CHAPTER 6

ENVIRONMENTAL MEASURES AND MONITORING PROGRAMS

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
μgm/m^3	micrograms per cubic meter
/Q	relative air concentration
AADT	annual average daily traffic
A/B	auxiliary building
ac	acre
AC	alternating current
ac-ft	acre-feet
ACFT	acre-feet
ACRS	advisory committee on reactor safeguards
ACSR	aluminum-clad steel reinforced
ADFGR	Alaska Department of Fish and Game Restoration
AEA	Atomic Energy Act
AEC	U.S. Atomic Energy Commission
AHD	American Heritage Dictionary
agl	above ground level
ALA	American Lifelines Alliance
ALARA	as low as reasonably achievable
AMUD	Acton Municipal Utility District
ANL	Argonne National Laboratory
ANSI	American National Standards Institute
AOO	anticipated operational occurrences
APE	areas of potential effect
APWR	Advanced Pressurized Water Reactor

ACRONYMS AND ABBREVIATIONS

ARLIS	Alaska Resources Library and Information Services
ARRS	airborne radioactivity removal system
AS	ancillary services
ASCE	American Society of Civil Engineers
AVT	all volatile treatment
AWG	American wire gauge
BAT	best available technology
bbl	barrel
BC	Business Commercial
BDTF	Blowdown Treatment Facility
BEA	U.S. Bureau of Economic Analysis
BEG	U.S. Bureau of Economic Geology
bgs	below ground surface
BLS	U.S. Bureau of Labor Statistics
BMP	best management practice
BOD	Biologic Oxygen Demand
BOP	Federal Bureau of Prisons
BRA	Brazos River Authority
bre	below reference elevation
BRM	Brazos River Mile
BSII	Big Stone II
BTI	Breakthrough Technologies Institute
BTS	U.S. Bureau of Transportation Statistics
BTU	British thermal units
BUL	Balancing Up Load

ACRONYMS AND ABBREVIATIONS

BW	Business Week
BWR	boiling water reactor
CAA	Clean Air Act
CBA	cost-benefit analysis
CBD	Central Business District
CCI	Chambers County Incinerator
CCTV	closed-circuit television
CCW	component cooling water
CCWS	component cooling water system
CDC	Centers for Disease Control and Prevention
CDF	Core Damage Frequency
CDR	Capacity, Demand, and Reserves
CEC	California Energy Commission
CEDE	committed effective dose equivalent
CEED	Center for Energy and Economic Development
CEQ	Council on Environmental Quality
CESQG	conditionally exempt small quantity generator
CFC	chlorofluorocarbon
CFE	Comisin Federal de Electricidad
CFR	Code of Federal Regulations
cfs	cubic feet per second
CFS	chemical treatment system
CG	cloud-to-ground
CGT	Cogeneration Technologies
CHL	Central Hockey League

ACRONYMS AND ABBREVIATIONS

CO	carbon monoxide
CO_2	carbon dioxide
COD	Chemical Oxygen Demand
COL	combined construction and operating license
COLA	combined construction and operating license application
CORMIX	Cornell Mixing Zone Expert System
CPI	Consumer Price Index
CPP	continuing planning process
CPS	condensate polishing system
CPNPP	Comanche Peak Nuclear Power Plant
CPSES	Comanche Peak Steam Electric Station
CRDM	control rod drive mechanism cooling system
CRP	Clean Rivers Program
CS	containment spray
Cs-134	cesium-134
Cs-137	cesium 137
CST	Central Standard Time
CST	condensate storage tank
CT	completion times
CT	cooling tower
cu ft	cubic feet
C/V	containment vessel
CVCS	chemical and volume control system
CVDT	containment vessel reactor coolant drain tank
CWA	Clean Water Act

ACRONYMS AND ABBREVIATIONS

CWS	circulating water system
DAW	dry active waste
dBA	decibels
DBA	design basis accident
DBH	diameter at breast height
DC	direct current
DCD	Design Control Document
DDT	dichlorodiphenyltrichloroethane
DF	decontamination factor
DFPS	Department of Family and Protective Services
DFW	Dallas/Fort Worth
DO	dissolved oxygen
DOE	U.S. Department of Energy
DOL	Department of Labor
DOT	U.S. Department of Transportation
DPS	Department of Public Safety
D/Q	deposition
DSHS	Department of State Health Services
DSM	Demand Side Management
DSN	discharge serial numbers
DSWD	Demand Side Working Group
DVSP	Dinosaur Valley State Park
DWS	demineralized water system
DWST	demineralized water storage tank
E	Federally Endangered

ACRONYMS AND ABBREVIATIONS

EA	Environmental Assessment
EAB	exclusion area boundary
E. coli	Escherichia coli
EDC	Economic Development Corp.
EDE	effective dose equivalent
EEI	Edison Electric Institute
EERE	Energy Efficiency and Renewable Energy
EFH	Energy Future Holdings Corporation
EFW	energy from waste
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EJ	environmental justice
ELCC	Effective Load-Carrying Capacity
EMFs	electromagnetic fields
EO	Executive Order
EOF	emergency operation facility
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EPZ	emergency planning zone
ER	Environmental Report
ERA	Environmental Resource Associates
ERCOT	Electric Reliability Council of Texas
ESA	Endangered Species Act
ESP	Early Site Permit
ESRP	Environmental Standard Review Plan

ACRONYMS AND ABBREVIATIONS

ESW	essential service cooling water
ESWS	essential service water system
F&N	Freese & Nicholas, Inc.
FAA	U.S. Federal Aviation Administration
FAC	flow-accelerated corrosion
FBC	fluidized bed combustion
FCT	Fuel Cell Today
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FFCA	Federal Facilities Compliance Act
FLMNH	Florida Museum of Natural History
FM	farm-to-market
FP	fire protection
FPL	Florida Power and Light
FPS	fire protection system
FPSC	Florida Public Service Commission
FR	Federal Register
FSAR	Final Safety Analysis Report
FSL	Forecast Systems Laboratory
ft	feet
FWAT	flow weighted average temperature
FWCOC	Fort Worth Chamber of Commerce
FWS	U.S. Fish and Wildlife Service
gal	gallon
GAM	General Area Monitoring

ACRONYMS AND ABBREVIATIONS

GAO	U.S. General Accountability Office
GDEM	Governor's Division of Emergency Management
GEA	Geothermal Energy Association
GEIS	Generic Environmental Impact Statement
GEOL	overall geological
GFD	ground flash density
GIS	gas-insulated switchgear
GIS	Geographic Information System
GMT	Greenwich Mean Time
gpd	gallons per day
gph	gallons per hour
gpm	gallons per minute
gps	gallons per second
GRCVB	Glen Rose, Texas Convention and Visitors Bureau
GST	gas surge tank
GTC	Gasification Technologies Conference
GTG	gas turbine generators
GWMS	gaseous waste management system
H-3	radioactive tritium
HC	Heavy Commercial
HCl	Hydrochloric Acid
HCP	Ham Creek Park
HEM	hexane extractable material
HEPA	high efficiency particulate air
HIC	high integrity container

ACRONYMS AND ABBREVIATIONS

HL	high-level
HNO_3	Nitric Acid
hr	hour(s)
HRCQ	highway route-controlled quantity
H_2SO_4	Sulfuric Acid
HT	holdup tank
HTC	Historic Texas Cemetery
HUC	hydrologic unit code
HUD	U.S. Department of Housing and Urban Development
HVAC	heating, ventilating, and air-conditioning
I	Industrial
I-131	iodine-131
IAEA	International Atomic Energy Agency
I&C	instrumentation and control
IEC	Iowa Energy Center
IGCC	Integrated Gasification Combined Cycle
IH	Interim Holding
in	inch
INEEL	Idaho National Engineering and Environmental Laboratory
IOUs	investor-owned electric utilities
IPE	individual plant examination
ISD	Independent School District
ISFSI	independent spent fuel storage installation
ISO	independent system operator
ISO rating	International Standards Organization rating

ACRONYMS AND ABBREVIATIONS

ISU	Idaho State University
JAMA	Journal of the American Medical Association
K-40	potassium-40
KC	Keystone Center
JRB	Joint Reserve Base
km	kilometer
kVA	kilovolt-ampere
kWh	kilowatt hour
L	LARGE
LaaR	Load Acting as a Resource
LANL	Los Alamos National Laboratory
lb	pounds
LC	Light Commercial
LG	Lake Granbury
LL	low-level
LLD	lower limits of detection
LLMW	low-level mixed waste
LNG	liquid natural gas
LOCA	loss of coolant accident
LPSD	low-power and shutdown
LPZ	low population zone
LQG	large-quantity hazardous waste generators
LRS	load research sampling
LTSA	long term system assessment
Luminant	Luminant Generation Company LLC

ACRONYMS AND ABBREVIATIONS

LVW	low volume waste
LWA	Limited Work Authorization
LWMS	liquid waste management system
LWPS	liquid waste processing system
LWR	light water reactor
M	MODERATE
ma	milliamperes
MACCS2	Melcor Accident Consequence Code System
MCES	Main Condenser Evacuation System
Mcf	thousand cubic feet
MCPE	Market Clearing Price for Energy
MCR	main control room
MD-1	Duplex
MDA	minimum detected activity
MDCT	mechanical draft cooling tower
MEIs	maximally exposed individuals
MF	Multi-Family
mG	milliGauss
mg/l	milligrams per liter
mg/m^3	milligrams per cubic meter
MH	Manufactured Housing
MHI	Mitsubishi Heavy Industries
mi	mile
mi^2	square miles
MIT	Massachusetts Institute of Technology

ACRONYMS AND ABBREVIATIONS

MMbbl	million barrels
MMBtu	million Btu
MNES	Mitsubishi Nuclear Energy Systems Inc.
MOU	municipally-owned utility
MOV	motor operated valve
MOX	mixed oxide fuel
mph	miles per hour
MSDS	Materials Safety Data Sheets
msl	mean sea level
MSR	maximum steaming rate
MSW	municipal solid waste
MT	Main Transformer
MTU	metric tons of uranium
MW	megawatts
MW	monitoring wells
MWd	megawatt-days
MWd/MTU	megawatt–days per metric ton uranium
MWe	megawatts electrical
MWh	megawatt hour
MWS	makeup water system
MWt	megawatts thermal
NAAQS	National Ambient Air Quality Standards
NAPA	Natural Areas Preserve Association
NAP	National Academies Press
NAR	National Association of Realtors

ACRONYMS AND ABBREVIATIONS

NARM	accelerator-produced radioactive material
NAS	Naval Air Station
NASS	National Agricultural Statistics Service
NCA	Noise Control Act
NCDC	National Climatic Data Center
NCDENR	North Carolina Department of Environmental and Natural Resources
NCES	National Center for Educational Statistics
NCI	National Cancer Institute
NCTCOG	North Central Texas Council of Governments
ND	no discharge
NDCT	natural draft cooling towers
NEI	Nuclear Energy Institute
NELAC	National Environmental Laboratory Accreditation Conference
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation/Council
NESC	National Electrical Safety Code
NESDIS	National Environmental Satellite, Data, and Information Service
NESW	non-essential service water cooling system
NESWS	non-essential service water system
NETL	National Energy Technology Laboratory
NHPA	National Historic Preservation Act
NHS	National Hurricane Center
NINI	National Institute of Nuclear Investigations
NIOSH	National Institute for Occupational Safety and Health

ACRONYMS AND ABBREVIATIONS

NIST	U.S. National Institute of Standards and Technology
NJCEP	NJ Clean Energy Program
NLDN	National Lightning Detection Network
NOAA	National Oceanic and Atmospheric Administration
NOAEC	no observable adverse effects concentration
NOI	Notice of Intent
NOIE	non-opt-in entities
NO_x	oxides of nitrogen
NP	Nacogdoches Power
NPDES	National Pollutant Discharge Elimination System
NPS	nonpoint source
NR	not required
NRC	U.S. Nuclear Regulatory Commission
NREL	U.S. National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NRRI	National Regulatory Research Institute
NSPS	New Source Performance Standards
NSSS	nuclear steam supply system
NTAD	National Transportation Atlas Database
NVLAP	National Voluntary Laboratory Accreditation Program
NWI	National Wetlands Inventory
NWS	National Weather Service
NWSRS	National Wild and Scenic Rivers System
O_2	Oxygen
O_3	Ozone

ACRONYMS AND ABBREVIATIONS

ODCM	Off-site Dose Calculation Manual
OECD	Organization for Economic Co-operation and Development
O&M	operations and maintenance
ORNL	Oak Ridge National Laboratory
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Act
OW	observation well
P&A	plugging and abandonment
PAM	primary amoebic meningoencephalitis
PD	Planned Development
PDL	Proposed for Delisting
PE	probability of exceedances
percent g	percent of gravity
PET	Potential Evapotranspiration
PFBC	pressurized fluidized bed combustion
PFD	Process Flow Diagram
PGA	peak ground acceleration
PGC	power generation company
PH	Patio Home
P&ID	piping and instrumentation diagram
PM	particulate matter
PM_{10}	particulate matter less than 10 microns diameter
$PM_{2.5}$	particulate matter less than 2.5 microns diameter
PMF	probable maximum flood
PMH	probable maximum hurricane

ACRONYMS AND ABBREVIATIONS

PMP	probable maximum precipitation
PMWP	probable maximum winter precipitation
PMWS	probable maximum windstorm
PPE	plant parameter envelope
ppm	parts per million
PPS	preferred power supply
PRA	probabilistic risk assessment
PSD	Prevention of Significant Deterioration (permit)
PSWS	potable and sanitary water system
PUC	Public Utility Commission
PUCT	Public Utility Commission of Texas
PURA	Public Utilities Regulatory Act
PWR	pressurized water reactors
QA	quality assurance
QC	quality control
QSE	qualified scheduling entities
R10	Single-Family Residential
R12	Single-Family Residential
R7	Single-Family Residential
R8.4	Single-Family Residential
RAT	Reserve Auxiliary Transformer
RB	reactor building
R/B	reactor building
RCDS	reactor coolant drain system
RCDT	reactor coolant drain tank

ACRONYMS AND ABBREVIATIONS

RCRA	Resource Conservation and Recovery Act
RCS	reactor coolant system
RDA	Radiosonde Database Access
REC	renewable energy credit
REIRS	Radiation Exposure Information and Reporting System
RELFRC	release fractions
rem	roentgen equivalent man
REMP	radiological environmental monitoring program
REP	retail electric providers
REPP	Renewable Energy Policy Project
RFI	Request for Information
RG	Regulatory Guide
RHR	residual heat removal
RIMS II	regional input-output modeling system
RMR	Reliability Must-Run
Rn_{222}	Radon-222
RO	reverse osmosis
ROI	region of interest
ROW	right of way
RPG	regional planning group
RRY	reactor reference year
RTHL	Recorded Texas Historic Landmarks
RTO	regional transmission organization
Ru-103	ruthenium-103
RW	test well

ACRONYMS AND ABBREVIATIONS

RWSAT	refueling waste storage auxiliary tank
RWST	refueling water storage tank
RY	reactor-year
S	SMALL
SACTI	Seasonal/Annual Cooling Tower Impact Prediction Code
SAL	State Archaeological Landmark
SAMA	severe accident mitigation alternative
SAMDA	severe accident mitigation design alternative
SB	Senate Bill
SCR	Squaw Creek Reservoir
SCDC	Somervell County Development Commission
scf	standard cubic feet
SCWD	Somervell County Water District
SDS	sanitary drainage system
SECO	State Energy Conservation Office
SER	Safety Evaluation Report
SERC	SERC Reliability Corporation
SERI	System Energy Resources, Inc.
SFPC	spent fuel pool cooling and cleanup system
SG	steam generator
SGBD	steam generator blow-down
SGBDS	steam generator blow-down system
SGs	steam generators
SGTR	steam generator tube rupture
SH	State Highway

ACRONYMS AND ABBREVIATIONS

SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SMP	State Marketing Profiles
SMU	Southern Methodist University
SOP	Standard Operations Permit
SO_2	sulfur dioxide
SO_x	sulfur
SPCCP	Spill Prevention Control and Countermeasures Plan
SPP	Southwest Power Pool
SQG	small-quantity generators
sq mi	square miles
SRCC	Southern Regional Climate Center
SRP	Standard Review Plan
SRST	spent resin storage tank
SSAR	Site Safety Analysis Report
SSC	structures, systems, and components
SSI	Safe Shutdown Impoundment
SSURGO	Soil Survey Geographic
SWATS	Surface Water and Treatment System
SWMS	solid waste management system
SWPC	spent fuel pool cooling and cleanup system
SWP3	Storm Water Pollution Prevention Plan
SWS	service water system
SWWTS	sanitary wastewater treatment system
T	Federally Threatened

ACRONYMS AND ABBREVIATIONS

t	ton
TAC	technical advisory committee
TAC	Texas Administrative Code
TB	turbine building
Tc_{99}	Technetium-99
TCEQ	Texas Commission on Environmental Quality
TCPS	Texas Center for Policy Studies
TCR	transmission congestion rights
TCS	turbine component cooling water system
TCWC	Texas Cooperative Wildlife Collection
T&D	transmission and distribution utility
TDCJ	Texas Department of Criminal Justice
TDOH	Texas Department of Health
TDOT	Texas Department of Transportation
TDPS	Texas Department of Public Safety
TDS	total dissolved solids
TDSHS	Texas Department of State Health Services
TDSP	transmission and distribution service provider
TDWR	Texas Department of Water Resources
TEDE	total effective dose equivalent
TGLO	Texas General Land Office
TGPC	Texas Groundwater Protection Committee
TH	Townhome
THC	Texas Historical Commission
THPOs	tribal historic preservation officers

ACRONYMS AND ABBREVIATIONS

TIS	Texas Interconnected System
TLD	Thermoluminescence Dosemeter
TMDLs	total maximum daily loads
TMM	Texas Memorial Museum
TOs	Transmission Owners
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
tpy	tons per year
TRAGIS	Transportation Routing Analysis Geographic Information System
TRB	Transportation Research Board
TRC	total recordable cases
TRE	Trinity Railway Express
TSC	technical support center
TSD	thunderstorm days per year
TSD	treatment, storage, and disposal
TSDC	Texas State Data Center
TSHA	Texas State Historical Association
TSP	transmission service provider
TSWQS	Texas Surface Water Quality Standards
TSS	total suspended sediment
TTS	The Transit System (Glen Rose)
TUGC	Texas Utilities Generating Company
TUSI	Texas Utilities Services Inc.
TWC	Texas Workforce Commission
TWDB	Texas Water Development Board

ACRONYMS AND ABBREVIATIONS

TWR	Texas Weather Records
TWRI	Texas Water Resources Institute
TxDOT	Texas Department of Transportation
TXU	Texas Utilities Corporation
TXU DevCo	TXU Generation Development Company LLC
UC	University of Chicago
UFC	uranium fuel cycle
UHS	Ultimate Heat Sink
UIC	Uranium Information Center
UO_2	uranium dioxide
USACE	U.S. Army Corps of Engineers
US-APWR	(MHI) United States-advanced pressurized water reactor
USC	U.S. Census
USCA	United States Court of Appeals
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey
USHCN	United States Historical Climatology Network
USHR	U.S. House of Representatives
USNPS	U.S. National Park Service
UTC	Universal Time Coordinated
UV	ultra-violet
VCIS	Ventilation Climate Information System

ACRONYMS AND ABBREVIATIONS

VCT	volume control tank
VERA	Virtus Energy Research Associates
VFD	Volunteer Fire Department
VOC	volatile organic compound
VRB	variable
WB	Weather Bureau
WBR	Wheeler Branch Reservoir
WDA	work development area
WDFW	Washington Department of Fish and Wildlife
weight percent	wt. percent
WHT	waste holdup tank
WMT	waste monitor tank
WNA	World Nuclear Association
WPP	Watershed Protection Plan
WQMP	Water Quality Management Plan
WRE	Water Resource Engineers, Inc.
WWS	wastewater system
WWTP	wastewater treatment plant
yr	year

CHAPTER 6

ENVIRONMENTAL MEASURES AND MONITORING PROGRAMS

6.0 ENVIRONMENTAL MEASURES AND MONITORING PROGRAMS

This chapter presents the details of the environmental monitoring programs that are instituted for the periods prior to application submission (preapplication), during construction, prior to operation (preoperational), and during operation of Comanche Peak Nuclear Power Plant (CPNPP) Units 3 and 4. These monitoring programs establish a baseline of information that allows for the evaluation of future information and provides a method of quantifying the environmental effects of CPNPP Units 3 and 4 operations.

