FPL.

L-2014-279
10 CFR 52.3

September 9, 2014

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

Re: Florida Power & Light Company
Proposed Turkey Point Units 6 and 7
Docket Nos. 52-040 and 52-041
Supplemental Response to NRC Request for Additional Information Letter No. 72
(eRAI 6985) SRP Section 11.02 - Liquid Waste Management Systems

Reference:

FPL Letter L-2014-102 to NRC dated April 22, 2014, Supplemental Response to Request for Additional Information Letter No. 72 (eRAI 6985) SRP Section 11.02 - Liquid Waste Management Systems

Florida Power & Light Company (FPL) provides, as an attachment to this letter, its supplemental response to the Nuclear Regulatory Commission's (NRC) Request for Additional Information (RAI) No. 11.02-6-6 (eRAI 6985) provided in Attachment 2 to the referenced letter. The clarifications to the referenced response are indicated by black or red text line-through and red or blue text insertion in the attachment. The attachment identifies changes that will be made in a future revision of the Turkey Point Units 6 and 7 Combined License Application (if applicable).

If you have any questions, or need additional information, please contact me at 561-691-7490.

D097
NRO

I declare under penalty of perjury that the foregoing is true and correct.

Executed on September 9, 2014.

Sincerely,

William Maher
Senior Licensing Director – New Nuclear Projects

WDM/RFO

Attachment: FPL Supplemental Response to NRC RAI No. 11.02-6-6 (eRAI 6985)

cc:
PTN 6 & 7 Project Manager, AP1000 Projects Branch 1, USNRC DNRL/NRO
Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant 3 & 4

NRC RAI Letter No. PTN-RAI-LTR-072 Dated February 20, 2013

SRP Section: 11.02 – Liquid Waste Management System

Supplemental Staff RAI to RAI 11.02-1, 11.02-2, 11.02-3, and 11.02-4.

NRC RAI Number: 11.02-6-6 (eRAI 6985)

[The preamble to this RAI is italicized below.]

In FSAR Rev. 4, Section 11.2.3.5, PTN COL 11.2-2, the applicant proposes a disposal method for liquid radioactive effluents using deep well injection into the Boulder Zone. When compared to routine effluent discharges in surface waters, the radioactivity injected in the Boulder Zone is expected to be isolated from the surface environment and out of reach of traditional radiation exposure scenarios and pathways considered by NRC regulations and guidance. Traditional effluent discharge methods dilute and disperse the radioactivity in the environment, but this disposal method confines the radioactivity into a slow moving and expanding plume with the total inventory of long-lived radionuclides increasing over the operating life of the plant. As a result, radiological assessment methods and assumed exposure scenarios used to quantify radiological impacts and compliance with NRC regulations for effluents discharged in surface water bodies are not directly applicable.

The deep well injection method involves technical and regulatory considerations that are not explicitly addressed under 10 CFR 50.34a, and 50.36a, and 10 CFR Part 50, Appendix I design objectives and ALARA provisions in controlling radioactive effluent releases. Similarly, the requirements of 10 CFR 20.1301 and 20.1302 and 40 CFR Part 190 [under Part 20.1301(e)] in complying with effluent concentration limits and doses to members of the public also do not explicitly address deep well injection. However, the applicant must still meet applicable requirements under these regulations in applying the deep well injection method for waste disposal.

Accordingly, the applicant has performed and provided an analysis in its current application under the provisions of 10 CFR 20.2002, "Method for obtaining approval of proposed disposal procedures." However, the results are presented in a manner that excludes a demonstration of compliance with some NRC requirements and associated guidance on the assumption that the discharge method offers complete isolation of the radioactivity with no radiation exposures to the public. The applicant has not included information sufficient to determine if it meets the requirements of 10 CFR 20.1301, 10 CFR 20.1302, and 10 CFR 20.1406; and numerical *guides, design objectives, and ALARA provisions of 10 CFR Part 50, Appendix I for liquid effluents.*

