A/B/C, 4A/B, 5A/B overflow	DEP-ZS-00283-S11C-10	DEP-ZS-20242-W31A-10	DEP-ZS-20244-S11C-01
	Fume hood drain & evaporator drain	DEP-ZS-20194-N11F-04	DEP-ZS-20245-W11A-04	DEP-ZS-20246-N11F-01
	SBS cond/plant wash	DEP-ZS-00009-S11C-03	DEP-ZS-20249-W31A-03	DEP-ZS-20251-S11C-01
	Off-spec evaporator concentrate drain	DEP-ZS-20229-N11F-011/2	DEP-ZS-20282-W11A-011/2	DEP-ZS-20284-N11F-01
	Scrubber blowdown LVP-TK-00001	DEP-ZY-00001-S11C-03	DEP-ZY-00181-W31A-03	DEP-ZY-00183-S11C-01
	Vessel DEP-VSL-00001 vent header	DVP-GV-00029-S11X-03	DVP-GV-00026-W31A-03	DVP-GV-00028-S11X-01
24590-BOF-M6-DEP-00001002	Condensate flush DEP-PMP-00015A/B/C	DEP-ZS-00218-S11C-02	DEP-ZS-20219-W31A-02	DEP-ZS-20220-S11C-01
	Pump discharge line from DEP-PMP-00031, emptying SUMP-00001	DEP-ZS-00022-S11C-02	DEP-ZS-20222-W31A-02	DEP-ZS-20223-S11C-01
	Pump discharge lines from DEP-PMP-00001A/B, emptying VSL-00001	DEP-ZS-00016-S11C-02	DEP-ZS-20225-W31A-02	DEP-ZS-20226-S11C-01
24590-BOF-M6-DEP-00002006	Conditioned effluent	DEP-ZS-20268-S11C-03	DEP-ZS-20265-W31A-03	DEP-ZS-20266-S11C-01
24590-BOF-M6-DEP-00010001	Effluent concentrate DEP-PMP-00003A/B	DEP-ZS-00314-N11F-03	DEP-ZS-20252-W11A-03	DEP-ZS-20217-N11F-01

### **3.1.3 Leak Detection Boxes**

DEP has six leak detection boxes (LDBs) on the headers of the coaxial piping draining into the low point drain sump (DEP-VSL-00001) through the feed line DEP-ZS-00043-S11C-01.

The six LDBs are designed to detect a leak within the annular space of the coaxial line. The LDB is separated into two parts by a weir equipped with a drain plug in the closed position to create a detectable liquid level. A conductivity level switch is used to detect liquid in the LDB, to activate the control system alarms, and to trip supply pumps and associated isolation valves. An overflow plug is provided on the opposite side of the weir in an open position, which prevents overflowing of the leak detection box until it can be drained. Figure 3 shows the alarm function for the conductivity level switch instrument associated with each of the leak detection boxes, which serves as a typical method of operation for all leak detection boxes in the DEP.

In the event of a leak detection high level detection alarm, the source of the spill will be identified and isolated; notifications, spill response, and waste removal will be completed in accordance with WTP Operating and Spill Response procedures.

### 3.2 Above-Grade System Requirements

The DEP low level waste equipment located at or above elevation 0 ft includes the following:

#### Sumps

- DEP-SUMP-00002A West process area sump
- DEP-SUMP-00002B West process area sump
- DEP-SUMP-00003A East process area sump
- DEP-SUMP-00003B East process area sump
- DEP-SUMP-00004A Evaporator concentrate area sump
- DEP-SUMP-00004B Evaporator concentrate area sump
- DEP-SUMP-00005A Process condensate area sump
- DEP-SUMP-00005B Process condensate area sump

#### EMF Process Vessels

- DEP-VSL-00002 Evaporator feed vessel
- DEP-VSL-00003A Evaporator concentrate vessel
- DEP-VSL-00003B Evaporator concentrate vessel
- DEP-VSL-00003C Evaporator concentrate vessel
- DEP-VSL-00004A Overhead sampling vessel
- DEP-VSL-00004B Overhead sampling vessel
- DEP-VSL-00005A Process condensate lag storage vessel
- DEP-VSL-00005B Process condensate lag storage vessel

#### Evaporator

- DEP-EVAP-00001 Evaporator

#### 3.2.1 West Process Area Sumps DEP-SUMP-00002A/B

The west process area sumps (DEP-SUMP-00002A/B) are located within room E-0103, designated R4/C5 at elevation 0 ft. The west process area sumps and level detection instruments detect a leak from the evaporator (DEP-EVAP-00001), the evaporator reboiler (DEP-RBLR-00001), the evaporator feed vessel prefilter (DEP-FILT-00003), the LAW effluent cooler heat exchanger (DEP-HX-00001), or ancillary equipment associated with the evaporator and heat exchanger.