The environmental measurements and monitoring programs are described in the following sections:

Thermal Monitoring (Section 6.1).

Radiological Monitoring (Section 6.2).

Hydrological Monitoring (Section 6.3).

Meteorological Monitoring (Section 6.4).

Ecological Monitoring (Section 6.5).

Chemical Monitoring (Section 6.6).

Summary of Monitoring Programs (Section 6.7).

6.1 THERMAL MONITORING

The following subsections discuss thermal monitoring activities related to the preapplication, preoperational, and operational phases of the CPNPP Units 3 and 4. The Texas Commission on Environmental Quality (TCEQ) can incorporate thermal monitoring requirements into wastewater discharge permits to ensure compliance with the National Pollution Discharge Elimination System (NPDES). Luminant Generation Company LLC (Luminant) has a current Texas Pollution Discharge Elimination System (TPDES) permit, Permit Number WQ0001854000, which is used in this section to provide examples of waste streams that may require monitoring (TCEQ 2004). The operational water supply for CPNPP Units 3 and 4 is to be withdrawn from Lake Granbury. Current conceptual design plans for CPNPP Units 3 and 4 show the circulation water system (CWS) and service water system (SWS) blowdown discharging to Lake Granbury, and the nonradioactive wastewater, the liquid low-level radioactive process water, stormwater, and sanitary outflows discharging to Squaw Creek Reservoir (SCR). Potable water is planned to be supplied by Wheeler Branch Reservoir (WBR). As a result of the differing water supply sources and discharge points, monitoring points, and wastewater outfalls, changes to the existing permit for CPNPP Units 1 and 2 are planned. Activities to amend the site’s TPDES wastewater permit are currently planned for 2008.

The TCEQ typically reviews historical thermal data on the receiving water, outfall discharge volume and temperature to independently model the thermal plume geometry and behavior as part of their permit modification process. Luminant has completed several Cormix Mixing Zone Expert System (CORMIX) modeling runs, which indicate that Lake Granbury is not significantly impacted by the thermal discharge of plant wastewater. The CORMIX modeling parameters and results are provided in Subsections 5.2.3.1, 5.2.3.3, and 5.3.2.1.

The CPNPP Units 1 and 2 have been operational since April 17, 1990, and April 6, 1993, respectively. As a result, operational processes, such as water intake, wastewater generation and discharge, are known and permitted (TCEQ 2004). However, the operational water for CPNPP Units 3 and 4 is to be supplied from Lake Granbury and not SCR, as with CPNPP Units 1 and 2. Because CPNPP Units 3 and 4 use a new source of operational water; that is, Lake Granbury, modification of the current TPDES permit and new monitoring locations is necessary. Permit modification activities are currently planned for 2008 and are expected to identify additional discharge outfalls, monitoring points, and sampling parameters as applicable.

Several sections of this report contain details related to regional hydrology (Subsection 2.3.1) including historical, current, and future water use, and anticipated water uses including cooling water at, and discharges from, CPNPP Units 3 and 4 and potential pollutant sources (Subsections 2.3.2, 2.3.3, and Sections 3.3, 3.6, and 5.5). Also included in this report are details related to baseline thermal monitoring programs that can be used to describe the CPNPP Units 3 and 4 thermal impacts Subsections 5.2.3.1, 5.2.3.3, and 5.3.2.1.

Information and maps of the plant, site, regional hydrology, water usage, water bodies, and thermal baselines are provided in the Final Safety Analysis Report (FSAR) Section 2.4 (Figures 2.4.1-205 and 2.4.1-208, and Table 2.4.1-202) and ER Subsection 2.3.1.2.5 (Figures 2.3-13, 2.3-17 and Tables 2.3-22, 2.3-23, and 2.3-24). Information on, and maps showing, the location of thermal, hydrological, or aquatic biological monitoring stations, as well as the predicted extent of the thermal plume are provided in Section 2.3 (Figures 2.3-10, 2.3-12, 2.3-13, 2.3-16, 2.3-17 and

2.3-20), Sections 2.4 and 4.3, Section 5.3 (Figures 5.3-2, 5.3-3 and 5.3-4, and Tables 5.3-1, 5.3-2 and 5.3-4), Section 5.6 and Section 6.3 (Figures 6.3-1 and 6.3-2).

Consultations with the TPDES authority, TCEQ, have been initiated and are expected to continue throughout COLA preapplication, preoperational, and operational phases of the project.

6.1.1 PREAPPLICATION MONITORING

Modeling of the anticipated thermal effects of cooling system discharges from the operation of CPNPP Units 3 and 4 on Lake Granbury was conducted using CORMIX2 (CORMIX 2007). The details and results of this modeling are provided in Subsection 5.3.2.1. The results of one year of quarterly surfacewater sampling, conducted at 10 points in the vicinity of the expected intake and outfall points at Lake Granbury (beginning in April 2007 and ending in January 2008) are presented in Subsection 2.3.3.1.2 (Tables 2.3-26 and 2.3-46). Quarterly surfacewater samples were analyzed in the field using a YSI multi-parameter meter (model 6820) to measure temperature, conductivity, total dissolved solids (TDS), dissolved oxygen (DO), pH, oxidation-reduction potential (ORP), and turbidity. Samples were also submitted to a commercial laboratory for additional analysis. The results of the field and laboratory analysis are provided in Tables 2.3-26 and 2.3-46. The preoperational baseline thermal monitoring data that were input to the CORMIX model reflect actual Lake Granbury conditions in the vicinity of the anticipated intake and outfall locations. The data are adequate to support the environmental descriptions provided in Section 2.3 and the impact analyses detailed in Sections 5.2 and 5.3. The following factors were used to determine the location and number of monitoring stations:

- Bathymetric characteristics in the vicinity of the site (Subsection 2.3.1 and FSAR Subsection 2.4.1) (Boss 2007).
- Cooling system employed and its probable operating modes (Section 3.4).
- Transient hydrological parameters in the vicinity of the site (Section 2.3).
- Vertical and horizontal temperature geometry of Lake Granbury in the vicinity of the intake and outfall locations are described in Subsections 2.3.1, 5.3.1 and 5.3.2. Analytical results of water samples taken from Lake Granbury for conductivity analysis indicate that the water has a slightly saline classification (EPA 1985).

The TCEQ was consulted to determine if any other parameters should be considered in the preapplication monitoring program. The TCEQ did not suggest analyzing any additional parameters other than those already being monitored. The TCEQ concurred with the approach used to determine the appropriate parameters that must be considered for the preapplication monitoring program.

6.1.2 PREOPERATIONAL MONITORING

The preoperational thermal monitoring program is intended to supplement the preapplication monitoring in providing a baseline water temperature database. Modeling of the anticipated thermal effects of cooling system discharges from operation of CPNPP Units 3 and 4 on Lake Granbury was conducted using CORMIX, version 5.0. The details and results of this CORMIX modeling analysis are presented in Subsection 5.3.2.1. The following items were considered when the modeling was performed:

- Temporal variations of Lake Granbury Reservoir (an impoundment of the Brazos River) were taken into account. To adequately consider temporal variations, CORMIX thermal plume modeling and analysis were conducted to represent conditions of low, mean, and high river temperatures for average and low downstream flow (Subsection 5.3.2.1).
- Seasonal temperature variations of the blowdown discharge were considered when conducting CORMIX thermal plume modeling and analysis. The temperature of the blowdown from the mechanical draft cooling towers varies with ambient temperature, relative humidity, heat load, and lake water temperature. The blowdown water temperature may be less than the Lake Granbury water temperature in July and August and may be greater than Lake Granbury water temperature in January. The smallest temperature differential is expected in July and August when lake temperatures are the highest.
- Internal data-quality boundaries contained within the CORMIX program check and limit input values to ensure that the model's capabilities are not exceeded, and that accurate outputs are generated. The program rejects and produces error indicators for data input values that are outside the boundaries of the model's limits and warns the user of questionable input parameters.
- Average, extreme extent, and enclosed surface area of the limiting excess temperature isotherms, as established by TCEQ, in comparison with background and baseline data were considered. CORMIX modeling for the maximum temperature differential conditions; that is, the low river temperature downstream flow, determined the surface area within a 5°F temperature isotherm to be approximately 270 sq ft. In addition, CORMIX modeling results indicated that the thermal plume temperature would be below the current TPDES limit of 93°F (Outfall 005 to Lake Granbury) within a 100-ft mixing zone as required by TCEQ.

The results of the CORMIX modeling were used to predict biological impacts of the discharge that include time-temperature relationships. Subsection 5.3.2.2 provides details related to biological impacts of discharge including seasonal and time-temperature variations.

The TCEQ was consulted to determine if any other parameters should be considered in the preoperational monitoring program. The TCEQ concurred with the approach used to determine the appropriate parameters that must be considered for the pre-operational monitoring program. Luminant expects the TCEQ to independently conduct and confirm the CORMIX modeling results associated with discharges from CPNPP Units 3 and 4, as detailed above (Luminant 2007).

The thermal monitoring requirements listed in the existing TPDES permit were developed for once-through cooling discharge to SCR. The current discharge return pipeline from CPNPP Units 1 and 2 has not been utilized since the units have been in operation. As mentioned previously, due to the addition of CPNPP Units 3 and 4, the current TPDES permit is expected to be modified to include a new outfall location for each of the two units discharging to Lake

Granbury. These outfall locations on Lake Granbury are expected to be in the vicinity of the current SCR discharge pipe (Outfall 005), which is approximately 600 ft upstream of De Cordova Dam (Figure 2.3-13).

6.1.3 OPERATIONAL MONITORING

The operational monitoring program is designed to detect changes in water temperature resulting from plant operation. The current CPNPP TPDES permit, Permit Number WQ0001854000, for CPNPP Units 1 and 2, establishes routine thermal monitoring of discharges to SCR. Specifically, discharges through Outfall 001, mainly discharges from the circulating and other wastewater systems that discharge through other described outfalls, must be monitored for temperature. The existing current daily average and daily maximum temperature limits for discharges made through Outfall 001 are 113°F and 116°F, respectively (TCEQ 2004). The permit requires that discharges made through Outfall 001 be continually monitored for temperature through a continuous recording device (TCEQ 2004). Under the current TDPES permit temperature limit for discharge to Lake Granbury is 93°F (Outfall 005). Monitoring requirements similar to those for CPNPP Units 1 and 2 are anticipated for CPNPP Units 3 and 4.

The existing TPDES permit is sufficient for the continued operation of CPNPP Units 1 and 2 but a permit amendment is required for a new wastewater outfall for each of the CPNPP Units 3 and 4. Modification of the existing TPDES permit is anticipated to establish sampling requirements and outfall locations for CPNPP Units 3 and 4. The TPDES permit will be amended as required to support Units 3 and 4 construction activities. Anticipated chemicals used and residual concentrations within the waste stream discharged from CPNPP Units 3 and 4 are listed in Subsection 3.6.1.

The monitoring equipment to be used would be selected based on permit requirements. It is expected that the monitoring equipment used at CPNPP Units 3 and 4 would be identical or similar to equipment currently used at CPNPP Units 1 and 2.

Required data analysis procedures are developed through consultation with the TCEQ and implemented at the time of permit modification.

Thermal monitoring during the operational phase of the project would comply with approved regulatory permits and requirements. Water temperatures from CPNPP Units 3 and 4 are expected to meet applicable federal and state environmental regulatory requirements. CPNPP Units 3 and 4 would use surfacewater from Lake Granbury, a public reservoir, for system operation. The existing operational units, CPNPP Units 1 and 2, would use surfacewater supplied by the SCR, a privately owned reservoir, and are permitted accordingly. In addition, CPNPP is permitted by the Brazos River Authority (BRA) to withdraw up to 48,300 ac-ft of water from Lake Granbury as makeup to SCR (BRA 1999).

6.1.4 REFERENCES

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(BRA 1999) Brazos River Authority, Contract CP-20 Water Allocation, TXU Electric Company, Comanchce Peak Steam Electric Station, October 15, 1999.

(CORMIX 2007) CORMIX Mixing Zone Model, http://www.cormix.info/index.php, Accessed October 11, 2007.

(EPA 1985) Environmental Protection Agency, Seminar Publication, Protection of Public Water Supplies from Ground-Water Contamination, Center for Environmental Research Information, Cincinnati, Ohio, September 1985.

(Jirka, Doneker, and Hinton 1996) G. H. Jirka, Doneker, R. L., and S. W. Hinton. User's Manual for CORMIX: A Hydrodynamic Mixing Zone Model and Decision Support System for Pollutant Discharges into Surface Waters. Office of Science and Technology, U.S. Environmental Protection Agency. Washington, DC. September 1996.

(Luminant 2007) Texas Commission on Environmental Quality (TCEQ) Meeting Minutes, Luminant, Comanche Peak Nuclear Power Plant, August 23, 2007.

(TCEQ 2004) Texas Commission on Environmental Quality Texas Pollutant Discharge Elimination System Permit, TXU Energy Company, L.L.C., Comanche Peak Nuclear Power Plant, Permit No.WQ0001854000. April 23, 2004.

6.2 RADIOLOGICAL MONITORING

The Radiological Environmental Monitoring Program (REMP) in place at CPNPP provides the data necessary to characterize the radiological environment of the biosphere of the site and vicinity, provides measurable levels of radiation and radioactive materials of the site and vicinity, and provides baseline data on the exposure pathways. The program continues to provide data necessary to evaluate the effectiveness of the controls placed on radioactive releases from CPNPP. The REMP has the flexibility to expand based on sample results, changes in population and land usage, and future regulatory requirement changes. The REMP is required for continued operation of CPNPP Units 1 and 2 and supports the construction and operation of CPNPP Units 3 and 4.

6.2.1 CURRENT RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM BASIS

The existing REMP is described in the CPNPP Off-site Dose Calculation Manual (ODCM) and is discussed in the following subsections (CPSES 2006).

6.2.2 CURRENT RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM CONTENTS

The REMP has been in place since 1981 to include preoperational data. The measurement of radiation levels, concentrations, and quantities of radioactive materials is used to evaluate potential exposures and doses to members of the public, and to evaluate any impact on the local environment.

The following radiation exposure pathways are monitored:

- Direct radiation (thermoluminescent dosimetry).
- Airborne activity (gross beta, radioactive iodines, and radioactive particulates).
- Waterborne activity (surfacewater, surface drinking water, groundwater, and shoreline sediment).
- Ingestion (milk, fish, food products [broadleaf, garden produce and commercial food crops]).

Radioactive liquids are filtered, treated, sampled prior to discharge, and monitored continuously during release. The principal release pathway for radioactive liquids is via the circulating water discharge piping where radioactive liquids are introduced into the circulating water flow for dilution prior to release into SCR.

Radioactive gases from the plant are stored in gas surge tanks, treated by charcoal delay beds for radioactive decay, sampled prior to or during release and monitored continuously during release. Radioactive gases are designed to exit the plant through the plant ventilation stacks.

Radioactive solids are collected and packaged prior to removal from the plant, then temporarily stored on-site until they are safely shipped to the appropriate disposal site.

Sample results from the REMP are evaluated to determine the potential effects of all types of radioactive releases from CPNPP to the general public and on the environment surrounding the site. Release pathways from CPNPP Units 3 and 4 are similar to CPNPP Units 1 and 2 release pathways. The radioactive liquid effluents from all four units use the same outfall for release to the environment; SCR. As a precaution to prevent the buildup of the tritium concentration in SCR, an evaporation pond is being constructed that can receive a portion of the radioactive liquid released from CPNPP Units 3 and 4 should it be necessary to control SCR tritium concentration. The radioactive gaseous releases are released to the environment from each of the plant vent stacks. CPNPP Units 3 and 4 have continuous releases whereas Units 1 and 2 use hold and release design (Units 3 and 4 holdup is by transit time through carbon filters). The monitoring program is a quality-related program conducted by qualified technicians, controlled by approved procedures, and is designed to continue to provide the data necessary to determine the effects on the environment and to the population in the vicinity.