10 CFR 20.2002 provides an applicant with a method to obtain approval for proposed procedures, not otherwise authorized in the regulations, for disposal of licensed material generated in the licensee's activities. Under 10 CFR Part 20.2002, an applicant has to provide (a) a description of the waste, including the chemical and physical properties important to risk evaluation and the proposed manner and conditions of disposal; (b) an analysis of the environment in which wastes will be disposed; (c) the nature and location of other potentially affected licensed and unlicensed facilities; and (d) analyses and procedures to ensure that doses are maintained ALARA and within the dose limits of 10 CFR Part 20. The NRC typically approves Part 20.2002 requests that will result in a dose to a member of the public (including all exposure groups) that is no more than "a few millirem/year" (see SECY-07-0060, Attachment 1, and NUREG-1757, Vol. 1, Rev. 2, Section 15.12). As is noted in the SECY paper, the NRC selected this criterion because it is a fraction of the dose associated with naturally occurring background radiation, a fraction of the annual public dose limit, and an attainable objective in the majority of cases.

In this context, the staff considers its well-established Part 50 light-water-reactor criteria (including those prescribed by Appendix I) in determining whether all releases of radioactive material to the environment are ALARA and what monitoring, design criteria, and other conditions apply. As a result, the staff's evaluation of this disposal method under Part 20.2002 does not preclude the staff from considering the substantial technical requirements, design criteria, technical specifications, monitoring, and annual reporting called for by other provisions of Part 20 and Part 50.

Moreover, the staff notes that there is a need to ensure that NRC and Florida Department of Environmental Protection (FLDEP) requirements, when issued, are not conflicting and do not impose duplicative requirements, such as for radiological monitoring, periodic inspections and testing in confirming the mechanical integrity of the injection and monitoring wells, and requirements for well abandonment and closure at the end of their operational cycles or in the event of well failures and migration of radioactive materials in Upper Floridan aquifers. As a result, there are a number of issues that the staff needs to consider in bridging and integrating these regulatory requirements and NRC acceptance criteria. The issues involve the resolution of geo-hydrological characteristics of the Boulder Zone; use of information described in the construction and testing of the first exploratory and monitoring wells (see FPL reports of Sept. 2012); development of an appropriate radioactive source term confined within an amorphous *plume; development of an approach and method for modeling potential exposure scenarios that consider well failures and intrusion scenarios as expected operational occurrences using current land-use practices for this part of Florida; identification of surrogate criteria in achieving the same regulatory objectives since some of current regulatory requirements do not apply to this disposal method; identification of FLDEP permit conditions that would fulfill or supplement NRC requirements on installation, testing, operation, and environmental monitoring; and insertion of specific license conditions on the design features of injection and monitoring wells whose construction would not be completed before the issuance of the combined license.*

RAI Questions on Proposed Deep Well Injection Disposal Method

The information provided in FSAR Rev. 4, Sections 9.2, 10.4.5, and 11.2 and responses to staff RAIs presented in FPL correspondence (May 22, 2012 and July 13, 2012) are not sufficient for the staff to validate and verify the estimated doses of the assumed exposure doses in the FSAR are bounding and acceptable. Without this information, the staff is unable to make a determination that the applicant meets the acceptance criteria in SRP 11.2 and complies with the requirements of 10 CFR 20.2002, 20.1301, 20.1302, and 20.1406, and 10 CFR Part 50, Appendix I numerical guides, design objectives, and ALARA provisions. This supplemental RAI on the proposed deep well injection method consolidates and subsumes the issues identified in prior staff RAIs. As a result, the following RAIs are closed: RAI 11.02-1, 11.02-2, 11.02-3, and 11.02-4.

Question 6

With respect to injection flow and dilution flow rates, the applicant is requested to reconcile differences in stated flow rates and citations for the location of such information. For example, FSAR Tier 2, Rev. 4, Section 11.2.3.5 refers to FSAR Section 9.2.6.2.1 for details on deep well injection, but this FSAR section addresses the treatment of sanitary wastes. While FSAR Tier 2, Rev. 4, Section 11.2.3.5 identifies dilution flow rates for the disposal of liquid effluents by deep well injection in assessing radiological impacts, it does not refer to a specific FSAR section for design specific information, such as FSAR Tier 2, Section 9.2 or 10.4.5. A review of ER, Rev. 4, Section 5.2.3.2.4 indicates that the stated flow rates are 12,500 gpm and 58,000 gpm, which are consistent with ER Rev. 4, Table 3.3-1 under normal and maximum cases. However, FSAR Rev. 4, Section 2.4.12.2.1.3 refers to peak and operational injection rates, with a stated 14,000 gpm for reclaimed water and 62,500 gpm for seawater as implied normal operational flow rates. These injection rates are driven, in part, by FLDEP specifications on maximum linear velocities and friction loss and injection pressures, but such details and limitations on the design basis are not described in the FSAR. Accordingly, it is not clear which injection flow rates form the FSAR design basis, and whether the stated injection flow rates reflect the information presented in FPL's September 2012 report on the construction and testing of the first exploratory well. The applicant is requested to review and revise the FSAR and include in its revision a description of the DWI system and flow schematics, essential operational features and characteristics, and design basis of deep well injection flow rates when using reclaimed water and seawater and qualify the operational conditions for each, as expected normal operation versus peak or maximum conditions, and their justifications in modeling radiological impacts.