The sumps are equipped with pumps which will transfer the fluid to the appropriate vessel. Fluid contained in the west process area sumps are transferred to the overhead sampling vessels (DEP-VSL-00004A/B) or the low point drain vessel (DEP-VSL-00001) by sump pumps (DEP-PMP-00032A/32B).

The liquid level in the sump is monitored by a level element (LE-8626/8629) and a level transmitter (LT-8626/8629). The transmitters communicate with the PCJ and provide a control room indication (LI-8626/8629) and alarm on high and high-high-high level. A high-level alarm will trip upon detection of liquid in the sump. The PCJ system will alert the operator.

Sump level instrumentation has three alarm points. The first alarm, high level, assumes that the sump starts out completely dry. It alerts the operator at or before the level in the sump reaches 2.4 gallons based on a leak of 0.1 gallons per hour within 24 hours, as provided in permit condition III.10.E.9.e.ii. Once the alarm is received, the sump liquids are transferred by the operator from the sump to the appropriate downstream vessel.

The second alarm point, high LKY level rate of change function, will calculate any change in fluid level above the first alarm setpoint. The LKY control function shown in Figure 2 detects a change in sump liquid levels. The third alarm, high-high-high level, will alert the operator that the sump has reached its maximum volume.

The operator will investigate the source of the alarm and will transfer any effluent from the sump. The transfer will end when the level in the sump reaches its low-level functional logic control point, a batch is transferred, or the selected target collection vessel (DEP-VSL-00001) reaches its actual high-level batch control point.

In the event of any sump level detection alarm, the source of the spill will be identified and isolated; notifications, spill response, and waste removal will be completed in accordance with WTP Operating and Spill Response procedures.

### **3.2.2 East Process Area Sumps DEP-SUMP-00003A/B**

The east process area sumps (DEP-SUMP-00003A/B) are located within room E-0102, designated R3/C3 at elevation 0 ft. The east process area sumps and level detection instruments detect a leak from the evaporator condensers (DEP-COND-00001/2/3) or the ancillary equipment associated with the evaporator condensers.

The sumps are equipped with pumps which will transfer the fluid to the appropriate vessel. Fluid contained in the east process area sumps are transferred to the process condensate lag storage vessels (DEP-VSL-00005A/B) by sump pumps (DEP-PMP-00033A/33B).

The levels in the sumps are measured by a level transmitter (LT-8646/8647). The transmitters communicate with the PCJ and provide a control room indication (LI-8646/8647) and alarm on high and high-high-high level. A high-level alarm will trip upon detection of liquid in the sump. The PCJ system will alert the operator.

Sump level instrumentation has three alarm points. The first alarm, high level, assumes that the sump starts out completely dry. It alerts the operator at or before the level in the sump reaches 2.4 gallons based on a leak of 0.1 gallons per hour within 24 hours, as provided in permit condition III.10.E.9.e.ii. Once the alarm is received, the sump liquids are transferred by the operator from the sump to the appropriate downstream vessel.

The second alarm point, high LKY level rate of change function, will calculate any change in fluid level above the first alarm setpoint. The LKY control function shown in Figure 2 detects a change in sump liquid levels. The third alarm, high-high-high level, will alert the operator that the sump has reached its maximum volume.

The operator will investigate the source of the alarm and will transfer any effluent from the sump. The transfer will end when the level in the sump reaches its low-level functional logic control point, a batch is transferred, or the selected target collection vessel (DEP-VSL-00001) reaches its actual high-level batch control point.

In the event of any sump level detection alarm, the source of the spill will be identified and isolated; notifications, spill response, and waste removal will be completed in accordance with WTP Operating and Spill Response procedures.

### **3.2.3 Evaporator Concentrate Area Sumps DEP-SUMP-00004A/B**

The evaporator concentrate area sumps (DEP-SUMP-00004A/B) are located within room E-0105, designated R4/R3/C1 at elevation 0 ft. The evaporator concentrate area sumps and level detection instruments detect an overflow or a leak from the evaporator feed vessel (DEP-VSL-00002), the evaporator concentrate vessels (DEP-VSL-00003A/B/C), and a leak from ancillary equipment located within this stainless steel lined room E-0105.