Figures 6.2-1 and 6.2-2 show existing REMP sampling locations. Each sample location is evaluated and selected based on the requirements of the ODCM. The sample locations selected are based on factors such as regulatory requirements, population, accessibility, distance, prevalent wind patterns, permission of landowners, and power availability (CPSES 2006). One sample location is currently located in the site area that is used for the construction of the new cooling towers. This location is expected to collect data until the construction activities require its retirement from use. CPNPP has committed to locating a new area in the same general area (sector and distances as appropriate) and sampling the same exposure pathways. This new area is expected to be established at least one year prior to the retirement of the original location so that overlapping data can be compared. The new location is established in accordance with the requirements of the ODCM and reported in the Annual Radiological Environmental Operating Report.

Tables 6.2-1, 6.2-2, 6.2-3, 6.2-4, 6.2-5, 6.2-6, and 6.2-7 provide details of the current radiation exposure pathways monitored by listing the sample designation, the sample location, the type of analysis, and the frequency of monitoring. The lower limits of detection used for the analysis of sample media are described in detail in the ODCM, and the levels of detection achieved are reported, with each sample result obtained from the vendor laboratory (CPSES 2006) and (CPSES 2006a). Any deviation from the required level of detection is included in the annual report to the NRC.

Trending and comparison reviews of analyzed data provide information regarding changes in natural background levels and provide an indication of possible effects of radiological releases if detected in the environment. The program monitors the effectiveness of plant design and operational controls of radioactive releases to ensure the exposure and dose to members of the public are as low as reasonably achievable (ALARA). The new reactor units and a new radioactive waste temporary storage facility are located within the site boundaries and their locations would be adequately covered by existing REMP locations. There is no need to modify the current location except for the one location mentioned above that is within the cooling tower footprint. The replacement location is in the appropriate sector and contains annual and quarterly dose information to ensure off-site doses are monitored and that they are within the limits required.

6.2.3 CURRENT RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM REPORTING

Each Annual Radiological Environmental Operating Report submitted to the NRC is in accordance with the requirements of the ODCM. Each Annual Radiological Environmental Operating Report that is submitted contains the detailed results of the radiological analysis performed in support of the program and provides results of the quality assurance related inter-laboratory comparison programs of the third-party laboratory as well as any results or problems encountered during the reporting period that are significant.

The REMP requires an annual land-use census that contains the latest details on sample locations, recent changes in the sampling program, population distributions, garden locations, milk animal locations, and resulting changes in atmospheric dispersion factor X/Qs and deposition factor D/Qs if necessary. The land-use census is also used to monitor for changes in hazardous materials stored in the surrounding area to support control room habitability and emergency planning operations. A copy of each land-use census is included as an attachment to the Annual Radiological Environmental Operating Report (CPSES 2006), (CPSES 2006a), and (CPSES 2005).

6.2.4 LABORATORY ACCREDITATION SUPPORTING ANALYTICAL RESULTS

The CPNPP is a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory for thermoluminescent dosimetry; therefore, all environmental dosimetry is processed at CPNPP. The NVLAP accreditation is maintained at all times and the CPNPP program is periodically audited and certified.

The program provides for a quality assurance check of the third-party vendor laboratory that provides the remainder of the radiological environmental analysis by participation in multiple inter-laboratory comparisons and cross-check programs. These programs include the Environmental Crosscheck Program by Analytics, Inc., the National Institute of Standards and Technology (NIST) Measurement Assurance Program, the Environmental Resources Associates (ERA) Proficiency Test, the Department of Energy (DOE) Quality Assessment Program, and the Mixed Analyte Performance Evaluation Program (CPSES 2006a).

6.2.5 PREOPERATIONAL AND OPERATIONAL RADIOLOGICAL MONITORING PROGRAM RESULTS

The preoperational and operational radiological environmental monitoring conducted at CPNPP has collected and analyzed significant numbers of samples over the 25 years that the program has been in place. The program is audited routinely by regulatory agencies, CPNPP Quality Assurance personnel, and peer evaluators to ensure quality of results. The program produces results consistent with the design and goals of the program. The dose to members of the public is maintained ALARA.

Over the years of monitoring, there have been no sample results of radiological nuclides present in quantities greater than the lower limits of detection (LLD) requirements found in the environs of CPNPP that are not naturally occurring except for the following findings:

- Radioactive tritium (H-3) is found in SCR (CPSES 2006a).
- Several sample results of radiological nuclides present in quantities greater than the LLD requirements are directly associated with the radioactive materials released from the 1986 Chernobyl accident (Elevated gross beta radioactivity levels were measured from May 7, 1986 through June 4, 1986. The second quarter air particulate composite had measurable levels of Ruthenium-103 [Ru-103], Cesium-134 [Cs-134], and Cesium-137 [Cs-137]. Iodine-131 [I-131] was measured in weekly air cartridges from May 7, 1986 through May 28, 1986. I-131 was also measured in two milk samples collected May 27, 1986) (CPSES 1987).
- Cs-137 was reported during both the preoperational and operational phases of the program in both broadleaf and shoreline sediments (CPSES 2006a).

The SCR contains tritium that is directly attributable to radioactive effluent releases at the CPNPP site. The measured level of tritium varies due to many different factors such as rainfall, makeup water, type of fuel, boron enrichment, and time in reactor core life. Reported values indicate that the tritium level is approaching equilibrium and currently varies around the 13,050 pCi/l range (average value for the eight quarterly samples collected in 2005). SCR is not used as a drinking water source (no drinking water pathway) and therefore, the 30,000 pCi/l reportable limit applies. (CPSES 2006), (CPSES 2006a) and (CPSES 1998).

Sample results of radiological nuclides present in quantities greater than the LLD requirements have been obtained from naturally occurring nuclides such as Potassium-40 (K-40), and the results are consistent with preoperational values. Sample results of radiological nuclides present in quantities greater than the LLD requirements for Cs-137 have been found in all phases of the program, both preoperational and operational. While values for Cs-137 are occasionally reported, no reactor-produced nuclides other than Cs-137 have been detected. Based on this data, Cs-137 can not positively be identified as being from radioactive effluent releases at the CPNPP site exclusively (CPSES 2006a) and (CPSES 2005).

The SCR tritium is the only radioactive nuclide reported in the environs of CPNPP that is directly attributable to the radioactive releases from CPNPP (CPSES 2006a). It is both expected and within regulatory limits. Access to SCR is through Squaw Creek Park for recreational activity. The SCR will be open to the public for full recreational uses with controlled access. The SCR is restricted in use, because no drinking water source is allowed from the reservoir.

6.2.6 REFERENCES

(CPSES 2006) Comanche Peak Steam Electric Station Off-site Dose Calculation Manual Units 1 and 2, Revision 26, December 2006.

(CPSES 2006a) Comanche Peak Steam Electric Station, Annual Radiological Environmental Operating Report For 2005, March 30, 2006.

(CPSES 1987) Texas Utilities Generating Company. Comanche Peak Steam Electric Station. Radiological Environmental Monitoring Program 1986 Annual Report. Teledyne Isotopes, April 15, 1987.

(CPSES 2005) Comanche Peak Steam Electric Station. Land Use Census 2005.

(CPSES 1998) Comanche Peak Steam Electric Station, Technical Evaluation 98-228, Squaw Creek Reservoir Tritium Activity, Scott E. Bradley, March 30, 1998.

TABLE 6.2-1 (Sheet 1 of 2)
REMP SAMPLING STATIONS FOR DIRECT RADIATION

Sample Designation	Sample Location (Direction-Distance mi)	Analysis Performed (all by TLD)	Frequency
R1	N-1.5 (Squaw Creek Park)	Direct Radiation	Quarterly and Annual
R2	N-4.4	Direct Radiation	Quarterly and Annual
R3	N-6.5	Direct Radiation	Quarterly and Annual
R4	N-9.4 (Granbury)	Direct Radiation	Quarterly and Annual
R5	NNE-1.1	Direct Radiation	Quarterly and Annual
R6	NNE-5.7	Direct Radiation	Quarterly and Annual
R7	NE-1.7	Direct Radiation	Quarterly and Annual
R8	NE-4.8	Direct Radiation	Quarterly and Annual
R9	ENE-2.5	Direct Radiation	Quarterly and Annual
R10	ENE-5.0	Direct Radiation	Quarterly and Annual
R11	E-0.5	Direct Radiation	Quarterly and Annual
R12	E-1.9	Direct Radiation	Quarterly and Annual
R13	E-3.5 (Children’s Home)	Direct Radiation	Quarterly and Annual
R14	E-4.2	Direct Radiation	Quarterly and Annual
R15	ESE-1.4	Direct Radiation	Quarterly and Annual
R16	ESE-4.7	Direct Radiation	Quarterly and Annual
R17	SE-1.3	Direct Radiation	Quarterly and Annual
R18	SE-3.9	Direct Radiation	Quarterly and Annual
R19	SE-4.6	Direct Radiation	Quarterly and Annual
R20	SSE-1.3	Direct Radiation	Quarterly and Annual
R21	SSE-4.4 (Glen Rose)	Direct Radiation	Quarterly and Annual
R22	SSE-4.5 (Glen Rose)	Direct Radiation	Quarterly and Annual

TABLE 6.2-1 (Sheet 2 of 2)
REMP SAMPLING STATIONS FOR DIRECT RADIATION

Sample Designation	Sample Location (Direction-Distance mi)	Analysis Performed (all by TLD)	Frequency
R23	S-1.5	Direct Radiation	Quarterly and Annual
R24	S-4.2	Direct Radiation	Quarterly and Annual
R25	SSW-1.1	Direct Radiation	Quarterly and Annual
R26	SSW-4.4 (State Park)	Direct Radiation	Quarterly and Annual
R27	SW-0.9	Direct Radiation	Quarterly and Annual
R28	SW-4.8	Direct Radiation	Quarterly and Annual
R29	SW-12.3 (Control)	Direct Radiation	Quarterly and Annual
R30	WSW-1.0	Direct Radiation	Quarterly and Annual
R31	WSW-5.4	Direct Radiation	Quarterly and Annual
R32	WSW-7.0 (Control)	Direct Radiation	Quarterly and Annual
R33	W-1.0	Direct Radiation	Quarterly and Annual
R34	W-2.0	Direct Radiation	Quarterly and Annual
R35	W-5.5	Direct Radiation	Quarterly and Annual
R36	WNW-1.0	Direct Radiation	Quarterly and Annual
R37	WNW-5.0	Direct Radiation	Quarterly and Annual
R38	WNW-6.7	Direct Radiation	Quarterly and Annual
R39	NW-1.0	Direct Radiation	Quarterly and Annual
R40	NW-5.7	Direct Radiation	Quarterly and Annual
R41	NW-9.9 (Tolar)	Direct Radiation	Quarterly and Annual
R42	NNW-1.35	Direct Radiation	Quarterly and Annual
R43	NNW-4.6	Direct Radiation	Quarterly and Annual

TABLE 6.2-2 (Sheet 1 of 2)
REMP SAMPLING STATIONS FOR AIRBORNE ACTIVITY

Sample Designation	Sample Location (Direction-Distance mi)	Analysis Performed	Frequency
A1	N-1.5 (Squaw Creek Park)	Gross Beta, I-131	Weekly (continuous filter and charcoal sampling)
		Gamma Isotopic of composites	Quarterly
A2	N-9.4 (Granbury)	Gross Beta, I-131	Weekly (continuous filter and charcoal sampling)
		Gamma Isotopic of composites	Quarterly
A3	E-3.5 (Children’s Home)	Gross Beta, I-131	Weekly (continuous filter and charcoal sampling)
		Gamma Isotopic of composites	Quarterly
A4	SSE-4.5 (Glen Rose)	Gross Beta, I-131	Weekly (continuous filter and charcoal sampling)
		Gamma Isotopic of composites	Quarterly
A5	S/SSW-1.2 (Control)	Gross Beta, I-131	Weekly (continuous filter and charcoal sampling)
		Gamma Isotopic of composites	Quarterly
A6	SW-12.3 (Control)	Gross Beta, I-131	Weekly (continuous filter and charcoal sampling)
		Gamma Isotopic of composites	Quarterly

TABLE 6.2-2 (Sheet 2 of 2)
REMP SAMPLING STATIONS FOR AIRBORNE ACTIVITY

Sample Designation	Sample Location (Direction-Distance mi)	Analysis Performed	Frequency
A7	SW/WSW-0.95	Gross Beta, I-131	Weekly (continuous filter and charcoal sampling)
		Gamma Isotopic of composites	Quarterly
A8	NW-1.0	Gross Beta, I-131	Weekly (continuous filter and charcoal sampling)
		Gamma Isotopic of composites	Quarterly

Air samples are taken in accordance with the requirements of the ODCM, Table 3.12-1, Radiological Environmental Monitoring Program.

TABLE 6.2-3
REMP SAMPLING STATIONS FOR SURFACE/SURFACE DRINKING WATER

Sample Designation	Sample Location (Direction-Distance mi)	Analysis Performed	Frequency
SW1	N-1.5 (Squaw Creek Reservoir Marina)	Gamma Isotopic	Weekly samples (1gal) are composited Monthly
		Tritium Analysis	Monthly samples are composited Quarterly
SW2	N-9.9 (Lake Granbury – drinking water analysis)	Gross Beta, I-131, Gamma Isotopic	Weekly samples (1gal) are composited Monthly
		Tritium Analysis	Monthly samples are composited Quarterly
SW3	N-19.3 (Control – Brazos River)	Gamma Isotopic	Monthly grab sample (1gal)
		Tritium Analysis	Monthly samples are composited Quarterly
SW4	NE-7.4 (Lake Granbury)	Gamma Isotopic	Monthly grab sample (1gal)
		Tritium Analysis	Monthly samples are composited Quarterly
SW5	ESE-1.4 (SCR)	Gamma Isotopic	Weekly samples (1gal) are composited Monthly
		Tritium Analysis	Monthly samples are composited Quarterly
SW6	NNW-0.1 (SCR – drinking water analysis)	Gross Beta, I-131, Gamma Isotopic	Weekly samples (1gal) are composited Monthly
		Tritium Analysis	Monthly samples are composited Quarterly

Surfacewater samples are taken in accordance with the requirements of the ODCM, Table 3.12-1, Radiological Environmental Monitoring Program.

TABLE 6.2-4
REMP SAMPLING STATIONS FOR GROUNDWATER ACTIVITY

Sample Designation	Sample Location (Direction-Distance mi)	Analysis Performed	Frequency
GW1	W-1.2 (NOSF potable water)	Gamma Isotopic Tritium analysis	Quarterly (1gal)
GW2	WSW-0.1 (CPNPP site potable water)	Gamma Isotopic Tritium analysis	Quarterly (1gal)
GW3	SSE-4.6 (Glen Rose)	Gamma Isotopic Tritium analysis	Quarterly (1gal)
GW4	N-9.8 (Granbury)	Gamma Isotopic Tritium analysis	Quarterly (1gal)
GW5	N-1.5 (Squaw Creek Park)	Gamma Isotopic Tritium analysis	Quarterly (1gal)

Groundwater samples are taken in accordance with the requirements of the ODCM, Table 3.12-1, Radiological Environmental Monitoring Program.

TABLE 6.2-5
REMP SAMPLING STATIONS FOR SHORELINE SEDIMENT ACTIVITY

Sample Designation	Sample Location (Direction-Distance mi)	Analysis Performed	Frequency
SS1	NNE-1.0 (SCR)	Gamma Isotopic	Quarterly (1Kg)
SS2	N-9.9 (Lake Granbury)	Gamma Isotopic	Quarterly (1Kg)
SS3	NE-7.4 (Lake Granbury)	Gamma Isotopic	Quarterly (1Kg)
SS4	SE-5.3 (Squaw Creek at Tres Rios)	Gamma Isotopic	Quarterly (1Kg)

Shoreline sediments are sampled in accordance with the requirements of the ODCM, Table 3.12-1, Radiological Environmental Monitoring Program.

TABLE 6.2-6
REMP SAMPLING STATIONS FOR FISH, FOOD PRODUCT, AND BROADLEAF ACTIVITY

Sample Designation	Sample Location (Direction-Distance mi)	Analysis Performed	Frequency
F1 (fish)	ENE-2.0 (SCR)	Gamma Isotopic	Semi-annual (1kg each species)
F2 (fish)	NNE-8.0 (Lake Granbury)	Gamma Isotopic	Semi-annual (1kg each species)
FP1 (food product)[a]	*ENE-9.0 (Leonard Bros. Pecan Farm)	Gamma Isotopic	Semi-annual and/or time of harvest (1kg)
BL1 (broadleaf)	N-1.5	Gamma Isotopic, I-131	Semi-annual (1kg)
BL2 (broadleaf)	SW-1.0	Gamma Isotopic, I-131	Semi-annual (1kg)
BL3 (broadleaf)	SW-13.5 (Control)	Gamma Isotopic, I-131	Semi-annual (1kg)

a) Pecans are the only commercial food product in the area. Pecans are normally harvested in the late fall season. There are no gardens irrigated with effluent from SCR. There are no gardens that meet the criteria for monitoring in accordance with the requirements of the ODCM, Table 3.12-1, Radiological Environmental Monitoring Program

TABLE 6.2-7
REMP SAMPLING STATIONS FOR MILK ACTIVITY

Sample Designation	Sample Location (Direction-Distance mi)	Analysis Performed	Frequency
NONE[(a)]	NONE[(a)]	Gamma Isotopic I-131	Monthly (2gal)

a) No milk samples are currently available. Broadleaf sampling is in place to provide the required monitoring in accordance with the requirements of the ODCM, Table 3.12-1, Radiological Environmental Monitoring Program.

6.3 HYDROLOGICAL MONITORING

This section describes the hydrological monitoring programs related to the preapplication construction, preoperational, and operational phases of the CPNPP Units 3 and 4. The various elements of the hydrological monitoring program relating to thermal, radiological, and chemical monitoring are described in Sections 6.1, 6.2, and 6.6, respectively. The hydrological monitoring programs presented in this section include the following:

- Preapplication monitoring to verify existing hydrologic conditions, substantiate design assumptions related to site hydrology, and support baseline hydrologic descriptions in Subsection 2.3.1.
- Site preparation and construction monitoring to control anticipated water-related impacts from site preparation and construction (Section 4.2), and detect unexpected impacts arising from these activities.
- Preoperational monitoring to establish a baseline for identifying and assessing environmental impacts resulting from plant operations.
- Operational monitoring programs to establish the impacts of plant operations and detect unexpected impacts arising from plant operation.