FPL RESPONSE:

In response to an NRC letter to FPL dated February 20, 2013, Request for Additional Information Letter No. 072 Related to SRP Section: 11.02 – Liquid Waste Management Systems for the Turkey Point Nuclear Plant Units 6 and 7 Combined License Application, FPL submitted a supplemental response to eRAI 6985 in a letter, L-2014-102, to the NRC dated April 22, 2014, "Supplemental Response to NRC Request for Additional Information Letter No. 72 (eRAI 6985) SRP Section 11.02 – Liquid Waste Management". Subsequent to that submittal, a necessary additional clarification concerning the dilution factor has been identified. As described in DCD Section 11.2.3.3, the dilution factor is "site dependent" and dilution flow rates will be selected by the plant operator "to ensure that the effluent concentration limits of 10 CFR Part 20, the annual offsite dose limits in 10 CFR 50 Appendix I, and any local requirements are continuously met." To be consistent with the DCD, this submittal provides this additional clarification to the response to Question 11.02-6-6.

There are two sources of makeup water for the circulating water system (CWS) – reclaimed water (primary) and saltwater from the radial collector wells (backup). The saltwater backup source is expected to be used not more than 60 days in any consecutive 12-month period. The saltwater backup source will be used only when the primary water source is not of sufficient quality or quantity. The deep injection well flow is comprised of the blowdown from the cooling tower circulating water system, additional dilution from the Reclaimed Water Treatment Facility (primary source only), and discharge flow from the sanitary waste treatment plant and wastewater retention basin during normal plant operation. Figure 1 depicts the proposed locations of the deep injection wells and dual zone monitoring wells.

The reclaimed water supply from the Miami Dade South District Wastewater Treatment Plant to FPL Reclaimed Water Treatment Facility is approximately 50,500 gpm (72.72 mgd). The output of the FPL Reclaimed Water Treatment Facility provides approximately 9750 gpm for future FPL use and approximately 40,686 gpm to the makeup water reservoir for use as cooling water makeup and alternate dilution flow to Units 6 & 7. The reclaimed water from the makeup water reservoir will supply the cooling towers with makeup to replace water lost through cooling tower evaporation, drift and blowdown (28,800, 7, and 9593 gpm, respectively) and a~~n~~ **nominal** alternate dilution flow rate of approximately 2286 gpm. The ~~requirement~~**need** to provide alternate dilution flow when using reclaimed water is based on a **nominal DCD-referenced** 12,000 gpm dilution flow ~~requirement~~ for two units (6000 gpm dilution flow per unit). The cooling tower blowdown flow to the blowdown sump is approximately 9714 gpm (includes 121 gpm service water tower blowdown) for both units and therefore an additional alternate dilution flow of 2286 gpm is required to supply ~~the~~**a** total **nominal DCD-referenced** 12,000 gpm ~~requirement~~**flow**. The 2286 gpm alternate dilution flow will be supplied from the makeup water reservoir to the blowdown sump.

The makeup water reservoir will have a capacity of approximately 275 to 300 million gallons of reclaimed water and consequently is capable of supplying the plant makeup and alternate dilution flow**, based on a nominal DCD-referenced dilution flow of 12,000 gpm,** ~~requirements~~ for approximately 5 days of full power operation of both units with no replenishment from the FPL Reclaimed Water Treatment Facility. The final available capacity of the makeup water reservoir will be based on the final design of the reservoir, the cooling tower supporting structures and other ancillary equipment, and may vary the total available reservoir capacity within 10 to 15 percent of the value stated above.