The sumps are equipped with pumps which will transfer the fluid to the appropriate vessel. Fluid contained in the evaporator concentrate area sumps are transferred to the overhead sampling vessels (DEP-VSL-00004A/B) or the low point drain vessel (DEP-VSL-00001) by sump pumps (DEP-PMP-00034A/34B).

The liquid level in the sump is monitored by a level element (LE-8632/8656) and a level transmitter (LT-8632/8656). The transmitters communicate with the PCJ and provide a control room indication (LI-8626/8629) and alarm on high and high-high-high level. A high-level alarm will trip upon detection of liquid in the sump. The PCJ system will alert the operator.

Sump level instrumentation has three alarm points. The first alarm, high level, assumes that the sump starts out completely dry. It alerts the operator at or before the level in the sump reaches 2.4 gallons based on a leak of 0.1 gallons per hour within 24 hours, as provided in permit condition III.10.E.9.e.ii. Once the alarm is received, the sump liquids are transferred by the operator from the sump to the appropriate downstream vessel.

The second alarm point, high LKY level rate of change function, will calculate any change in fluid level above the first alarm setpoint. The LKY control function shown in Figure 2 detects a change in sump liquid levels. The third alarm, high-high-high level, will alert the operator that the sump has reached its maximum volume.

The operator will investigate the source of the alarm and will transfer any effluent from the sump. The transfer will end when the level in the sump reaches its low-level functional logic control point, a batch is transferred, or the selected target collection vessel (DEP-VSL-00001) reaches its actual high-level batch control point.

In the event of any sump level detection alarm, the source of the spill will be identified and isolated; notifications, spill response, and waste removal will be completed in accordance with WTP Operating and Spill Response procedures.



### **3.2.4 Process Condensate Area Sumps DEP-SUMP-00005A/B**

The process condensate area sumps (DEP-SUMP-00005A/B) are located within room E-0106, designated R2/C1 at elevation 0 ft. The process condensate area sumps and level detection instruments detect an overflow or a leak from the overhead sampling vessels (DEP-VSL-00004A/B) or the process condensate lag storage vessels (DEP-VSL-00005A/B).

The sumps are equipped with pumps which will transfer the fluid to the appropriate vessel. Fluid contained in the process condensate area sumps are transferred to the process condensate lag storage vessels (DEP-VSL-00005A/B) by sump pumps (DEP-PMP-00035A/35B). Prior to emptying the process condensate area sumps, the operator will need to verify that the chosen vessel has not ruptured as a ruptured vessel could be the source of the sump fluid.

The levels in the sumps are monitored by a level transmitter (LT-8638/8641). The transmitters communicate with the PCJ and provide a control room indication (LI-8638/8641) and alarm on high and high-high-high level. A high-level alarm will trip upon detection of liquid in the sump. The PCJ system will alert the operator.

Sump level instrumentation has three alarm points. The first alarm, high level, assumes that the sump starts out completely dry. It alerts the operator at or before the level in the sump reaches 2.4 gallons based on a leak of 0.1 gallons per hour within 24 hours, as provided in permit condition III.10.E.9.e.ii. Once the alarm is received, the sump liquids are transferred by the operator from the sump to the appropriate downstream vessel.

The second alarm point, high LKY level rate of change function, will calculate any change in fluid level above the first alarm setpoint. The LKY control function shown in Figure 2 detects a change in sump liquid levels. The third alarm, high-high-high level, will alert the operator that the sump has reached its maximum volume.

The operator will investigate the source of the alarm and will transfer any effluent from the sump. The transfer will end when the level in the sump reaches its low-level functional logic control point, a batch is transferred, or the selected target collection vessel (DEP-VSL-00001) reaches its actual high-level batch control point.

In the event of any sump level detection alarm, the source of the spill will be identified and isolated; notifications, spill response, and waste removal will be completed in accordance with WTP Operating and Spill Response procedures.

### **3.2.5 EMF Process Vessels**

The narrative for the eight vessels listed in Section 3.2 will be included in a future revision of this document.

### **3.2.6 Evaporator**

The narrative for the evaporator listed in Section 3.2 will be included in a future revision of this document.