Effluents discharged to navigable streams are governed by the Clean Water Act (CWA), 40 CFR 122, 40 CFR 423, and state water quality standards. As discussed in Section 6.1, Luminant has a current TPDES permit issued for CPNPP Units 1 and 2 that ensures compliance with the U.S. Environmental Protection Agency's (EPA) National Pollution Discharge Elimination System. Activities to amend the existing TPDES permit to include CPNPP Units 3 and 4 are planned for 2008. A monitoring program, both baseline and operational, is recommended for obtaining or renewing a TPDES permit.

Consultations with the Texas Commission on Environmental Quality (TCEQ), the TPDES authority, have been initiated and are expected to continue throughout the preapplication, preoperational, and operational phases of the project. These consultations consist of telephone conversations and meetings between TCEQ and Luminant personnel; the results of these consultations are expected to clarify issues that might have arisen during the TPDES permit amendment process.

6.3.1 PREAPPLICATION MONITORING

This subsection primarily addresses the data from ongoing monitoring programs at CPNPP and data obtained during the 2006 – 2008 COL application investigation. The monitoring was used as a baseline to verify existing hydrologic conditions, substantiate design assumptions related to site hydrology, assess the site suitability, and support the hydrologic descriptions in Subsection 2.3.1. Hydrological monitoring at the CPNPP site includes the surfacewaters of Lake Granbury and SCR as well as groundwater in the vicinity of the proposed CPNPP Units 3 and 4. Both surfacewater monitoring programs comply with the NUREG 1555 Hydrological Monitoring Preapplication guidelines.

6.3.1.1 Surfacewater

Luminant is required to conduct wastewater sampling and flow measurements in accordance with TPDES Permit Number WQ0001854000 (TCEQ 2004). Sampling data for a 3-year period are shown in Table 6.3-1, indicating the CPNPP discharge flow and water quality released into SCR from the CPNPP site. Data are shown for Monitoring Points 001, 003, and 004 (Figure 6.3-1). Monitoring Points 002, 005, and 104 have not received discharge wastewater during the operations of CPNPP Units 1 and 2. This TPDES permit is expected to be amended to include discharge from CPNPP Units 3 and 4 to Lake Granbury. Current design plans for CPNPP Units 3 and 4 show the circulation water system (CWS) and the essential service water system (ESWS) blowdown discharging to Lake Granbury, and the liquid low level radioactive and nonradioactive process waste waters, stormwater, and sanitary outflows discharging to SCR. Aquatic monitoring stations are shown on Figure 6.3-2.

The TCEQ was consulted to determine if any other parameters should be considered in the preapplication monitoring program. No other parameters were suggested other than those already being monitored. The TCEQ concurred with the approach used to determine the appropriate parameters that must be considered for the preapplication monitoring program.

Hydrological analysis requirements are specified in the TPDES permit for wastewater discharges from CPNPP Units 1 and 2 to SCR, which is a once-through cooling reservoir. The current TPDES permit does allow for discharge to Lake Granbury from the two operating units; however, this outfall has never been utilized but the option to use this outfall in the future is still available. The temperature at the discharge to SCR is monitored and limited by a daily maximum discharge temperature of 116°F, with a daily average of 113°F. This temperature limit is based on the daily average and the daily maximum of the combined CPNPP Units 1 and 2 discharge temperature and is calculated based on two hour increments. The temperature readings are monitored on a continuous basis. For discharge into Lake Granbury, the current TPDES permit has a daily maximum temperature and daily average temperature limit of 93°F as well as a TDS limit of 4000 milligrams per liter (mg/l). As stated above, this outfall (Outfall 005) has not been utilized during the operations of the existing units. Sampling requirements (including the type and frequency of data collected) for the existing outfalls under the current TPDES permit are presented in Table 6.6-1.

A bathymetric survey was conducted from April to May 2007 on Lake Granbury in the vicinity of the proposed cooling water system intake and discharge structures (Boss 2007). In addition, a bathymetric survey of SCR was also completed during the same time frame (Boss 2007a). Figure 2.3-12 shows the locations of waypoints on Lake Granbury that were used for temperature measurements, and Table 2.3-22 provides the measurement data. Figure 2.3-13 depicts the water depth obtained from the bathymetric survey. Figure 2.3-16 shows the locations of waypoints on SCR that were used for temperature measurements, and Table 2.3-24 provides the measurement data. Figure 2.3-17 depicts the water depth obtained from the bathymetric survey. On May 2, 2007, for Lake Granbury and April 17, 2007, for SCR, water temperatures were taken at the surface, then at 10-ft increments to a depth of 50 ft, where allowable, based on the total depth of the water at that location. The Lake Granbury data revealed that temperatures generally decrease by approximately 8.5°F to a depth of 50 ft. The SCR data revealed that the temperature did not vary substantially with increased depth except for around the discharge where the temperature decreased by approximately 5°F to a depth of 50 ft. Subsection 2.3.1.2.5

provides additional information about the bathymetric survey. Surfacewater flow rates and sediment transport are discussed in Subsections 2.3.1.2.3 and 2.3.1.2.4.

6.3.1.2 Groundwater

A total of forty-seven groundwater monitoring wells were installed at the site in October and November of 2006. An aquifer test well and three observation wells were installed at the site in February 2007. The well locations are shown on Figure 6.3-1. Due to the highly variable nature of the Glen Rose formation (Subsection 2.3.1.5.5), twenty well clusters were installed across the CPNPP site from west to east of the proposed reactor areas to define the groundwater bearing capabilities and properties of the zones of interest, and to identify the hydraulic connectivity between the zones. Monitoring wells were designated as follows, where X denotes the well cluster number:

- Regolith/undifferentiated fill monitoring well: MW-12XXa (where present).
- Shallow bedrock monitoring well: MW-12XXb (where required).
- Bedrock monitoring well: MW-12XXc.

The high density of wells shown within and surrounding the proposed reactor areas in Figure 2.3-26 were placed to determine, or confirm, the groundwater conditions in the immediate vicinity, and to provide sufficient information for the performance of an aquifer pump test (Subsection 2.3.1.5.5). No aquifer test data have been found that addresses the aquifer characteristics in the regolith or the Glen Rose Formation (four zones), or to address the vertical conductivity between the connected zones and geologic formations. Aquifer pump test data and slug-test data were used to confirm, supplement, or replace any existing aquifer test data as supporting information for FSAR Subsections 2.4.12 and 2.4.13.

Continuous rock and soil sampling methods were selected to allow a thorough description of the rock, residual soils and overburden materials, and the documentation of soil characteristics that may affect groundwater movement (e.g., perched water intervals, clay seams, sand lenses, etc.). These methods also assisted in the selection of the subsurface soil samples for analyses and to determine the depth to the top of the saturated zone for regolith well screen placement.

Ten groundwater monitoring wells were chosen for sampling to characterize groundwater conditions prior to construction and operations. The monitoring wells were selected across a broad spatial area, with an emphasis on wells within the groundwater flow paths. Groundwater pathways are discussed in Subsection 2.3.1.5.6. As part of this baseline water quality study, quarterly groundwater samples were collected and analyzed within a one-year period (January 2007, April 2007, July 2007, and October 2007), from 10 monitoring wells at the CPNPP site.

Groundwater monitoring well locations and quarterly groundwater potentiometric elevations of the monitoring wells that were installed and monitored in support of the COL application investigation are shown on Figure 2.3-27 (Sheets 1 to 6). Table 2.3-30 provides a summary of the monthly water level data collected between November 2006 and November 2007, January to May 2008, and August to December 2012. Depth to water at each groundwater monitoring well location was measured with a direct-reading water level meter. The water level meter was equipped with an audible alarm that sounded when the probe tip encountered the water surface. Depth to groundwater from below the top of the casing was read directly from the measuring tape. Groundwater depth measurements were then subtracted from a surveyed top-of-casing elevation to determine the groundwater surface elevation.

Based on an evaluation of the current groundwater elevation data, several groundwater monitoring wells exhibited very slow recharge or equalization characteristics, or were found to have no producible groundwater. These wells included the shallow regolith “a” wells, the shallow bedrock “b” wells, and the bedrock “c” wells. Until the monitoring well had a minimum of one ft of groundwater at the time of the elevation measurement, these wells were not used to determine the groundwater gradient and subsurface flow characteristics.

Groundwater flow velocities are discussed in Subsection 2.3.1.5.6. Transient variations in groundwater velocity and quality parameters are discussed in Subsections 2.3.1.5.6 and 2.3.3.2.2. The groundwater flow for the wells screened as regolith wells (MW-12XXa) generally follows the surface topography and flows towards SCR. In general, the groundwater flow in the shallow bedrock and bedrock wells (MW-12XXb and MW-12XXc) is towards the east and tends to follow the general dip of the Glen Rose Formation.

The gradient in the bedrock monitoring wells is consistent with the historical gradient reported from previous investigations conducted at the CPNPP site, as presented in Subsection 2.3.1.5.4. Based on the groundwater measurements collected between December 2006 and November 2007, the groundwater flow appears restricted in the regolith material where the bedrock is absent at or near the surface during the wet weather periods. Shallow groundwater flow during these periods appears to be controlled by gravity and follows the surface topography towards SCR. The exception to this flow is noted in a fill area that is located between the CPNPP Unit 3 and the intake location for CPNPP Units 1 and 2 where it appears that the groundwater is in direct communication with SCR. This information is discussed in detail in Subsection 2.3.3.

6.3.1.3 Sediment Transport and Erodibility

Information on sediment transport for Lake Granbury and the Brazos River is provided in Subsection 2.3.1.2.4. However, published information for specific sediment transport analyses such as rate, bed and suspended load fractions, and graduation analyses, and erosion studies in the CPNPP vicinity is not readily accessible or has not been performed. The majority of the soils on the CPNPP site consist of the Tarrant-Bolar association, hilly (48); and the Tarrant-Purves association, undulating (49) (USDA 1978). These soil types typically have slopes ranging from 1 to 30 percent, with some areas exhibiting as much as a 45-percent slope. Fragments of limestone, ranging from 3 in to 4 ft in diameter, cover from 2 to 60 percent of the surface. These soils are located on narrow ridgetops, edges of benches, and steeper slope breaks, and typically they have moderately slow permeability, very low available water capacity, and are not easily erodible. These soils have a medium potential for range use because of stones, low available water capacity, and shallow root zone, and have a low potential as cropland and pasture land (USDA 1978). Subsection 2.3.1.5.2 provides a discussion on the local and regional geology. Figure 2.3-24 shows the major geomorphic features for the area and the regional geologic formations. In addition, Figure 2.3-28 shows the soil types found at the CPNPP site.

6.3.2 CONSTRUCTION MONITORING

Hydrological monitoring to control anticipated water-related impacts from site preparation and construction (Section 4.2), and to detect unexpected impacts arising from these activities, includes pre-construction monitoring to establish a baseline for assessing subsequent impacts of site preparation and construction. This monitoring is needed in circumstances where specific adverse impacts are possible.

6.3.2.1 Surfacewater

Preconstruction surfacewater monitoring was conducted and is described in Subsection 2.3.3.1.2. Background surfacewater quality sampling conducted quarterly at Lake Granbury from April 2007 to January 2008 and at SCR from January to October 2007 is used to establish the baseline water quality data prior to initial construction. No additional preconstruction surfacewater monitoring is planned in conjunction with the pre-COL application investigation.

Surfacewater sampling locations were selected to aid in the evaluation of surfacewater conditions at and near CPNPP. As a part of the baseline water quality study at the CPNPP site, quarterly surfacewater samples were collected and analyzed during a one-year period (January 2007, April 2007, July 2007, and October 2007), from seven surfacewater sampling locations on SCR, one sampling location on Squaw Creek, one sampling location on the Brazos River, and one sampling location on Lake Granbury. Additionally, quarterly surfacewater samples were collected and analyzed during a one-year period (April 2007, July 2007, October 2007, and January 2008), from nine additional surfacewater sampling locations on Lake Granbury. Lake Granbury and SCR surfacewater sampling results are presented in Tables 2.3-26 and 2.3-46, respectively, with the surfacewater sampling locations also presented in Figures 2.3-20 and 2.3-30.

The surfacewater samples were obtained in accordance with a site-specific surfacewater sampling plan developed for obtaining data for the pre-COL application investigation. Laboratory analytical methods are listed in Table 6.3-2. Field measurements were obtained using a multi-parameter water quality meter. Industry standard data quality procedures were used in the acquisition of the groundwater and surfacewater quality samples.

Construction impacts are expected to be reduced by the development and implementation of a site-specific construction stormwater pollution prevention plan (SWP3), which typically includes regular inspections for erosion-control measures and visual inspections for discharges that may be detrimental to the water quality.

Dredging for sediment removal during the construction of the proposed cooling water system intake and discharge structures on Lake Granbury prior to startup of the raw water system is anticipated (Subsection 4.2.1.2). Monitoring of Lake Granbury for increased turbidity downstream of the dredging operations is expected to be conducted during dredging operations to minimize impacts to the aquatic systems.

6.3.2.2 Groundwater

Preconstruction groundwater monitoring has been conducted, as described in Subsection 2.3.3.2.2. Background groundwater quality sampling, conducted quarterly from January to October 2007, was used to establish the seasonal baseline water quality data prior to the initial construction. This monitoring also included monthly water level gauging of all wells installed as part of the pre-COL application investigation. No additional preconstruction groundwater monitoring is anticipated in conjunction with the pre-COL application investigation.

Groundwater samples were collected and analyzed quarterly within a one-year period (January 2007, April 2007, July 2007, and October 2007), from 10 monitoring wells at the CPNPP site as part of this baseline water quality study. Groundwater sampling results are presented in Table 2.3-50, with locations presented in Figure 2.3-26.

The groundwater samples were obtained in accordance with a site-specific data collection plan developed for groundwater investigation during the pre-COL application investigation. Laboratory analytical methods are listed in Table 6.3-3. Field measurements were obtained using a multi-parameter water quality meter. Industry standard data-quality procedures were used in the acquisition of the groundwater and surfacewater quality samples.

Most of the existing monitoring wells require proper plugging and abandonment (P&A) to prevent destruction during the construction process as excavation for the power block and other structures proceeds. Monitoring well clusters, MW-1203 and MW-1204, and well MW-1218 are expected to remain intact throughout construction (Figure 6.3-1). As construction proceeds, monitoring wells are expected to be installed to replace the P&A'd wells surrounding CPNPP Units 3 and 4 and to verify that no dewatering requirements are needed during construction and substantiate the design assumptions related to hydrostatic loading. Monthly water level gauging of these replacement wells is conducted for the duration of the construction activities.

Due to low water production from the formation and the review of construction activities of CPNPP Units 1 and 2, extensive excavation dewatering is not expected during construction of CPNPP Units 3 and 4. Hydrologic alterations resulting from the construction activities might include temporary changes in shallow groundwater levels from minor dewatering of the foundation excavation areas, or general rising or lowering of the shallow groundwater table in localized areas due to topographic alterations. Once the dewatering and foundation construction activities are terminated, shallow groundwater levels are expected to return to their pre-construction levels.

6.3.3 PREOPERATIONAL MONITORING

Preoperational hydrological monitoring is conducted to establish a baseline for identifying and assessing environmental impacts resulting from plant operation. The monitoring is anticipated to be used to verify existing hydrologic conditions and substantiate design assumptions related to the site hydrology.

Hydrological measurements are anticipated to consist of reconnaissance, field sampling, laboratory analysis, data reduction, and evaluation. This monitoring includes approximately 1 year of seasonal data collection for most parameters to ensure that temporal variations, such as seasonal changes, have been adequately monitored. Monitoring focuses on physical, chemical, and microbial components of the hydrologic systems on, and adjacent to, the CPNPP site. The monitoring is used to evaluate the following:

- Alteration of surfacewater flow.
- Alteration of groundwater flow.
- Impact of sanitary and chemical waste retention methods on water quality.
- Alteration of sediment transport.
- Alteration of floodplain or wetlands.

Data from the ongoing monitoring programs for the existing CPNPP plant are evaluated and used as appropriate. Monitoring is expected to be performed using industry standard equipment and analysis procedures. The program may be modified as improved equipment and analysis methods are developed, or as needed to meet updated regulatory program requirements.

6.3.4 OPERATIONAL MONITORING

This subsection discusses operational monitoring to establish the impacts of plant operation and detect unexpected impacts arising from plant operation. Operational monitoring is used to evaluate the following:

- Alteration of surfacewater flow.
- Alteration of groundwater flow.
- Impact of sanitary and chemical waste retention methods on water quality.
- Alteration of sediment transport.
- Alteration of floodplain or wetlands.

Monitoring and subsequent sediment removal for maintenance of the CPNPP Units 3 and 4 cooling water system intake is anticipated periodically to minimize any impact to the raw water system operation. The interval between channel soundings is expected to be modified to correspond to the rate of sedimentation incurred during station operation. A bathymetric survey of the intake channel is expected to be conducted by the Texas Water Development Board (TWDB) following the first year of operation to measure sediment build up and determine future dredging intervals.

Data from ongoing monitoring programs for the existing CPNPP plant are evaluated and used as appropriate. Surfacewater and groundwater parameters are monitored quarterly for the first year of operation, then yearly afterwards. Monitoring is expected to be performed using industry standard equipment and analytical procedures. The program may be modified as improved equipment and analysis methods are developed, or as needed to meet updated regulatory program requirements. Operational monitoring for groundwater and surfacewater satisfies the applicable requirements of other state and federal agencies, as appropriate.

Groundwater contours are mapped prior to operation. Continued monitoring of groundwater levels, along with the radiological monitoring of groundwater, are used to evaluate the groundwater pathway for potential movement of radionuclides into the environment.