When using saltwater as cooling water makeup there will be sufficient blowdown from the cooling towers (approximately 58,000 gpm) to supply ~~the~~**a nominal DCD-referenced** 12,000 gpm dilution flow ~~requirement~~ and no alternate dilution is required. Reclaimed water from the makeup water reservoir may be available as an alternate supply of water when using saltwater but is not required to ~~meet the 12,000 gpm~~ **satisfy the calculated** plant effluent **minimum** dilution ~~requirements~~**factor** due to the volume of blowdown from the cooling towers. To maintain the water chemistry of the makeup water reservoir as close as possible to reclaimed water, saltwater makeup to the cooling towers will be supplied directly into the cooling tower basins and not into the makeup water reservoir.

Figure 2 is a schematic which depicts all of the waste streams relevant to the deep well injection system (DIS). Figure 2 of the RAI response will be used to replace the system description in FSAR Figure 9.2-203 and will be titled the same as Figure 2. FSAR Figure 9.2-203 has been revised to include the typical installation locations for system air/vacuum release valves, vents, and drains. The DIS piping system connecting the injection wells to the pump station has not been designed; therefore, the final location and spacing of the air/vacuum release valves, vents, and drains on the piping system have not been determined. The estimated makeup water flow rate is 38,400 gpm when reclaimed water is used for CWS makeup. Based on four cycles of concentration in the CWS and additional dilution to maintain 10 CFR Part 20 criteria (6000 gpm dilution flow per AP 1000 Unit), the resultant total flow to all of the deep injection wells is approximately 12,500 gpm (normal) and approximately 13,000 gpm (maximum) for both units. A minimum of two deep injection wells will be used resulting in estimated normal and maximum flow rate per injection well of approximately 6250 gpm and 6500 gpm, respectively.

The estimated makeup water flow rate is 86,400 gpm when saltwater is used for cooling water makeup. Based on one and a half cycles of concentration in the CWS (additional dilution of the radioactive effluent is not required), the resultant total flow to the deep injection wells is nominally 58,000 gpm (normal) and 59,000 gpm (maximum) for both units. A minimum of nine deep injection wells will be used, resulting in an estimated normal and maximum flow rate per injection well of approximately 6445 gpm and 6555 gpm, respectively.

The maximum linear injection velocity of 10 feet per second (fps) into the deep injection well is based on Florida Department of Environmental Protection (FDEP) Underground Injection Control (UIC) Rule 62-528.415(1)(f)2, F.A.C., which requires that the maximum fluid velocity of injected fluid inside an injection well not exceed a flow velocity of 10 fps except as provided by Rule 62-528.415(1)(f)3, F.A.C., which allows a velocity of 12 fps during planned testing, maintenance or emergency condition when one or more of the wells are taken out of service. While Rule 62-529.415(1)(f), F.A.C., does not specify the point of measuring the fluid injection velocity, prior FDEP practice is to base the 10 fps fluid velocity limit on the inside diameter of the final casing and not that of the FRP injection liner. Using an inside diameter of 23 inches (the inside diameter of the 24-inch outside diameter final casing), the maximum allowable injection rate into one of the proposed injection wells is calculated as follows from Reference 1:

$$V = \frac{0.4085 \times Q}{d^2} \qquad (1)$$

where V = fluid velocity in fps
Q = flow rate in gallon per minute (gpm)
d = pipe inside diameter in inches

Rearranging the equation to calculate flow rate:

$$Q = \frac{V \times d^2}{0.4085} \qquad (2)$$

Solving the equation using a fluid velocity of 10 fps and a final casing inside pipe diameter of 23 inches yields the following results:

$$Q = \frac{10 \text{ fps} \times 23 \text{ inches}^2}{0.4085} \qquad (3)$$

Q = 12,950 gpm

Therefore, the maximum allowable injection rate into a single proposed injection well in accordance with Rule 62-528.415(1)(f)2, F.A.C., is approximately 12,950 gpm, which is significantly greater than the anticipated injection rates while operating Units 6 & 7 using reclaimed or saltwater for cooling tower makeup. A minimum of two deep injection wells will be used when operating with reclaimed water, resulting in estimated normal and maximum flow rate per injection well of approximately 6250 gpm and 6500 gpm, respectively.