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**Effluent Management Facility Process System (DEP)**

Table 2 below lists auxiliary equipment associated with low point drain vessel and aforementioned sumps.

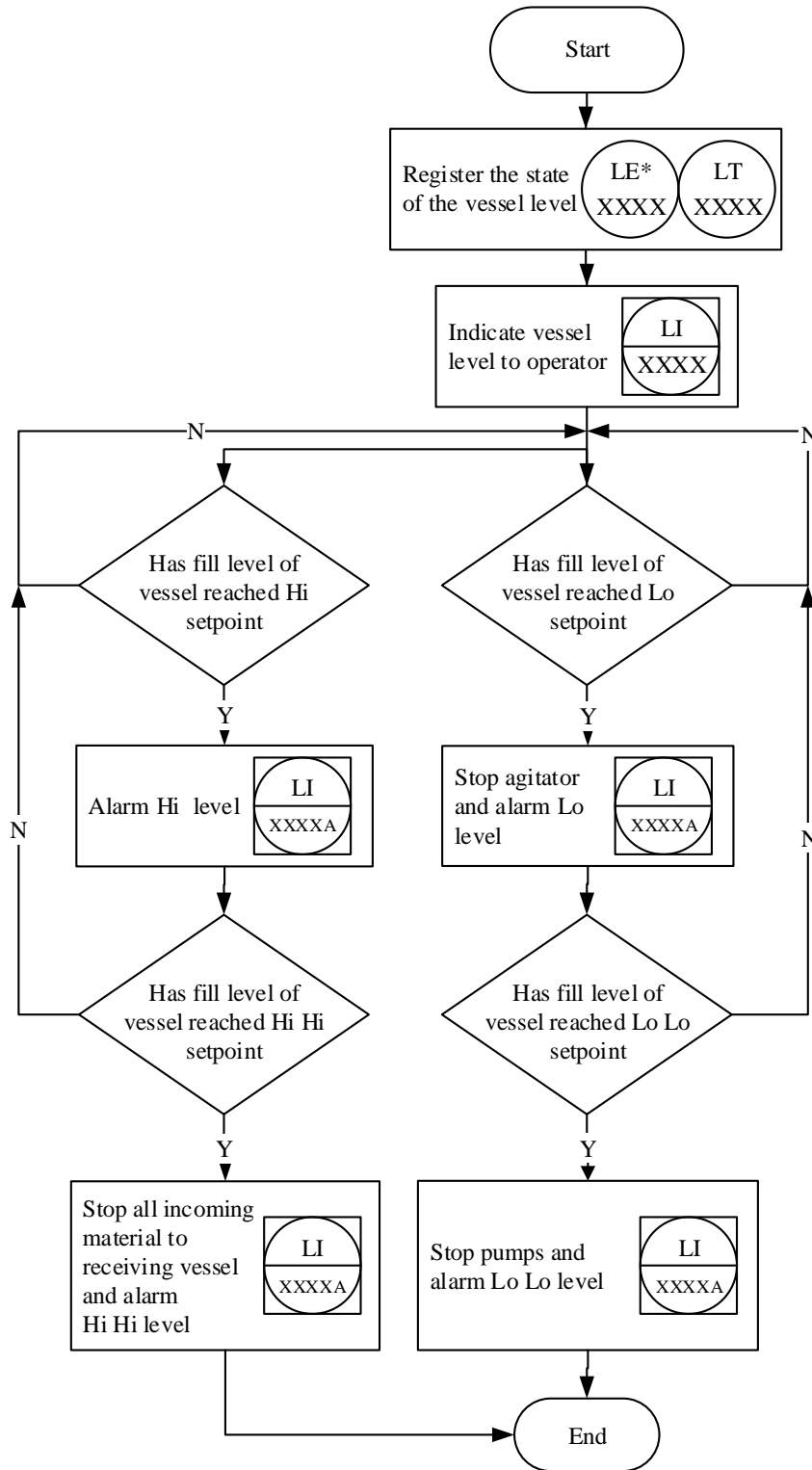
**Table 2 Associated Instruments for DEP Low Point Drain Vessel and Sumps**