6.3.5 SUPPLEMENTAL INFORMATION

Sentinel groundwater monitoring wells will be located in down-gradient hydrologic positions from each reactor building in proximity to systems, structures, and components where the highest potential exists to detect inadvertent radiological releases. A minimum of two sentinel wells will be placed down-gradient from each reactor building. To provide positive detection should an inadvertent release from containment occur, these sentinel wells will be located between the Unit 3 and 4 reactor buildings and Squaw Creek Reservoir. Excavation of soil regolith is planned to achieve the final plant grade elevation, exposing the Glen Rose Formation. Therefore, the sentinel wells will be completed in the upper Glen Rose Formation. Each well will be installed in such a manner as to intercept radionuclides prior to reaching sensitive receptors. Please refer to FSAR Figures 2.4.12-213 and 2.4.12-214 for post construction flow paths. The sentinel wells will be installed at depths sufficient to intercept releases from areas with the highest potential for inadvertent radiological releases. To insure proper placement of the sentinel wells, resources such as post-construction drawings, as-built drawings, photographs, and videos of site construction will be used as well as any other information that would assist well placement to allow early detection of any inadvertent release of radionuclides to the environment.

To assess potential groundwater movement and quality, groundwater monitoring wells will be located in up-gradient and cross-gradient positions to each reactor building. One up-gradient and one cross-gradient monitoring well will be associated with each nuclear island.

Sentinel groundwater monitoring wells, in addition to groundwater monitoring wells located up-gradient and cross-gradient from the reactor buildings will be incorporated into the station’s existing groundwater monitoring program. These wells will be sampled on a quarterly basis in accordance with the existing groundwater monitoring program.

At this time, it is not possible to assess which existing groundwater monitoring wells will remain in place after construction of CPNPP Units 3 and 4. Consequently, if existing groundwater monitoring wells will not remain in positions to act as sentinel, up-gradient, and cross-gradient monitoring points, new wells will be installed in the appropriate positions.

Due to the impermeable nature and thickness of the Glen Rose Formation in the immediate vicinity of CPNPP Units 3 and 4, the underlying Twin Mountains Formation will not be monitored in this area. Currently and in the future, the Twin Mountains Formation is and will be sampled as part of the existing CPNPP Radiological Environmental Monitoring Program.

6.3.6 REFERENCES

(Boss 2007) Boss, Stephen, PhD, P.G., Bathymetry and Volume Storage of a Portion of Lake Granbury, Hood County, Texas. Department of Geosciences University of Arkansas. Fayetteville, AR. July 11, 2007.

(Boss 2007a) Boss, Stephen, PhD, P.G., Bathymetry and Volume Storage of a Portion of Squaw Creek Reservoir, Hood County, Texas. Boss, Stephen, PhD, P.G. Department of Geosciences University of Arkansas. Fayetteville, AR. July 11, 2007.

(EPA 2007) U.S. Environmental Protection Agency. Water Discharge Permits. http://www.epa.gov/enviro/html/qmr.html Accessed November 16, 2007.

(TCEQ 2004) Texas Commission on Environmental Quality. Texas Pollutant Discharge Elimination System Permit, TXU Energy Company, L.L.C., Comanche Peak Nuclear Power Plant, Permit No.WQ0001854000. April 23, 2004.

(USDA 1978) United States Department of Agriculture – Soil Conservation Service. Soil Survey of Hood and Somervell Counties, Texas. December 1978.

TABLE 6.3-1 (Sheet 1 of 6)
CPNPP SURFACEWATER DISCHARGES AND WATER QUALITY DATA

Monitoring Point	Monitoring Period End Date	Flow (MGD)		Water Temperature (°F)		pH		Total Suspended Solids (PPM)		Oil And Grease (PPM)		Total Residual Chlorine (PPM)		Biochemical Oxygen Demand (BOD)		Fecal Coliform
		Max	Avg.	Max	Avg.	Max	Min	Max	Avg.	Max	Avg.	Max	Avg.	Max	Avg.	Max
001	5/31/2004	3168	2745	101	94	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	6/30/2004	3168	3168	106	103	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	7/31/2004	3168	3168	110	108	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	8/31/2004	3168	3168	111	108	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	9/30/2004	3168	3168	108	106	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	10/31/2004	3168	3168	105	101	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	11/30/2004	3168	3168	102	94	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	12/31/2004	3168	2531	89	87	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	1/31/2005	2376	2376	88	86	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	2/28/2005	2376	2376	89	86	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	3/31/2005	2411	2247	91	88	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	4/30/2005	3168	1776	86	82	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	5/31/2005	3168	3168	102	95	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	6/30/2005	3168	3168	108	105	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	7/31/2005	3168	3168	110	109	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	8/31/2005	3168	3149	110	109	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	9/30/2005	3168	3168	110	108	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	10/31/2005	3168	2399	106	93	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	11/30/2005	3168	2988	91	87	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	12/31/2005	3168	2597	87	85	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR

Notes:
PPM - Part per Million
MGD - Millions of Gallons per Day
NR - Not required
ND - No discharge for Monitoring Points 002, 005 and 104
(EPA 2007)

TABLE 6.3-1 (Sheet 2 of 6)
CPNPP SURFACEWATER DISCHARGES AND WATER QUALITY DATA

Monitoring Point	Monitoring Period End Date	Flow (MGD)		Water Temperature (°F)		pH		Total Suspended Solids (PPM)		Oil And Grease (PPM)		Total Residual Chlorine (PPM)		Biochemical Oxygen Demand (BOD)		Fecal Coliform
		Max	Avg.	Max	Avg.	Max	Min	Max	Avg.	Max	Avg.	Max	Avg.	Max	Avg.	Max
001	1/31/2006	2406	2377	87	85	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	2/28/2006	2772	2418	87	85	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	3/31/2006	3168	2806	91	87	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	4/30/2006	3168	3168	97	94	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	5/31/2006	3168	3168	102	100	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	6/30/2006	3168	3168	107	105	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	7/31/2006	3168	3168	110	108	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	8/31/2006	3168	3168	110	108	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	9/30/2006	3168	3168	109	105	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	10/31/2006	3168	2611	103	93	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	11/30/2006	3168	3168	91	89	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	12/31/2006	3168	3168	87	85	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	1/31/2007	3168	2442	86	84	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	2/28/2007	2376	2266	83	81	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	3/31/2007	1584	1288	82	79	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	4/30/2007	3168	2677	92	80	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	5/31/2007	3168	3168	100	98	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	6/30/2007	3168	3168	105	103	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
001	7/31/2007	3168	3168	109	106	NR	NR	NR	NR	NR	NR	0.00	0.00	NR	NR	NR
003	5/31/2004	0.0371	0.0195	NR	NR	7.3	7.1	11	5	NR	NR	NR	NR	2	2	1
003	6/30/2004	0.0789	0.0278	NR	NR	6.6	6.5	6	5	NR	NR	NR	NR	3	2	220

Notes:
PPM - Part per Million
MGD - Millions of Gallons per Day
NR - Not required
ND - No discharge for Monitoring Points 002, 005 and 104
(EPA 2007)

TABLE 6.3-1 (Sheet 3 of 6)
CPNPP SURFACEWATER DISCHARGES AND WATER QUALITY DATA

Monitoring Point	Monitoring Period End Date	Flow (MGD)		Water Temperature (°F)		pH		Total Suspended Solids (PPM)		Oil And Grease (PPM)		Total Residual Chlorine (PPM)		Biochemical Oxygen Demand (BOD)		Fecal Coliform
		Max	Avg.	Max	Avg.	Max	Min	Max	Avg.	Max	Avg.	Max	Avg.	Max	Avg.	Max
003	7/31/2004	0.0370	0.0268	NR	NR	7.1	6.7	3	2	NR	NR	NR	NR	2	2	57
003	8/31/2004	0.0440	0.0229	NR	NR	6.9	6.8	4	3	NR	NR	NR	NR	2	2	8
003	9/30/2004	0.0413	0.0214	NR	NR	6.9	6.8	2	2	NR	NR	NR	NR	4	3	2
003	10/31/2004	0.0323	0.0170	NR	NR	6.9	6.9	2	1	NR	NR	NR	NR	7	6	11
003	11/30/2004	0.0366	0.0139	NR	NR	6.9	6.9	5	3	NR	NR	NR	NR	12	9	1
003	12/31/2004	0.0158	0.0083	NR	NR	7.3	7.1	5	3	NR	NR	NR	NR	2	2	7
003	1/31/2005	0.0190	0.0090	NR	NR	7.2	7.1	6	5	NR	NR	NR	NR	14	6	1
003	2/28/2005	0.0260	0.0114	NR	NR	7.1	6.9	3	2	NR	NR	NR	NR	3	3	3
003	3/31/2005	0.0305	0.0154	NR	NR	7.1	7.0	4	3	NR	NR	NR	NR	2	2	2
003	4/30/2005	0.0361	0.0233	NR	NR	7.3	7.0	2	2	NR	NR	NR	NR	10	7	5
003	5/31/2005	0.0300	0.0165	NR	NR	7.1	6.7	6	3	NR	NR	NR	NR	4	3	1
003	6/30/2005	0.0385	0.0164	NR	NR	7.1	7.1	3	3	NR	NR	NR	NR	2	2	1
003	7/31/2005	0.0830	0.0201	NR	NR	7.1	7.0	3	3	NR	NR	NR	NR	0	5	54
003	8/31/2005	0.0830	0.0275	NR	NR	7.0	7.0	8	6	NR	NR	NR	NR	2	2	7
003	9/30/2005	0.0345	0.0168	NR	NR	6.7	6.7	10	8	NR	NR	NR	NR	2	2	29
003	10/31/2005	0.0480	0.0190	NR	NR	7.1	6.6	7	5	NR	NR	NR	NR	4	3	3
003	11/30/2005	0.0401	0.0123	NR	NR	7.5	7.0	1	1	NR	NR	NR	NR	9	6	10
003	12/31/2005	0.0151	0.0065	NR	NR	7.4	7.3	1	1	NR	NR	NR	NR	8	5	1
003	1/31/2006	0.0216	0.0081	NR	NR	7.4	7.3	12	6	NR	NR	NR	NR	8	7	18
003	2/28/2006	0.0188	0.0080	NR	NR	7.3	7.3	2	2	NR	NR	NR	NR	9	7	1
003	3/31/2006	0.0162	0.0072	NR	NR	7.1	6.9	5	4	NR	NR	NR	NR	6	4	1

Notes:
PPM - Part per Million
MGD - Millions of Gallons per Day
NR - Not required
ND - No discharge for Monitoring Points 002, 005 and 104
(EPA 2007)

TABLE 6.3-1 (Sheet 4 of 6)
CPNPP SURFACEWATER DISCHARGES AND WATER QUALITY DATA

Monitoring Point	Monitoring Period End Date	Flow (MGD)		Water Temperature (°F)		pH		Total Suspended Solids (PPM)		Oil And Grease (PPM)		Total Residual Chlorine (PPM)		Biochemical Oxygen Demand (BOD)		Fecal Coliform
		Max	Avg.	Max	Avg.	Max	Min	Max	Avg.	Max	Avg.	Max	Avg.	Max	Avg.	Max
003	4/30/2006	0.0205	0.0097	NR	NR	6.6	6.5	16	11	NR	NR	NR	NR	4	4	6
003	5/31/2006	0.0211	0.0111	NR	NR	6.9	6.7	4	3	NR	NR	NR	NR	2	2	3
003	6/30/2006	0.0235	0.0133	NR	NR	6.9	6.7	2	1	NR	NR	NR	NR	2	2	21
003	7/31/2006	0.0245	0.0122	NR	NR	6.9	6.8	1	1	NR	NR	NR	NR	2	2	14
003	8/31/2006	0.0490	0.0167	NR	NR	6.7	6.5	6	3	NR	NR	NR	NR	2	2	10
003	9/30/2006	0.0305	0.0200	NR	NR	6.7	6.5	1	1	NR	NR	NR	NR	2	2	10
003	10/31/2006	0.0468	0.0219	NR	NR	6.5	6.4	7	5	NR	NR	NR	NR	2	2	3
003	11/30/2006	0.0336	0.0113	NR	NR	6.8	6.7	2	2	NR	NR	NR	NR	2	2	1
003	12/31/2006	0.0191	0.0083	NR	NR	6.9	6.8	3	2	NR	NR	NR	NR	3	3	1
003	1/31/2007	0.0236	0.0107	NR	NR	7.1	6.7	20	12	NR	NR	NR	NR	26	15	3
003	2/28/2007	0.0280	0.0158	NR	NR	6.9	6.5	22	18	NR	NR	NR	NR	12	11	13
003	3/31/2007	0.0493	0.0295	NR	NR	7.4	7.3	15	9	NR	NR	NR	NR	13	13	76
003	4/30/2007	0.0363	0.0202	NR	NR	7.5	7.2	6	4	NR	NR	NR	NR	13	9	1
003	5/31/2007	0.0439	0.0234	NR	NR	7.2	7.1	2	2	NR	NR	NR	NR	2	2	1
003	6/30/2007	0.0770	0.0298	NR	NR	7.1	7.0	2	2	NR	NR	NR	NR	2	2	1
003	7/31/2007	0.4680	0.0291	NR	NR	7.7	7.6	2	2	NR	NR	NR	NR	2	2	1
004	5/31/2004	1	1	NR	NR	8.3	7.8	3	3	5	5	NR	NR	NR	NR	NR
004	6/30/2004	1	1	NR	NR	9.3	7.8	13	8	5	5	NR	NR	NR	NR	NR
004	7/31/2004	ND	ND	NR	NR	ND	ND	ND	ND	ND	ND	NR	NR	NR	NR	NR
004	8/31/2004	0.8210	0.4260	NR	NR	8.8	7.7	12	6	5	5	NR	NR	NR	NR	NR
004	9/30/2004	1	0.4380	NR	NR	8.3	7.6	5	3	5	5	NR	NR	NR	NR	NR

Notes:
PPM - Part per Million
MGD - Millions of Gallons per Day
NR - Not required
ND - No discharge for Monitoring Points 002, 005 and 104
(EPA 2007)

TABLE 6.3-1 (Sheet 5 of 6)
CPNPP SURFACEWATER DISCHARGES AND WATER QUALITY DATA

Monitoring Point	Monitoring Period End Date	Flow (MGD)		Water Temperature (°F)		pH		Total Suspended Solids (PPM)		Oil And Grease (PPM)		Total Residual Chlorine (PPM)		Biochemical Oxygen Demand (BOD)		Fecal Coliform
		Max	Avg.	Max	Avg.	Max	Min	Max	Avg.	Max	Avg.	Max	Avg.	Max	Avg.	Max
004	10/31/2004	1	0.5254	NR	NR	8.9	7.7	11	6	5	5	NR	NR	NR	NR	NR
004	11/30/2004	0.8210	0.4655	NR	NR	8.8	7.4	11	8	5	5	NR	NR	NR	NR	NR
004	12/31/2004	0.8210	0.5705	NR	NR	8.0	7.9	7	6	5	5	NR	NR	NR	NR	NR
004	1/31/2005	0.8210	0.5507	NR	NR	8.1	7.3	11	6	5	5	NR	NR	NR	NR	NR
004	2/28/2005	0.8210	0.6086	NR	NR	8.1	7.7	13	7	5	5	NR	NR	NR	NR	NR
004	3/31/2005	0.6270	0.1439	NR	NR	9.1	7.8	11	8	5	5	NR	NR	NR	NR	NR
004	4/30/2005	0.8410	0.5424	NR	NR	8.6	7.8	5	3	5	5	NR	NR	NR	NR	NR
004	5/31/2005	0.8390	0.5439	NR	NR	8.2	7.8	4	4	5	5	NR	NR	NR	NR	NR
004	6/30/2005	1	0.5850	NR	NR	8.2	7.3	9	5	5	5	NR	NR	NR	NR	NR
004	7/31/2005	0.8370	0.5055	NR	NR	8.1	7.9	8	6	5	5	NR	NR	NR	NR	NR
004	8/31/2005	1	0.5065	NR	NR	8.2	7.2	8	5	5	5	NR	NR	NR	NR	NR
004	9/30/2005	2	0.4221	NR	NR	7.8	7.5	4	3	5	5	NR	NR	NR	NR	NR
004	10/31/2005	1	0.4216	NR	NR	7.8	7.7	5	4	5	5	NR	NR	NR	NR	NR
004	11/30/2005	1	0.4804	NR	NR	8.0	7.6	6	4	5	5	NR	NR	NR	NR	NR
004	12/31/2005	0.8410	0.4684	NR	NR	8.0	7.6	7	5	5	5	NR	NR	NR	NR	NR
004	1/31/2006	2	0.6008	NR	NR	8.4	7.5	9	5	5	5	NR	NR	NR	NR	NR
004	2/28/2006	0.8400	0.4634	NR	NR	7.5	7.4	5	4	5	5	NR	NR	NR	NR	NR
004	3/31/2006	1	0.6824	NR	NR	8.4	7.6	14	11	5	5	NR	NR	NR	NR	NR
004	4/30/2006	0.8210	0.4041	NR	NR	7.8	7.5	4	3	5	5	NR	NR	NR	NR	NR
004	5/31/2006	0.8390	0.5340	NR	NR	8.7	7.1	7	4	5	5	NR	NR	NR	NR	NR
004	6/30/2006	0.8400	0.4696	NR	NR	8.1	7.0	2	2	5	5	NR	NR	NR	NR	NR

Notes:
PPM - Part per Million
MGD - Millions of Gallons per Day
NR - Not required
ND - No discharge for Monitoring Points 002, 005 and 104
(EPA 2007)