The estimated makeup water flow rate is 86,400 gpm when saltwater is used for cooling water makeup. Based on one and a half cycles of concentration in the CWS (additional dilution of the radioactive effluent is not required), the resultant total flow to the deep injection wells is nominally 58,000 gpm (normal) and 59,000 gpm (maximum) for both units. A minimum of nine deep injection wells will be used, resulting in an estimated normal and maximum flow rate per injection well of approximately 6445 gpm and 6555 gpm, respectively.
The actual injection velocity inside the FRP injection tubing when injecting at the maximum anticipated rate of 6555 gpm is calculated below.

$$V = \frac{0.4085 \times Q}{d^2} \qquad (4)$$

where V = fluid velocity in fps
Q = flow rate in gallon per minute (gpm)
d = pipe inside diameter in inches

Solving the equation using an injection rate of 6555 gpm and an inside pipe diameter of 16.62 inches yields the following results:

$$V = \frac{0.4085 \times 6555 \text{ gpm}}{(16.62 \text{ inches})^2} \qquad (5)$$

V = 9.7 fps

Therefore, injection fluid velocity will be approximately 10 fps inside the FRP injection tubing when operating at the maximum anticipated injection rate into a single injection well.

As discussed previously, reclaimed water is the primary source of makeup cooling water, with saltwater used as a backup. For the purposes of injectate travel in the subsurface and dose modeling for the operational life of Units 6 & 7, operational parameters such as makeup water source (reclaimed or saltwater), time period for different makeup water source use, and unit outage schedule were all considered in the analysis of radionuclide fate and transport in the subsurface. These operational flow rates serve as data input to the groundwater model used in the determination of receptor radiological dose in the response to RAI 6985, Questions 11.02-6-1 and 11.02-6-2.

As described in FPL letter L-2014-002 (Attachment page 7), FPL would maintain the required minimum dilution factor to control liquid radwaste discharges arising from the release of WLS monitor tank contents:

> "The activity concentration of the radwaste portion of the effluent would be controlled to 10 CFR Part 20, Appendix B, effluent concentration limits (ECLs) at the blowdown sump discharge by specifying and maintaining flow rates corresponding to at least the minimum dilution factor (DF). The required minimum DF is calculated and applied prior to the release of liquid radwaste (batch is the only release mode anticipated) to ensure the activity concentration of the mixture complies with 10 CFR Part 20, Appendix B, ECLs. Implementation of the liquid radwaste effluent control program will be in accordance with the Turkey Point Units 6 & 7 Offsite Dose Calculation Manual (ODCM), which will be available for inspection prior to initial fuel load as shown in FSAR Table 13.4-201."

This requirement will be added to FSAR Sections 11.2 and 11.5 as indicated in the Associated COLA Revisions section of this response.

FSAR Subsection 11.2.3.5 will be revised as part of eRAI 6985 Question 11.02-6-2. FSAR Subsection 2.4.12.2.1.3 was previously revised to state the operational range of flow rates for reclaimed water and saltwater. FSAR Subsection 9.2.12 will be added to provide injection system design and operational parameters, including flow details, essential operational features and characteristics, expected normal operation versus peak or maximum conditions, and design basis of deep well injection flow rates when using reclaimed water and seawater.