<b>P&amp;ID</b>	<b>Monitoring/Control Parameter</b>	<b>Type of Instrument/Control Device</b>	<b>Instrument/Control Device Tag Number</b>
24590-BOF-M6-DEP-00001002	Level measurement for DEP-VSL-00001	Level Element	DEP-LE-8109
		Level Transmitter	DEP-LT-8109
		Level Indicator	DEP-LI-8109
		Level Alarm (High, High-High, Low, and Low-Low)	DEP-LI-8109A
24590-BOF-M6-DEP-00001002	Level measurement for DEP-SUMP-00001	Level Element	DEP-LE-8112
		Level Transmitter	DEP-LT-8112
		Level Indicator	DEP-LI-8112
		Level Alarm (High and High-High-High)	DEP-LI-8112A
		Level High-High Switch	DEP-LSHH-8112
		Leak Rate	DEP-LKY-8112A
24590-BOF-M6-DEP-00009001	Level measurement for DEP-SUMP-00002A	Level Element	DEP-LE-8626
		Level Transmitter	DEP-LT-8626
		Level Indicator	DEP-LI-8626
		Level Alarm (High and High-High-High)	DEP-LI-8626A
		Leak Rate	DEP-LKY-8626A
24590-BOF-M6-DEP-00009001	Level measurement for DEP-SUMP-00002B	Level Element	DEP-LE-8629
		Level Transmitter	DEP-LT-8629
		Level Indicator	DEP-LI-8629
		Level Alarm (High and High-High-High)	DEP-LI-8629A
		Leak Rate	DEP-LKY-8629A
24590-BOF-M6-DEP-00009002	Level measurement for DEP-SUMP-00004A	Level Element	DEP-LE-8632
		Level Transmitter	DEP-LT-8632
		Level Indicator	DEP-LI-8632
		Level Alarm (High and High-High-High)	DEP-LI-8632A
		Leak Rate	DEP-LKY-8632A
24590-BOF-M6-DEP-00009002	Level measurement for DEP-SUMP-00004B	Level Element	DEP-LE-8656
		Level Transmitter	DEP-LT-8656
		Level Indicator	DEP-LI-8656
		Level Alarm (High and High-High-High)	DEP-LI-8656A
		Leak Rate	DEP-LKY-8656A