TABLE 6.3-1 (Sheet 6 of 6)
CPNPP SURFACEWATER DISCHARGES AND WATER QUALITY DATA

Monitoring Point	Monitoring Period End Date	Flow (MGD)		Water Temperature (°F)		pH		Total Suspended Solids (PPM)		Oil And Grease (PPM)		Total Residual Chlorine (PPM)		Biochemical Oxygen Demand (BOD)		Fecal Coliform
		Max	Avg.	Max	Avg.	Max	Min	Max	Avg.	Max	Avg.	Max	Avg.	Max	Avg.	Max
004	7/31/2006	0.8120	0.5189	NR	NR	8.0	6.7	6	4	<5	<5	NR	NR	NR	NR	NR
004	8/31/2006	0.8380	0.6045	NR	NR	7.9	6.8	13	8	<5	<5	NR	NR	NR	NR	NR
004	9/30/2006	0.8400	0.4945	NR	NR	7.5	7.5	5	3	<5	<5	NR	NR	NR	NR	NR
004	10/31/2006	1	0.5205	NR	NR	8.4	6.7	4	3	<5	<5	NR	NR	NR	NR	NR
004	11/30/2006	1	0.5300	NR	NR	7.7	7.6	10	5	<5	<5	NR	NR	NR	NR	NR
004	12/31/2006	0.8380	0.5041	NR	NR	7.9	7.7	7	4	<5	<5	NR	NR	NR	NR	NR
004	1/31/2007	1	0.5537	NR	NR	8.0	7.3	7	3	<5	<5	NR	NR	NR	NR	NR
004	2/28/2007	1	0.4857	NR	NR	7.7	7.2	22	8	<5	<5	NR	NR	NR	NR	NR
004	3/31/2007	1	0.5181	NR	NR	8.9	7.2	12	7	<5	<5	NR	NR	NR	NR	NR
004	4/30/2007	1	0.5938	NR	NR	8.4	7.3	10	5	<5	<5	NR	NR	NR	NR	NR
004	5/31/2007	1	0.6571	NR	NR	7.8	7.3	29	11	<5	<5	NR	NR	NR	NR	NR
004	6/30/2007	1	0.7966	NR	NR	7.7	7.3	8	6	<5	<5	NR	NR	NR	NR	NR
004	7/31/2007	1	0.7232	NR	NR	8.1	7.3	39	11	<5	<5	NR	NR	NR	NR	NR

Notes:
PPM - Part per Million
MGD - Millions of Gallons per Day
NR - Not required
ND - No discharge for Monitoring Points 002, 005 and 104
(EPA 2007)

TABLE 6.3-2 (Sheet 1 of 2)
SURFACEWATER ANALYTICAL METHODS

Parameter	EPA Method	Volume	Bottle Type	Preservative
Suspended Solids	160.2	500 ml	plastic	none
Total Dissolved Solids	160.1	250 ml	plastic	none
Hardness	130.1	250 ml	plastic	Nitric Acid (HNO_3)
Turbidity	180.1	250 ml	plastic	none
Nitrite	300	125 ml	plastic	Sulfuric Acid (H_2SO_4)
Nitrate	300	125 ml	plastic	Sulfuric Acid (H_2SO_4)
Organic Nitrogen - kjeldahl Nitrogen (TKN)	351.2	250 ml	plastic	Sulfuric Acid (H_2SO_4)
Ammonia Nitrogen	350.1	250 ml	plastic	Sulfuric Acid (H_2SO_4)
Bicarbonate/ Alkalinity	310.2	250 ml	plastic	none
Chlorides	300	125 ml	plastic	none
Sulfate	300	125 ml	plastic	none
Biochemical Oxygen Demand (BOD)	405.1	1 L	plastic	none
Chemical Oxygen Demand (COD)	410.4	250 ml	plastic	Sulfuric Acid (H_2SO_4)
Total Phosphorous	365.2	250 ml	plastic	Sulfuric Acid (H_2SO_4)
Phytoplankton (Chlorophyll a)	10,200H	1 L	plastic	Hydrochloric Acid (HCl)
pH	150.1	125 ml	plastic	none
Total Coliform	909C	125 ml	plastic	Sodium Thiosulfate
Fecal Coliform	909A	125 ml	plastic	Sodium Thiosulfate
Fecal Streptococci	9230	40 ml	glass	none
Mercury (Total)	245.1	500 ml	plastic	Nitric Acid (HNO_3)

TABLE 6.3-2 (Sheet 2 of 2)
SURFACEWATER ANALYTICAL METHODS

Parameter	EPA Method	Volume	Bottle Type	Preservative
Mercury (Dissolved)	245.1	500 ml	plastic	none
Silica	200.8	500 ml	plastic	Nitric Acid (HNO_3)
Sodium	200.8	500 ml	plastic	Nitric Acid (HNO_3)
Potassium	200.8	500 ml	plastic	Nitric Acid (HNO_3)
Calcium	200.8	500 ml	plastic	Nitric Acid (HNO_3)
Magnesium	200.8	500 ml	plastic	Nitric Acid (HNO_3)
Total Metals (arsenic, barium, cadmium, chromium, lead, selenium, silver, nickel, zinc, copper, boron, iron, and manganese)	200.8	500 ml	plastic	Nitric Acid (HNO_3)

TABLE 6.3-3 (Sheet 1 of 2)
GROUNDWATER ANALYTICAL METHODS

Parameter	EPA Method	Volume	Bottle Type	Preservative
Suspended Solids	160.2	500 ml	plastic	none
Total Dissolved Solids	160.1	250 ml	plastic	none
Hardness	130.1	250 ml	plastic	Nitric Acid (HNO_3)
Turbidity	180.1	250 ml	plastic	none
Color	909C	250 ml	plastic	none
Odor	140.1	250 ml	glass	none
Conductivity	120.1	250 ml	plastic	none
Nitrite	300	125 ml	plastic	Sulfuric Acid (H_2SO_4)
Nitrate	300	125 ml	plastic	Sulfuric Acid (H_2SO_4)
Organic Nitrogen -Kjeldahl Nitrogen (TKN)	351.2	250 ml	plastic	Sulfuric Acid (H_2SO_4)
Carbon Dioxide (CO_2)	406B	250 ml	plastic	none
Ammonia Nitrogen	350.1	250 ml	plastic	Sulfuric Acid (H_2SO_4)
Bicarbonate/ Alkalinity	310.2	250 ml	plastic	none
Chlorides	300	125 ml	plastic	none
Sulfate	300	125 ml	plastic	none
Biochemical Oxygen Demand (BOD)	405.1	1 L	plastic	none
Chemical Oxygen Demand (COD)	410.4	250 ml	plastic	Sulfuric Acid (H_2SO_4)
Total Phosphorous	365.2	250 ml	plastic	Sulfuric Acid (H_2SO_4)
Orthophosphate	365.2	250 ml	plastic	none
pH	150.1	125 ml	plastic	none

TABLE 6.3-3 (Sheet 2 of 2)
GROUNDWATER ANALYTICAL METHODS

Parameter	EPA Method	Volume	Bottle Type	Preservative
Total Coliform	909C	125 ml	plastic	Sodium Thiosulfate
Fecal Coliform	909A	125 ml	plastic	Sodium Thiosulfate
Fecal Streptococci	9230	40 ml	Glass	none
Mercury (Total)	245.1	500 ml	Plastic	Nitric Acid (HNO_3)
Mercury (Dissolved)	245.1	500 ml	plastic	none
Silica	200.8	500 ml	plastic	Nitric Acid (HNO_3)
Sodium	200.8	500 ml	plastic	Nitric Acid (HNO_3)
Potassium	200.8	500 ml	plastic	Nitric Acid (HNO_3)
Calcium	200.8	500 ml	plastic	Nitric Acid (HNO_3)
Magnesium	200.8	500 ml	plastic	Nitric Acid (HNO_3)
Total Metals (arsenic, barium, cadmium, chromium, lead, selenium, silver, nickel, zinc, copper, boron, iron, and manganese)	200.8	500 ml	plastic	Nitric Acid (HNO_3)

6.4 METEOROLOGICAL MONITORING

The meteorological monitoring program for CPNPP Units 3 and 4 is a continuation of the on-site meteorological monitoring program in place at CPNPP Units 1 and 2. The on-site program follows the program requirements defined in the CPNPP ODCM (CPSES 2006). The current meteorological monitoring program functions throughout the CPNPP Units 3 and 4 construction, preoperational, and operational phases of the project.

The meteorological monitoring program completed the preoperational phase (May 15, 1972 – May 14, 1976) and was reestablished as an operational system prior to CPNPP Unit 1 fuel load (CPSES 2007a). The program is maintained in accordance with all applicable requirements, was improved on several occasions, and maintains a high level of reliably to perform all required functions.

The preoperational meteorological program measured the parameters needed to evaluate the dispersive characteristics of the site for both routine operational and hypothetical accidental releases of radionuclides to the atmosphere. Some of the other data collection programs used to provide data for the description of atmospheric transport and diffusion characteristics within 50 mi of the site are located at Dallas-Fort Worth, Waco Madison Cooper, and Dallas Love Field airports plus the National Weather Service office in Fort Worth. The data collection programs provided necessary data such as the frequency of seasonal and annual mixing heights, ultimate heat sink data such as air and dew point temperature, wind speed, wind direction, cloud cover and atmospheric pressure as well as data dealing with dust, visibility, rainfall, hail, stagnation, and thunderstorms. Detailed information on the dispersive characteristics of the site can be found in the Comanche Peak Steam Electric Station (CPSES) FSAR Section 2.3 (CPSES 2007a). A map showing the general topographic features and the locations of off-site meteorological facilities that provide information characteristic of the region are provided in Figure 6.4-2.

6.4.1 METEOROLOGICAL MEASUREMENTS PROGRAM

The meteorological measurements system consists of a primary meteorological tower, a backup tower, and a computer system with condition and limit code checks. The location of the meteorological towers relative to other significant site structures is shown in Figure 6.4-1.

The primary tower is located east of the reactor complex at an elevation of 838 ft msl. The primary tower structure is a 197-ft, guyed, open lattice tower with an instrument elevator and instrumentation booms at the 33-ft and 197-ft levels. Due to the prevailing winds, the booms are located on the west side of the tower in order to minimize tower interference. The aspirator motors and shields for the temperature sensors are oriented north/south. The primary meteorological tower directly monitors or provides information to determine the following meteorological parameters:

- Wind speed at 33 ft and 197 ft.
- Wind direction at 33 ft and 197ft.
- Ambient temperature at 33 ft.

- Delta-temperature between 33 ft and 197 ft (redundant channels).
- Sigma theta at 33 ft.
- Precipitation near ground level.

An additional 33 ft backup tower is located 75 ft east-northeast from the primary tower. This tower is an open lattice tower with a stationary instrumentation boom located on top of the tower. The aspirator motor and shield for the backup temperature sensor are also oriented north/south. The backup tower monitors or provides information to determine the following meteorological parameters:

- Wind speed at 33 ft.
- Wind direction at 33 ft.
- Ambient temperature at 33 ft.
- Sigma theta at 33 ft.

Precipitation is measured at ground level near the primary tower.

A temporary relative humidity instrumentation was used onsite to collect data from June 12, 2008 through September 23, 2008. Likewise, data was collected from Dallas-Fort Worth (DFW) Airport and Mineral Wells (MWL) Airport National Weather Service (NWS) from this same time frame. The data sets from the DFW and MWL airports were compared to the CPNPP on-site data, during both average and peak events. MWL Airport is selected as a better representation of CPNPP site conditions. In addition, MWL Airport has geographic similarities to CPNPP (rural/suburban and 37 miles proximity), in comparison to the DFW Airport geography (urban and 61 miles proximity). The relative humidity data recorded at MWL Airport is representative of the relative humidity at the CPNPP site and serves as the data of record for supporting the cooling tower plume analysis calculations.

All the permanent towers and instrumentation described above are located in an area surrounded by a security fence and maintained free of obstructions that could interfere with data collection and accuracy. The environmentally controlled meteorological instrumentation building that supports the electronic components associated with the instrumentation on the towers is located within the fenced area (CPSES 2007a).

6.4.1.1 Instrument Description

An overview of the instrumentation used in the meteorological monitoring system is provided below (CPSES 2007a). The CPNPP Units 1 and 2 FSAR and other plant documents contain specific data about sensors and requirements for replacement of sensors.

Measurement	Level	Instrument Type	Threshold	Range
Wind speed	33 and 197 ft	3-cup anemometer	0.45 m/s	0 – 100 mph

Measurement	Level	Instrument Type	Threshold	Range
Wind direction	33 and 197 ft	Wind vane	0.45 m/s	0 – 540 degrees
Temperature	33 ft	Platinum temp. sensor	N/A	-20°F to +120°F
Delta-temperature	33 and 197 ft	Platinum temp. sensor	N/A	-5°F to +15°F
Precipitation	Surface	Tipping bucket	0.01 in	0.0 – 1.0 in

6.4.1.2 System Accuracy

System accuracies are specified in Tables 6.4-1 and 6.4-2. All system accuracies meet or exceed regulatory requirements (CPSES 2007a). Calibration and maintenance procedures ensure the accuracy of the instrumentation. All calibrations are performed semi-annually and in accordance with the ODCM. Procedures control the calibration process and each instrument channel is checked for total system accuracy. Instruments are checked for instrument accuracy and calibrated to the required standards. Any deviation for the required calibration is noted in the work control process and the results are reflected in the meteorological data recovery. Any instrument not meeting the accuracy requirements, such as for excessive drift, is replaced. All problems are corrected and explained in the Annual Radiological Effluent Report each year. All outages of instrument channels is tracked by procedure and documented for compliance with ODCM limits for availability. An annual inspection of the tower structure is also performed.

6.4.1.3 Meteorological Data Recovery

Data recovery from the meteorological monitoring program for the five-year period 2001 – 2005 is presented in Table 6.4-3. Recovery rates are provided for joint frequency distribution (wind speed, wind direction, and stability class determined by delta temperature) and for each individual channel. The average joint frequency distribution recovery rate for this five-year period is 95.3 percent.

6.4.1.4 Meteorological Data Processing

The meteorological monitoring program provides data for many functions. Meteorological data collection is the primary focus of the program, but the data are also available for the plant computer system for easy access by operations and emergency planning personnel. The data are available for routine operations, accident analysis, and annual reporting requirements.

6.4.1.4.1 Data Acquisition

The meteorological monitoring system includes two separate recording systems. There is a digital system and a digital paperless recorder. The digital system records all data on the meteorological computer in the control building. The digital paperless recorder is mounted inside the CPNPP Units 1 and 2 combined control room and the CPNPP Units 3 and 4 control rooms.

The meteorological data sensors electronic signals from both towers are transmitted through shielded twisted-pair cables to a digital-to-analog converter located in the CPNPP Unit 1 plant computer room.

The same digital signal from the meteorological instrumentation building that supplies the meteorological system also supplies the plant computer with meteorological data. The plant computer system is completely separate from the meteorological monitoring system, uses separate software, and displays and stores data to support the Operations and Emergency Planning departments. The plant computer is used to help meet the requirements of NUREG-0696, with displays in the CPNPP Units 1 and 2 technical support center (TSC), the CPNPP Unit 3 TSC, the CPNPP Unit 4 TSC, and the emergency operations facility (EOF) (CPSES 2007a).

6.4.1.4.2 Data Processing

The meteorological computer system provides a digital readout of all channels received from the instrumentation located on the primary and back-up towers. The data are sampled every five sec for all parameters except precipitation, which is the difference between the beginning value for the averaging period and the ending value for the averaging period. Using the data signals received 15-min and one-hr averages are calculated by the software for every instrument channel. A minimum of 75 percent of the data sampled is required for a 15-min or a one-hr average to be considered reliable. The 15-min and one-hr averages are stored by the computer system and are available for review, editing, or replacement as necessary to provide good quality data with a high recovery rate. The software performs data quality control and limit checks as data are recorded, and it displays the results of these checks with the data when it is reviewed. The data averaging methodology meets the requirements of RG 1.23 Second Proposed Revision 1, April 1986 because this program is monitoring an existing operational nuclear plant (CPSES 2007a), (CPSES 2001b), (CPSES 2002b), (CPSES 2003b), (CPSES 2004b), and (CPSES 2005b).

15-min and one-hr data averages are provided for the following meteorological channels:

- Primary tower upper - wind speed, wind direction.
- Primary tower upper - lower level - "A" delta temperature, "B" delta temperature.
- Primary tower lower - wind speed, wind direction, sigma theta, ambient temperature.
- Primary tower base - precipitation.
- Back-up tower lower level - wind speed, wind direction, sigma theta, ambient temperature.

6.4.1.4.3 Data Analysis

The paperless strip chart recorders are verified by the control room personnel on a 12-hr basis as part of the daily channel check.

The digital display of the meteorological computer system is available in the CPNPP Unit 1 plant computer and control room for CPNPP Units 1 and 2. CPNPP Units 3 and 4 would have a display available in their respective control rooms at all times. The digital meteorological data display integrates the condition codes and limit checks, and assigns a status code for each averaged value. This code ensures easy detection of a problem with the data. If a problem is detected, then corrective action is taken immediately.

The plant computer system displays the meteorological data separately from the meteorological system display and provides easy access, condition checks, and associated warning messages.

Data may be retrieved from the meteorological monitoring system for any time period and type of average desired. Historical data are available in the plant archives, and up to the last 10 years of data are available on the computer system. Data can be produced in raw data format, joint frequency table format, or in a format suitable for transmitting to the NRC (CPSES 2007a).

The CPNPP procedures (CPSES 2007b) require a detailed review of all data parameters on a quarterly basis. Hourly averages are reviewed, validated, replaced with backup data if necessary, documented, then archived. All data and supporting documentation are carried forward throughout the year to produce the annual data recovery rates published as part of the fourth quarter Meteorological Data Report each year, and the results are included in the Annual Radioactive Effluent Release Reports filed with the NRC (CPSES 2001b), (CPSES 2002b), (CPSES 2003b), (CPSES 2004b), and (CPSES 2005b).

6.4.2 REFERENCES

(CPSES 2007a) Comanche Peak Steam Electric Station. 2007. Comanche Peak Steam Electric Station Final Safety Analysis Report. Amendment 101. (February 10, 2007).

(CPSES 2007b) Comanche Peak Steam Electric Station. 2007. Comanche Peak Steam Electric Station Radiation Protection Manual Routine Operations of the Meteorological Computer System Instruction No. RPI – 309. Revision No.8. (February 19, 2007)

(CPSES 2006) Comanche Peak Steam Electric Station. 2006. Comanche Peak Steam Electric Station Off-site Dose Calculation Manual Unit 1 and 2. Revision 26. (February 10, 2007).

(CPSES 2005a) Comanche Peak Steam Electric Station. 2005. Comanche Peak Steam Electric Station Units 1 and 2 Radioactive Effluent Release Report January 1, 2005 – December 31, 2005. (February 15, 2007).

(CPSES 2005b) Comanche Peak Steam Electric Station. 2005. Quarterly Meteorological Data Report Compiled through the 4th Quarter for the Year 2005. (February 12, 2007).