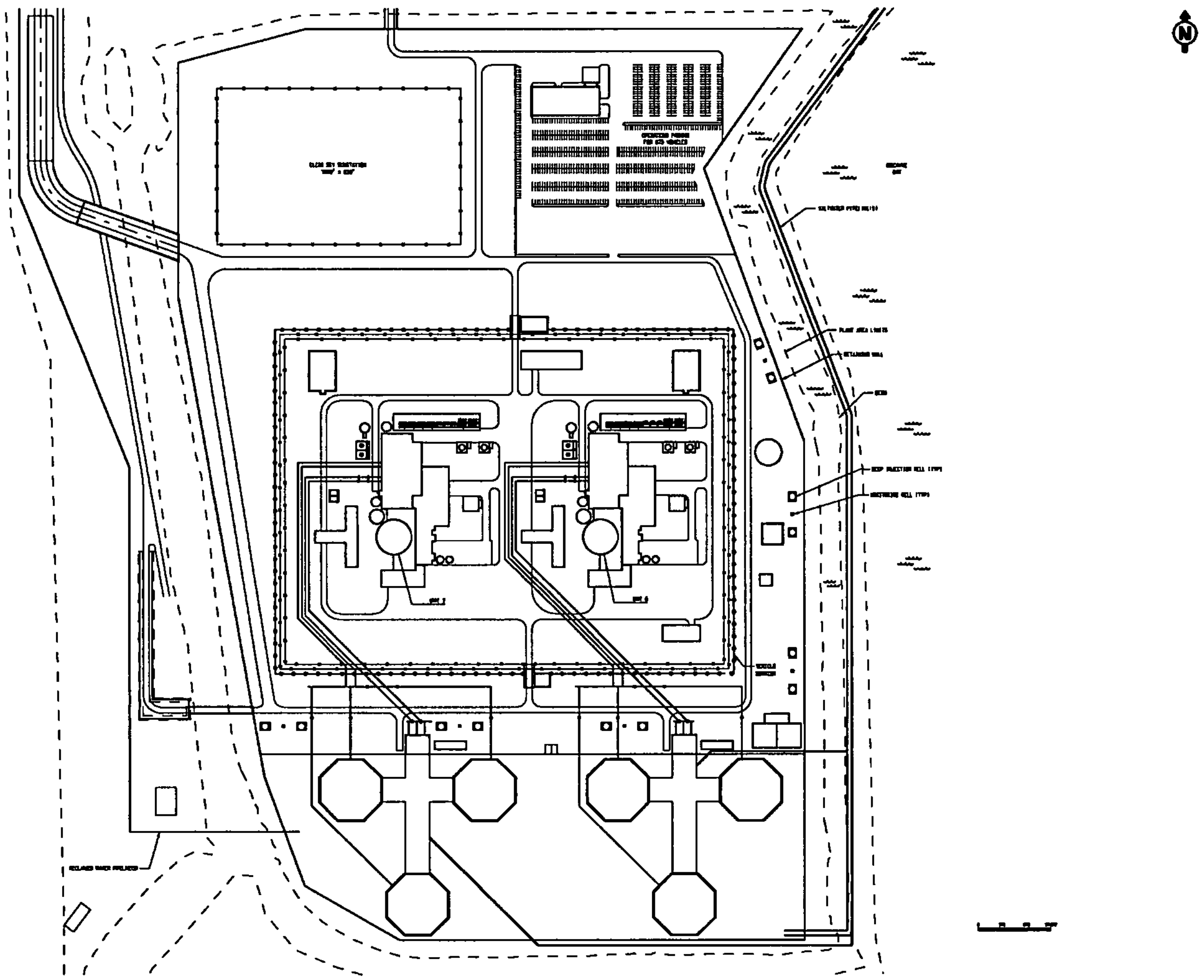

Figure 1 – Proposed Locations of Deep Injection Wells and Dual Zone Monitoring Wells