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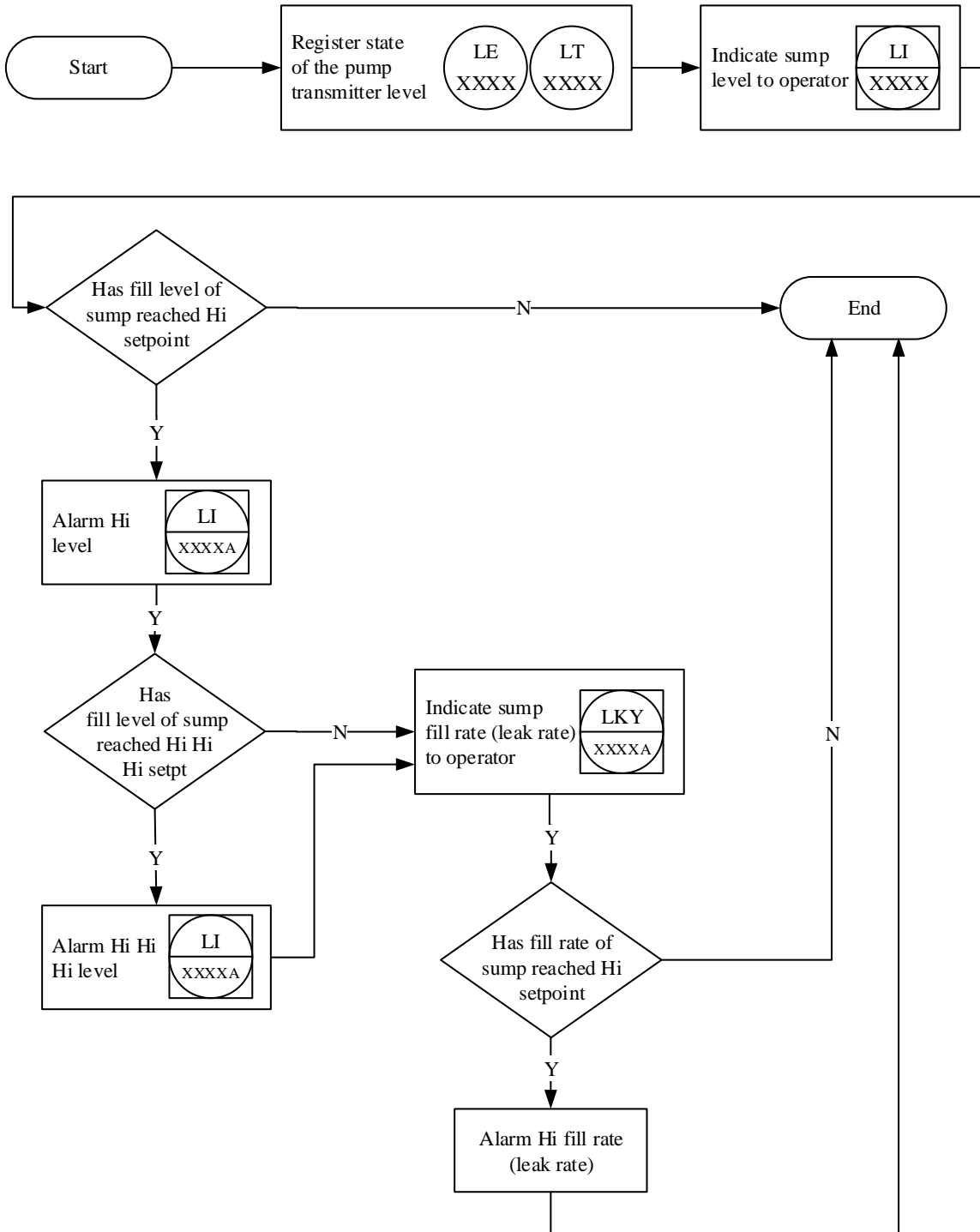
<b>P&amp;ID</b>	<b>Monitoring/Control Parameter</b>	<b>Type of Instrument/Control Device</b>	<b>Instrument/Control Device Tag Number</b>
24590-BOF-M6-DEP-00009004	Level measurement for DEP-SUMP-00003A	Level Transmitter	DEP-LT-8646
		Level Indicator	DEP-LI-8646
		Level Alarm (High and High-High-High)	DEP-LI-8646A
		Leak Rate	DEP-LKY-8646A
24590-BOF-M6-DEP-00009004	Level measurement for DEP-SUMP-00003B	Level Transmitter	DEP-LT-8647
		Level Indicator	DEP-LI-8647
		Level Alarm (High and High-High-High)	DEP-LI-8647A
		Leak Rate	DEP-LKY-8647A
24590-BOF-M6-DEP-00009005	Level measurement for DEP-SUMP-00005A	Level Transmitter	DEP-LT-8638
		Level Indicator	DEP-LI-8638
		Level Alarm (High and High-High-High)	DEP-LI-8638A
		Leak Rate	DEP-LKY-8638A
24590-BOF-M6-DEP-00009005	Level measurement for DEP-SUMP-00005B	Level Transmitter	DEP-LT-8641
		Level Indicator	DEP-LI-8641
		Level Alarm (High and High-High-High)	DEP-LI-8641A
		Leak Rate	DEP-LKY-8641A
24590-BOF-M6-DEP-00011001	Level measurement for DEP-LDB-00001	Level High Switch	DEP-LSH-8701
		Level High Alarm	DEP-LAH-8701
24590-BOF-M6-DEP-00011001	Level measurement for DEP-LDB-00002	Level High Switch	DEP-LSH-8702
		Level High Alarm	DEP-LAH-8702
24590-BOF-M6-DEP-00011001	Level measurement for DEP-LDB-00003	Level High Switch	DEP-LSH-8703
		Level High Alarm	DEP-LAH-8703
24590-BOF-M6-DEP-00011001	Level measurement for DEP-LDB-00004	Level High Switch	DEP-LSH-8706
		Level High Alarm	DEP-LAH-8706
24590-BOF-M6-DEP-00011001	Level measurement for DEP-LDB-00005	Level High Switch	DEP-LSH-8705
		Level High Alarm	DEP-LAH-8705
24590-BOF-M6-DEP-00011001	Level measurement for DEP-LDB-00006	Level High Switch	DEP-LSH-8704
		Level High Alarm	DEP-LAH-8704

Figure 1 Typical Collection Vessel Level Detection



\*Level measurement for some vessels will not utilize a Level Element (LE).

Figure 2 Typical Sump Level Detection



Note: DEP-SUMP-00001 level detection includes additional functional Hi Hi setpoint to close demin water line.

Figure 3 Typical Leak Detection Box Level Detection