(CPSES 2004a) Comanche Peak Steam Electric Station. 2004. Comanche Peak Steam Electric Station Units 1 and 2 Radioactive Effluent Release Report January 1, 2004 – December 31, 2004. (February 15, 2007).

(CPSES 2004b) Comanche Peak Steam Electric Station. 2004. Quarterly Meteorological Data Report Compiled through the 4th Quarter for the Year 2004. (February 12, 2007).

(CPSES 2003a) Comanche Peak Steam Electric Station. 2003. Comanche Peak Steam Electric Station Units 1 and 2 Radioactive Effluent Release Report January 1, 2003 – December 31, 2003. (February 15, 2007).

(CPSES 2003b) Comanche Peak Steam Electric Station. 2003. Quarterly Meteorological Data Report Compiled through the 4th Quarter for the Year 2003. (February 12, 2007).

(CPSES 2002a) Comanche Peak Steam Electric Station. 2002. Comanche Peak Steam Electric Station Units 1 and 2 Radioactive Effluent Release Report January 1, 2002 – December 31, 2002. (February 15, 2007).

(CPSES 2002b) Comanche Peak Steam Electric Station. 2002. Quarterly Meteorological Data Report Compiled through the 4th Quarter for the Year 2002. (February 12, 2007).

(CPSES 2001a) Comanche Peak Steam Electric Station. 2001. Comanche Peak Steam Electric Station Units 1 and 2 Radioactive Effluent Release Report January 1, 2001 – December 31, 2001. (February 15, 2007).

(CPSES 2001b) Comanche Peak Steam Electric Station. 2001. Quarterly Meteorological Data Report Compiled through the 4th Quarter for the Year 2001. (February 12, 2007).

TABLE 6.4-1
CPNPP METEOROLOGICAL SYSTEM ACCURACIES

Parameter	Recording Type	System Accuracy (ANSI/ANS-2.5-1984)[(a)]	Actual System Accuracy[(b)]
Wind Speed	Digital	±0.5 mph, WS<5 mph ±10%, otherwise	±0.39 mph, WS<25 mph ±1.10%, otherwise
	Paperless Digital	±0.75 mph, WS<5 mph ±15%, otherwise	±0.58 mph, WS<25 mph ±1.18%, otherwise
Wind Direction	Digital	±5 degrees	±3.4 degrees
	Paperless Digital	±7.5 degrees	±4.5 degrees
Temperature	Digital	±0.9°F	±0.6°F
	Paperless Digital	±0.9°F	±0.9°F
Delta Temperature	Digital	±0.27°F	±0.17°F
	Paperless Digital	±0.27°F	±0.19°F
Precipitation	Digital	Rain gauge with ±0.01 in resolution ±10% measured value for total accumulated catch greater than 0.2 in	Rain gauge with ±0.01 resolution ±0.011 in or ±1.1%
	Paperless Digital	Rain gauge with ±0.01 in resolution +10% measured value for total accumulated catch greater than 0.2 in	Rain gauge with ±0.01 resolution ±0.013 in or ±1.3%

(CPSES 2007a)

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a) Endorsed by RG 1.23 Second Proposed Revision 1, April 1986.

b) Accuracy values shown were calculated for the original system. Calculations made for subsequent equipment upgrades computed uncertainties equal to or less than those stated. All uncertainties computed are within acceptance criteria of requirements

TABLE 6.4-2
CPNPP METEOROLOGICAL DELTA TEMPERATURE SYSTEM ACCURACY

Instrument Accuracy		
1.	Sensor Accuracy	
	Signal Conditioner Accuracy	±0.13°F
	Instrument Accuracy	±0.08°F
	Temperature Coefficient	±0.05°F
2.	Square Root of the Sum of the Squared Tolerances	±0.09°F
3.	Transmitter Accuracy	±0.04°F
4.	Receiver Accuracy	±0.04°F
5.	Current Driver Accuracy	±0.04°F
6.	Digital Recorder Accuracy	
	Input Resistor Accuracy	±0.05°F
	Input Accuracy	±0.05°F
7.	Square Root of the Sum of the Squared Tolerances	±0.071°F
8.	Analog Data Reduction Accuracy	±0.05°F
	System Accuracy[(a)]	
	Digital Recording	
	Square Root of the Sum of the Squared Tolerance of 1, 2, 3, 4, 5 and 6	±0.17°F

(CPSES 2007a)

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a) These values are within the ±0.27°F criteria established by ASI/ANS-2.5-1984, which is endorsed by RG 1.23.

TABLE 6.4-3
ANNUAL RECOVERY RATES IN PERCENTAGE FOR JOINT FREQUENCY DISTRIBUTION AND INDIVIDUAL CHANNELS

Data retrieved from CPNPP “Quarterly Meteorological Data Report” RPI-309-5.

Year	A	B	C	D	E	F	G	H	I	J	K	L	M	N
2005	**87.3**	87.9	87.6	87.4	88.1	87.9	83.6	87.6	87.6	87.2	87.3	87.2	82.8	87.5
2004	**97.1**	98.9	98.6	98.9	99.1	93.3	99.1	98.9	98.9	97.1	97.1	98.5	98.4	99.1
2003	**97.8**	99.4	99.0	99.3	99.5	85.0	99.4	99.6	99.6	97.8	97.8	99.5	99.4	99.5
2002	**96.7**	99.3	98.1	99.1	99.8	98.5	91.4	95.9	99.6	96.7	96.7	99.5	99.1	99.4
2001	**97.5**	99.3	98.2	99.1	99.6	99.5	99.4	99.1	99.1	84.5	97.1	99.5	99.2	99.9

Legend: A – Joint Frequency Data Recovery (wind speed, wind direction, and stability class from delta-temperature)

B – Primary tower wind speed lower level
C – Primary tower wind speed upper level
D – Backup tower wind speed lower level
E – Primary tower wind direction lower level
F – Primary tower wind direction upper level
G – Backup tower wind direction lower level
H – Primary tower ambient temperature lower level
I – Backup tower ambient temperature lower level
J – Primary tower delta temperature “A” upper – lower
K – Primary tower delta temperature “B” upper – lower
L – Primary tower sigma theta lower level
M – Backup tower sigma theta lower level
N – Precipitation

Failure to meet expected recovery rates:
2005 – The Meteorological Computer was inoperable for 36 days. Meteorological data were available from the strip chart recorder and the Plant Computer. Because the Plant Computer and the Meteorological Computer are stand-alone systems, the data could not be retrieved and recovered in the manner described in the meteorological monitoring program.
2003 – The 197-ft wind direction sensor failed, with no replacement immediately available.
2001 – The delta temperature channel “A” sensor failed
(CPSES 2001a), (CPSES 2002a), (CPSES 2003a), (CPSES 2004a), and (CPSES 2005a)
(CPSES 2001b), (CPSES 2002b), (CPSES 2003b), (CPSES 2004b), and (CPSES 2005b)

6.5 ECOLOGICAL MONITORING

Subsections 2.4.1 and 2.4.2 discuss the timing and methodology employed during preapplication ecological monitoring. This section discusses the process employed during preapplication as it relates to possible future ecological monitoring for the CPNPP site.

6.5.1 TERRESTRIAL ECOLOGY AND LAND USE

As described in Subsection 2.4.1, the CPNPP site consists of two operating nuclear reactors, roads and a railway, the SCR, the Squaw Creek Dam, and numerous support buildings. The CPNPP Units 3 and 4 are to be located in an area of the site once used as a large parking lot during construction of the existing units. The area disturbed during construction of CPNPP Units 1 and 2 was later amended with topsoil and revegetated with species characteristic of improved pasture. This previously disturbed area is a relatively low-quality wildlife habitat that lacks vertical structure and is occupied primarily by small mammals, ground-nesting birds, and common reptiles. The area is in a state of early successional development.

As reported in Subsection 2.4.1, no protected species, important species, critical habitat, or otherwise important habitat, as defined in NUREG-1555, occur there or elsewhere within the construction footprint of the additional units.

The cooling towers that would support the proposed CPNPP Units 3 and 4 are to be located on a largely undeveloped peninsula that extends into SCR immediately northwest of the core area of the site. The peninsula is forested primarily with Ashe juniper and to a lesser extent with mixed hardwood. Ashe juniper is a native invasive species that has expanded within its range since European settlement due to over-grazing of livestock and fire suppression (Sullivan 1993). Ashe juniper forests lack vertical structure and have low species diversity making them less valuable habitats than other forest types. The mixed hardwood forest in the construction footprint is more valuable as wildlife habitat but amounts to only three percent of the mixed hardwood stands on-site. Grassland, Ashe juniper, and mixed hardwood cover types at CPNPP are devoid of "important" species and habitats as defined by NUREG-1555, with the possible exception of the golden-cheeked warbler, a species listed at both the state and federal levels as endangered.

As discussed more fully in Subsection 2.4.1.1.4.1, an informal survey conducted in April 2007 and a targeted presence or absence survey conducted in May 2007 (PBS&J 2007) failed to detect the golden-cheeked warbler. These surveys also concluded that the Ashe juniper stands lacked or, at best, constituted minimally acceptable warbler habitat. However, the targeted survey in May did not satisfy the U.S. Fish and Wildlife Survey (USFWS) survey protocol for the species. Accordingly, Luminant repeated the procedure during the 2008 breeding season to comply with the protocol. Like the earlier surveys, the 2008 survey failed to reveal any golden-cheeked warblers (PBS&J 2008).

The 2008 survey was conducted during the breeding season that extends from March 15 to May 15. Field reconnaissance in early July 2008 at the location of the proposed evaporation pond revealed potential golden-cheeked warbler habitat in the area of the pond. Accordingly, Luminant plans to repeat the USFWS survey procedure during the 2009 breeding season at the location of the proposed Blowdown Treatment Facility and associated evaporation ponds.

Makeup water for the proposed CPNPP Units 3 and 4 circulation water system and essential service water system is planned to be withdrawn from Lake Granbury. The CPNPP Units 3 and 4 circulating water system and essential service water system blowdown are returned to Lake Granbury. Some of the makeup water for CPNPP Units 1 and 2 is currently supplied from Lake Granbury to SCR by existing pipelines within an established ROW. The ROW would be temporarily expanded during construction of the additional pipelines for Units 3 and 4. Field reconnaissance along the ROW failed to reveal any important species or habitats, including wetlands. Several potential ROWs from the current water discharge to SCR to the proposed cooling tower locations for Units 3 and 4 were assessed in late 2007. As with the existing ROW there were no important species or habitats, including wetlands.

Plants and wildlife found in less disturbed habitats on or near the CPNPP site commonly occur throughout north-central Texas. Subsections 4.3.2 and 5.3.3.2 discuss the impacts of construction and operation on terrestrial ecological resources. Also discussed are best management practices (BMPs) that might be implemented as needed to mitigate construction impacts. All of the impacts on terrestrial ecology and land use associated with construction on the CPNPP site are either negligible or SMALL, and do not warrant additional monitoring.

As discussed in Section 5.6, new electrical transmission circuitry supporting CPNPP Units 3 and 4 is constructed, owned, operated, and maintained by Oncor Electric Delivery Company LLC (Oncor), a separate company. Oncor proposes to expand five existing electrical transmission lines now connecting CPNPP to existing switching stations in the area (Figure 1.1-5). Three of the expansions are completed by installing new circuitry on existing structures. Two of the expansions may require constructing new towers on additional ROW. Once approved by the Public Utility Commission of Texas, the new ROWs would likely be subjected to further field evaluation designed to detect any fatal flaws not evident in the data collected to date.

After Oncor secures state approval, the new ROWs would be subjected to site-specific preconstruction investigations, possibly including but not limited to reconnaissance to ascertain the presence or absence of plant species of special concern and other important species and habitats defined in NUREG-1555 or as required by federal or state agency regulatory requirements.

With the exception of the 2009 golden-cheeked warbler survey discussed above and the possible exception of reconnaissance survey along the new transmission line ROWs, no additional preoperational or operational terrestrial ecological monitoring is planned unless the need for monitoring arises as a condition of a permit or other regulatory approval required to construct and operate CPNPP Units 3 and 4.

6.5.2 AQUATIC ECOLOGY

A limited preapplication field investigation designed to characterize aquatic vegetation, benthos, plankton, and fish communities in SCR and Lake Granbury was performed in 2007 and 2008. Subsection 2.4.2 describes this investigation, which was implemented to augment historical data for SCR, and its results. No protected species or critical habitats, as defined in NUREG-1555, have been located on or adjacent to CPNPP.

Dredging and other construction activities in aquatic environments are subject to permitting by the U.S. Army Corps of Engineers and other federal and state regulators. Luminant's contractors would implement BMPs during construction. A stormwater pollution prevention plan approved in accordance with the TPDES stormwater permit, addresses construction activities at the site, including possible dredging to construct the discharge structure on Lake Granbury. A spill prevention countermeasure and control plan (SPCC) may also be required if petroleum products are stored in associated construction areas. These plans also contain BMPs that mitigate impacts to the aquatic environment and shoreline vegetation in Lake Granbury during construction. Wastewater effluent testing is required in accordance with the TPDES permit.

Subsections 4.3.2 and 5.3.1.2 discuss the potential impacts on aquatic ecological resources from constructing and operating the proposed additional units at CPNPP. All of the construction impacts are SMALL, local, and temporary. Operational impacts are also SMALL. No additional preoperational or operational aquatic ecological monitoring is warranted or planned, with the possible exception of specific locations along the new transmission line ROWs, unless the need for monitoring arises during the course of obtaining the necessary regulatory permits or approvals required to construct and operate the proposed additional units at CPNPP.

6.5.3 REFERENCES

(PBS&J 2007) PBS&J. Golden-Cheeked Warbler Bird Survey Report (for) TXU Power, Comanche Peak Power Plant, Somervell County, Texas. Prepared for TXU Power, 1601 Bryan Street, Dallas, Texas 75201. 18383 Preston Road, Suite 110, Dallas, Texas 74252. May.

(PBS&J 2008) PBS&J. Golden-Cheeked Warbler Bird Survey Report (for) Luminant Power, Comanche Peak Power Plant, Somervell County, Texas. Prepared for Luminant Power, 1601 Bryan Street, Dallas, Texas 75201. 18383 Preston Road, Suite 110, Dallas, Texas 74252. May.

(Sullivan 1993) Juniperus ashei. In: Fire Effects Information System, (Online U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory [Producer]). http://www.fs.fed.us/database/feis/ Accessed February 12, 2008.

6.6 CHEMICAL MONITORING

This section describes the chemical monitoring activities for surfacewater and groundwater sources at CPNPP Units 3 and 4. Chemical monitoring includes the following activities:

- Preapplication chemical monitoring to establish the existing water quality and resulting baselines, as described in Chapters 2 and 3.
- Site preparation and construction chemical monitoring to define impacts on surfacewater and groundwater from site preparation and construction activities.
- Preoperational chemical monitoring that establishes a baseline for identifying and assessing environmental impacts from operation of the reactor units.
- Operational chemical monitoring that identifies impacts from CPNPP Units 3 and 4 station operation.

Discussions related to historic, current, and future water use, discharges from CPNPP Units 3 and 4, and potential pollutant sources are found in Subsections 2.3.2, 2.3.3, and Sections 3.3, 3.6, and 5.5. Baseline water quality is described in Subsection 2.3.3; information on anticipated wastewater generation is described in Sections 3.6 and 5.5; ecosystem impact monitoring is described in Sections 4.3 and 5.3, and baseline thermal monitoring programs that can be used to describe the thermal impacts are described in Sections 4.2 and 5.2.

As discussed in Section 6.1, Luminant has a current TPDES permit issued for CPNPP Units 1 and 2 that ensures compliance with the EPA's National Pollution Discharge Elimination System. A permit amendment to the existing TPDES permit to include CPNPP Units 3 and 4 is planned for 2008. The discharge sampling and monitoring requirements established in the TPDES permit (TPDES Permit Number WQ0001854000) are expected to be issued by the Texas Commission on Environmental Quality (TCEQ). Table 6.6-1 (TCEQ 2004) lists (1) the discharge streams, or systems, to be sampled; (2) monitored sampling stations, or outfalls; (3) constituents to be monitored or sampled; (4) frequency of sampling, type, or method, of sample collection; e.g., grab or composite, under the current TPDES permit. The current permit is used in this section to provide examples of waste streams that may require monitoring. The current TPDES permit is expected to be amended to include discharge from CPNPP Units 3 and 4 to Lake Granbury and SCR. Current design plans for CPNPP Units 3 and 4 show the circulation water system (CWS) and the essential service water system (ESWS) blowdown discharging to Lake Granbury, and the liquid low level radioactive and nonradioactive process waste waters, stormwater, and sanitary outflows discharging to SCR.

Specific outfall locations may change due to discharge configuration or site grading modifications that may alter discharge point locations or site stormwater runoff patterns. Cooling tower blowdown effluents from CPNPP Units 3 and 4 are directed to the blowdown diffusers, one for each unit, and discharged to Lake Granbury.

Stormwater is expected to be discharged to SCR. Wastewaters generated from the floor and equipment drains, nonradioactive laboratory wastewater, and sanitary wastes would be processed through the existing wastewater treatment facility mixed with wastewater from CPNPP

Units 1 and 2 then discharged to SCR. Wastewater discharge details are provided in Subsection 3.6.1.3. The chemical discharge concentration limitations are based on established federal and state water quality standards to assure that the receiving water body is not degraded. The amended TPDES permit may require additional monitoring requirements set by the TCEQ to ensure that the impact from wastewater discharges from CPNPP Units 3 and 4 are minimal.

Under the current compliance monitoring program for CPNPP Units 1 and 2, sampling for TPDES outfalls is performed by manually collected grab or composite samples. It is expected that samples are collected using the same procedures for the amended TPDES permit for CPNPP Units 3 and 4. Compliance monitoring samples are analyzed by the CPNPP on-site laboratory, with the exception of biomonitoring and stormwater samples for iron and total suspended solids (TSS) that are submitted to a third-party laboratory for analysis. The TPDES compliance data obtained are recorded, analyzed, and reported in accordance with TCEQ reporting requirements.