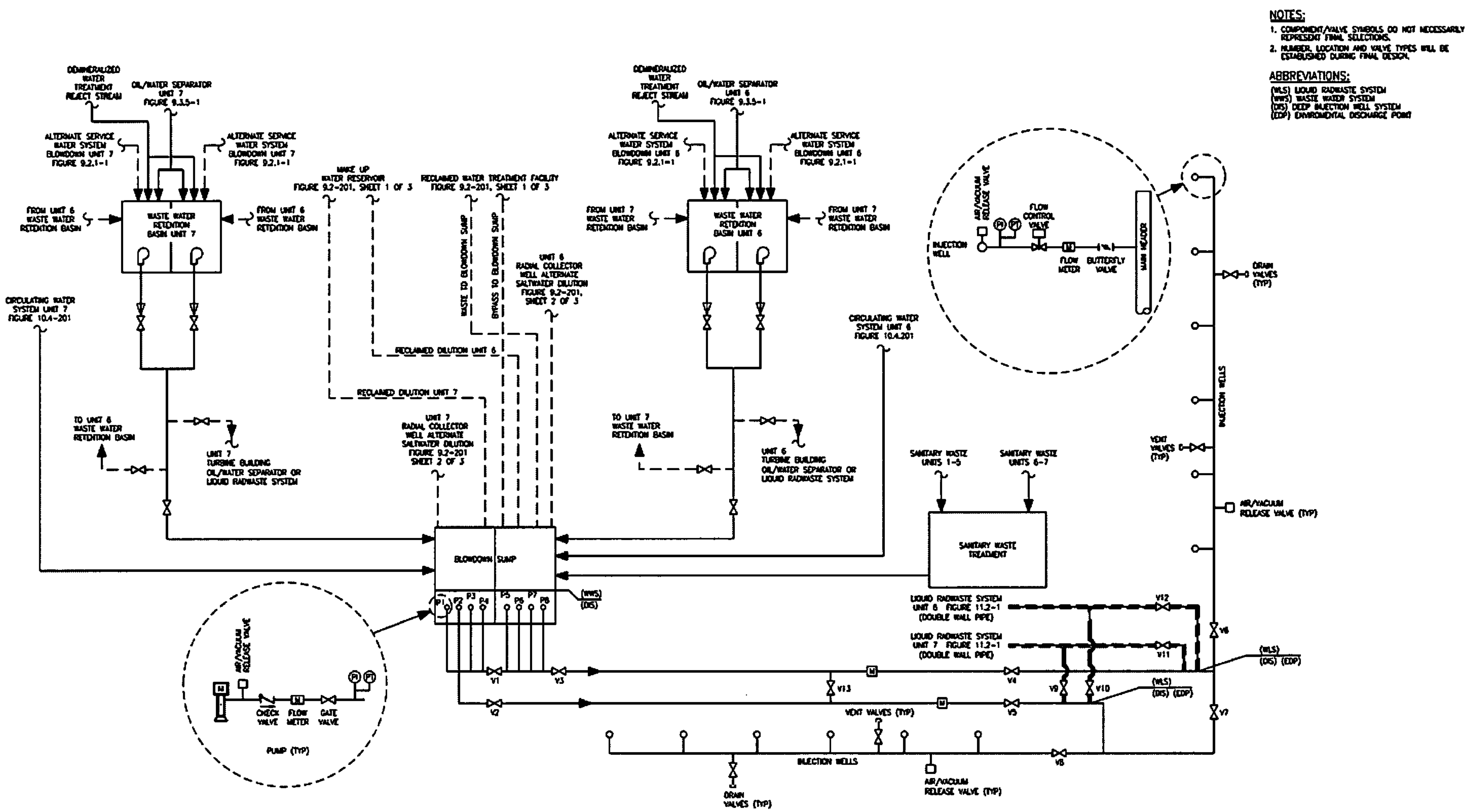

Figure 2 – Liquid Waste Stream Collection and Disposal Schematic (Typical)

This response is PLANT SPECIFIC.

References:

1. King, 1954. *Handbook of Hydraulics,* 4th Edition McGraw-Hill Book Company, Inc, page 6-2

ASSOCIATED COLA REVISIONS:

FSAR Subsection 9.2.12 was added in COLA Revision 5 as shown below. Original changes designated as COLA revisions in FPL letter L-2014-102 to the NRC dated April 22, 2014 are shown as insertions in bold red font. Further changes resulting from this supplemental response are shown by bold blue and strikethrough fonts. These changes will be made in a future COLA revision as follows:

9.2.12 DEEP WELL INJECTION SYSTEM (LMA STD DEP 1.1-1)

The DIS provides underground disposal of plant wastewater, including CWS blowdown and liquid radwaste, into the Boulder Zone. The system consists of 12 deep injection wells, 6 dual-zone monitoring wells, piping, valving, pumps, and instrumentation for system operational monitoring.

Dilution of the liquid radwaste is initiated as the radwaste enters the DIS in the discharge stream from the blowdown sump. The content of the blowdown sump is a combination of waste streams largely comprised of reclaimed water or saltwater from circulating water system blowdown during plant operation or from the alternate dilution flow paths when circulating water system blowdown is not sufficient or available for dilution. The DIS is shown in Figure 9.2-203. (LMA PTN SUP 9.2-2)

The alternate dilution flow, when using reclaimed water as the cooling water makeup source, is reclaimed water supplied from the makeup water reservoir. The makeup water reservoir is a concrete structure that contains between 275 and 300 million gallons of reclaimed water that is available for use as makeup for the cooling tower evaporative, drift, and blowdown losses and the alternate dilution flow to achieve ~~the~~a DCD-referenced nominal 12,000 gpm dilution ~~requirement~~flow. The reservoir contains approximately 5 days of makeup water to supply both units' cooling towers operating at full power.

ASSOCIATED ENCLOSURES:

None