Except for sanitary effluent flow and once-through circulating water discharge flow or temperature, analysis of samples are not monitored using instantaneous and totalized automated systems but are performed by Luminant or an independent third-party laboratory. Constituents that may be analyzed by Luminant or the independent third-party laboratory include pH, total suspended solids, oil and grease, free available and total residual chlorine, seven-day chronic toxicity, acute toxicity, biological oxygen demand, and fecal coliform. Luminant and the independent third-party laboratory comply with the necessary laboratory methodologies specific to data quality objectives, quality assurance (QA) procedures, quality control (QC) methods, including quality procedures and instructions for instrument maintenance and calibration, and statistical methods to interpret analytical results in accordance with 40 CFR Part 136.

Quantitative data on chemical characteristics of surfacewater and groundwater within the vicinity of the CPNPP site, including seasonal ranges, averages, and historical extremes, are presented in Subsection 2.3.3. Analytical methods for both surfacewater and groundwater are presented in Tables 6.3-2 and 6.3-3. For the TPDES monitoring, data quality is assured by applying applicable sample gathering, preservation, chain-of-custody, and analytical QA and QC procedures. Samples are analyzed by an independent third-party National Environmental Laboratory Accreditation Conference (NELAC) certified laboratory, as per Texas Administrative Code Title 30 Chapter 25 using EPA approved methods in accordance with 40 CFR 136. The EPA has established these standard methods in the EPA publication SW-846. The analytical requirements apply to groundwater and surfacewaters analyzed for reporting on applicable permits, such as in the TCEQ TPDES program.

6.6.1 PREAPPLICATION MONITORING

The purpose of preapplication water monitoring is to generate a baseline for the assessment of potential impacts that may result from construction and operational activities of CPNPP Units 3 and 4. The preapplication monitoring program may also be used to establish TPDES discharge limits for the site construction and operational stages. The preapplication monitoring program utilizes the existing surfacewater monitoring programs and groundwater monitoring programs.

6.6.1.1 Preapplication Surfacewater Monitoring

The outfalls shown in Figure 2.3-32 and Table 6.6-1 list the surfacewater quality parameters that are included in the current TPDES permit; however, the current TPDES permit must be amended to incorporate discharges through new outfalls as a result of operating CPNPP Units 3 and 4. Although the current TPDES permit does not specify required methods of sample collection or the time of day required for sampling, samples are obtained following generally accepted field sampling practices (Subsection 6.6.1.2). Samples collected as part of the preapplication surfacewater sampling are analyzed in accordance with 40 CFR Part 136 by an independent third-party laboratory that complies with the necessary laboratory certification methodologies (Section 6.6). Additional details on permit revisions and the required process-water discharge monitoring program are provided in Subsection 6.6.4.

During January through November 2007, quarterly surfacewater samples were collected at seven sample locations on SCR: one sample location on Squaw Creek, one sample location on the Brazos River, and one sample location at the existing makeup water intake on Lake Granbury. During April 2007 through January 2008, quarterly surfacewater samples were collected at nine sample locations in the vicinity of the new service water intake and blowdown water discharge on Lake Granbury. The samples were analyzed for a variety of constituents; the results of which are presented in Subsection 2.3.3.1.2 (Tables 2.3-46 and 2.3-26). The sampling locations are presented in Figure 2.3-30 and 2.3-20 and FSAR Subsection 2.4.12 (FSAR Figure 2.4.12-201).

The quarterly surfacewater samples were obtained following generally accepted field-sampling practices, including the use of clean sampling devices, and clean and pre-prepared sample containers supplied by the laboratory performing the analysis. Surfacewater samples were collected from SCR at depths ranging from near surface to 92 ft and from near surface to 50 ft on Lake Granbury. Samples were collected from Squaw Creek and the Brazos River from near surface. Samples were collected from surfacewater bodies at approximately 90-day intervals. Following sample collection, surfacewater samples were submitted in accordance with chain-of-custody protocol to an independent third-party commercial laboratory. Sample vessels were obtained from the independent third-party commercial laboratory, and where required, the sample containers were prepared with proper sample preservation chemicals before being shipped to the CPNPP site. The independent third-party commercial laboratory is NELAC certified for conducting drinking water analysis. Additionally, the analytical procedures that are applied to the surfacewater samples at the CPNPP site for total chromium, total copper, and many of the priority pollutants are identical to the procedures used by the independent third-party commercial laboratory when analyzing drinking water samples and are in accordance with 40 CFR Part 136. To acquire and maintain certification, the independent third-party commercial laboratories are required to develop and maintain instrument calibration procedures compliant with EPA and ASTM protocol, data analysis methods, including statistical methods to interpret results in accordance with 40 CFR Part 136, and QA and QC methods, therefore complying with the necessary laboratory certification methodologies.

The quarterly surfacewater sampling data provides a baseline water quality on Lake Granbury and SCR, coupled with the SCR historical data, in the vicinity of the CPNPP site, and adequately characterizes seasonal variations throughout an annual cycle. The data obtained through this sampling program supports the environmental descriptions for hydrology, water use, water quality, aquatic ecology, and water supply discussed in Chapters 2 and 3.

6.6.1.2 Preapplication Groundwater Monitoring

In January 2007, a groundwater sampling program was initiated as part of a subsurface study to evaluate current geologic and hydrogeologic conditions at the CPNPP site. Twenty groundwater monitoring well clusters (47 wells total), one aquifer test recovery well, and three aquifer test observation wells were installed from October 2006 to February 2007. The groundwater monitoring wells were developed, and water levels were measured monthly from December 2006 through December 2007, January to May 2008, and August to December 2012. A list of the monitoring wells and relevant installation data are presented in Subsection 2.3.1.5.5 (Table 2.3-29) and FSAR Subsection 2.4.12 (FSAR Table 2.4.12-201). The locations of the groundwater monitoring wells are presented in Figure 2.3-26 and FSAR Figure 2.4.12-208. In addition to the water level measurements, quarterly groundwater samples were taken from 10 of the wells and analyzed for a variety of constituents, and the results of the groundwater sampling are presented in Subsection 2.3.1.5.5 (Table 2.3-50). The groundwater samples were obtained following generally accepted field sampling procedures, including the use of clean sampling devices, and clean and prepared sample containers supplied by the laboratory that performs the analysis. The samples were taken on approximately 90-day intervals. Sample preservation and analysis followed the procedures for groundwater sampling and analysis. Groundwater samples were submitted in accordance with chain-of-custody protocol to independent third-party commercial laboratories.

6.6.2 CONSTRUCTION MONITORING

A construction monitoring program may be required by TCEQ to provide data necessary to assess surfacewater quality changes resulting from construction of CPNPP Units 3 and 4, especially in relation to construction-area stormwater runoff. The land area disturbed by construction of CPNPP Units 3 and 4 is expected to be 675 ac, which exceeds the one-ac limit, requiring a stormwater construction permit in accordance with 40 CFR 122.26 (Subsection 4.2.1.10).

If construction monitoring is required by TCEQ, the results can be compared with the preapplication quarterly surfacewater and groundwater sampling program discussed in Subsections 6.6.1.1 and 6.6.1.2 and used to detect any deviations from the baseline water quality.

6.6.2.1 Construction Surfacewater Monitoring

Construction activities for CPNPP Units 3 and 4 require a TPDES stormwater construction permit in accordance with 40 CFR 122.26 and the Texas Water Code (TCEQ 2007). The CPNPP site preparation and construction activities are expected to be performed under a TPDES permit, with all requirements implemented in the monitoring program, as required.

6.6.2.2 Construction Groundwater Monitoring

Construction is expected to have no effect on groundwater; consequently, no construction groundwater monitoring program is anticipated. As described in Subsection 6.3.2.2, as construction proceeds, some of the existing monitoring wells are expected to be closed and properly abandoned. As necessary, these wells are replaced with new wells in anticipation of the preoperational and operational monitoring.

6.6.3 PREOPERATIONAL MONITORING

Because preapplication monitoring was conducted (Subsection 6.6.1) and there is an ongoing radiological groundwater monitoring program and monitoring required by the existing TPDES permit for CPNPP Units 1 and 2, a preoperational monitoring program is not required. The preapplication monitoring conducted, as detailed in Subsection 6.6.1, provides (1) a logical extension of both the preapplication/site preparation and construction monitoring programs, (2) an adequate baseline to compare against the operational monitoring program (Subsection 6.6.4), and (3) the means to measure and quantify any water quality changes resulting from the CPNPP Units 3 and 4 operation.

Wastewaters are expected to be generated from preoperational activities, including pressurized hydrostatic testing, flushing, and cleaning of piping and other CPNPP equipment for CPNPP Units 3 and 4. System integrity testing conducted using pressurized water and flushing of piping and other equipment for CPNPP Units 3 and 4 generate various volumes of relatively clean wastewater. The volumes generated depend on the quantity and volume of the piping, and other CPNPP Units 3 and 4 equipment requiring pressure testing and flushing. The wastewaters generated from these activities are planned to be treated using the existing wastewater treatment system to ensure discharged waters meet the TPDES permit limits.

In some cases, prefabricated piping and other plant equipment are treated with oils or protective sealants to prevent damage and rusting during shipping and handling at the site. Solvent solutions may be used to dissolve protective sealants. The solvents and dissolved sealants are flushed with water from the piping and other equipment associated with CPNPP Units 3 and 4. This process generates wastewater that is captured and retained in designated temporary metal cleaning waste holding tanks or the lined metal cleaning waste retention pond for analysis. If the analysis determines that the wastewater generated is non-hazardous and can be discharged in accordance with the current TPDES permit, it is discharged. Conversely, if the analysis determines that the wastewater is hazardous or cannot be discharged in compliance with the current TPDES permit, it is hauled off-site for proper treatment. If these waste streams cannot be processed by the current wastewater treatment facility, then they are profiled and disposed of at an off-site permitted facility. Off-site disposal practices are discussed in Section 5.5.

6.6.4 OPERATIONAL MONITORING

A TPDES permit from TCEQ is required for the CPNPP operational wastewater discharges. Current design plans for CPNPP Units 3 and 4 show the CWS and ESWS blowdown discharging to Lake Granbury, and the liquid low level radioactive and nonradioactive process waste waters, stormwater, and sanitary outflows discharging to SCR. The TPDES permit monitoring requirements for the operation of the CPNPP identify constituents to be monitored for analysis of any changes in water quality that may result from plant operations. Table 6.6-1 lists information from the current TPDES permit for CPNPP Units 1 and 2 including outfalls that may be sampled, constituents to be monitored, frequency of sampling, and types of samples (e.g., grab or composite).This permit is expected to be amended to include a new outfall(s) for Lake Granbury to replace the current Outfall No. 005. Constituents to be monitored, frequency of sampling, and types of samples for this new outfall(s) are expected to be negotiated at the time of the TPDES permit amendment.

Subsection 3.3.1 discusses plant water use for CPNPP Units 3 and 4 and includes details related to water consumption by the various cooling and other water use systems and the discharges from these systems. Subsection 3.3.2 discusses methods of treatment of water used in the plant and discharged to Lake Granbury or SCR. Subsection 3.3.2.1 presents the treatment chemicals that are injected into the CWS, the ESWS, and the demineralized water system by the turbine island chemical feed system. The chemicals added to the CWS and ESWS maintain a noncorrosive, nonscale-forming condition, and limit biological film formation. Table 3.6-1 lists those chemicals used and residual concentrations within the waste streams discharged from the facility for CPNPP Units 3 and 4.

Figure 3.3-1 is a water balance summary for CPNPP, and Table 3.3-1 provides estimates of water use and blowdown discharged to Lake Granbury from the CPNPP Units 3 and 4 CWS and ESWS, and the demineralized water system. A CPNPP Unit 3 and 4 detailed water use by operating mode (power operation, start-up, hot standby, safe shutdown, cold shutdown and refueling) is provided in Table 3.4-2.

Subsection 3.5.1 discusses the CPNPP Units 3 and 4 liquid radioactive waste management system. Subsection 3.5.1.1.1.4 discusses steam generator blowdown. Under normal operating conditions the blowdown is returned to the condensate system. However, if the steam generator tube leakage results in significant levels of radioactivity in the steam generator blowdown stream, this stream is redirected to the liquid radwaste system for treatment before release. In this event, the blowdown stream is directed to one of the waste holdup tanks for processing. From the waste holdup tanks, the blowdown stream is pumped and processed through waste ion exchangers continuously or in batches. The blowdown is then collected in a monitor tank and sampled. The liquid waste is discharged from the monitor tank in a batch operation, with the discharge flow rate restricted as necessary to maintain an acceptable concentration when diluted by the cooling tower blowdown discharge flow. The treated liquid waste is discharged into the SCR.

Section 3.6 addresses the CPNPP Units 3 and 4 nonradioactive waste systems. Subsection 3.6.1 identifies and quantifies each chemical and biocide added to the receiving water by the discharge stream. Table 3.6-1 shows the chemicals used in each system (for the CWS and ESWS, and demineralized water systems), the amount used per year, the frequency of use, and the concentration anticipated in the waste stream discharged from CPNPP Units 3 and 4.

Subsection 3.6.1.2 further details the CPNPP Units 3 and 4 system for processing and discharging the steam generator blowdown. The chemicals that are needed to maintain proper operation of the system are injected by the turbine island chemical feed system on an as-needed basis and are not dependent on the modes of operation of the CPNPP. The chemicals injected into the steam generator blowdown, the amount used per year, the frequency of use, and the concentration in the waste stream are shown in Table 3.6-1.

Subsection 3.6.1.3 discusses the CPNPP Units 3 and 4 wastewater treatment system. For each unit, the wastewater system (1) collects wastes from system flushing during startup prior to treatment and discharge, (2) collects processes fluids drained from equipment or systems during maintenance or inspection activities, and (3) directs nonradioactive equipment and floor drains wastes to the building sumps and transfers their contents for proper waste disposal. The wastewater system also removes oil or suspended solids from miscellaneous waste streams generated from the CPNPP.

6.6.5 REFERENCES

(TCEQ 2004) Texas Commission on Environmental Quality. Texas Pollutant Discharge Elimination System (TPDES) Permit. TXU Energy Company, L.L.C. Comanche Peak Nuclear Power Plant. Permit No.WQ0001854000. April 23, 2004.

(TCEQ 2007) Texas Commission on Environmental Quality. TPDES Construction General Permit issued under the provisions of Section 26.040 of the Texas Water Code and Section 402 of the Clean Water Act.

TABLE 6.6-1 (Sheet 1 of 2)
SURFACEWATER QUALITY MONITORING PROGRAM (INFORMATION FROM CURRENT TPDES PERMIT FOR CPNPP UNITS 1 AND 2)

OUTFALL NUMBERS AND DISCHARGES	CONSTITUENTS (units)	MONITORING FREQUENCY	SAMPLE TYPE
001: Where once-through cooling water and previously monitored effluents[(a)] are discharged from the discharge structure to SCR.	Flow (Mgd)	Continuous[(b)]	Record
	Temperature, (ºF)[(c)]	Continuous	Record
	Free Available Chlorine[(d)]	1/Week[(e)]	Grab
	Total Residual Chlorine[(f)]	1/Week[(e)]	Grab
002: Where Safe Shutdown Impoundment (SSI) effluents are discharged to SCR.	Flow (Mgd)	Day[(g)]	Estimate
	Total Suspended Solids	Week[(g)]	Grab
	Oil and Grease	Week[(g)]	Grab
003: Where sanitary sewage effluents are discharged from the sewage treatment plant prior to SCR.	Flow (Mgd)	1/day[(h)]	Estimate
	Biochemical Oxygen Demand (5-day)	2/month	Grab
	Total Suspended Solids	2/month	Grab
	Fecal Coliform[(i)]	1/week	Grab
004: Where low-volume wastewater[(j)] and previously monitored effluents are discharged prior to mixing with the once-through cooling water and/ or SCR.	Flow (Mgd)	1/day[(g)]	Estimate
	Total Suspended Solids	1/week[(g)]	Grab[(k)]
	Oil and Grease	1/week[(g)]	Grab[(k)]
005: Located at SCR Dam, prior to discharge to Lake Granbury	Flow (Mgd)	1/day[(b)(g)]	Estimate
	Temperature	1/day[(b)]	Grab
	Total Dissolved Solids	1/month[(b)]	Grab

TABLE 6.6-1 (Sheet 2 of 2)
SURFACEWATER QUALITY MONITORING PROGRAM (INFORMATION FROM CURRENT TPDES PERMIT FOR CPNPP UNITS 1 AND 2)

OUTFALL NUMBERS AND DISCHARGES	CONSTITUENTS (units)	MONITORING FREQUENCY	SAMPLE TYPE
104: Where metal cleaning wastes are discharged from the retention pond or temporary treatment facilities prior to mixing with low-volume waste stream prior to discharge via Outfall 004	Flow (Mgd)	1/day[(g)]	Estimate
	Iron, Total	1/week[(g)]	Grab
	Copper, Total	1/week[(g)]	Grab

a) Effluent previously monitored at Outfall 004 may be discharged through Outfall 001.

b) Flow rates shall be obtained from pump curve data.

c) Daily average temperature is defined as the flow weighted average temperature (FWAT) and shall be computed and recorded on a daily basis. FWAT shall be computed at equal time intervals not greater than 2 hours. The method of calculating FWAT is as follows:

$$\text{FWAT} = \frac{\text{SUMMATION (INSTANTEOUS FLOW X INSTANTANEOUS TEMPERATURE)}}{\text{SUMMATION (INSTANTANEOUS FLOW)}}$$

"Daily average temperature" shall be the arithmetic average of all FWAT's calculated during the calendar month.

"Daily maximum temperature" shall be the highest FWAT calculated during the calendar month.

d) The term “total residual chlorine" (or total residual oxidants for the intake water with bromides) means the value obtained using the amperometric method for total residual chlorine described in 40 CFR Part 136. Total residual chlorine may not be discharged from any single generating unit for more than two hrs per day unless the discharge demonstrates to the permitting authority that discharges for more than two hrs is required for macroinvertebrate control. Simultaneous multi-unit chlorination is permitted.

e) Samples shall be representative of periods of Chlorination

f) The term “free available chlorine” shall mean the value obtained using the amperometric titration method for free available chlorine described in "Standard Methods for the Examination of Water and Wastewater." Free available chlorine may not be discharged from any unit for more than two hours in any one day.

g) When discharge occurs.

h) Flow monitoring may be suspended on weekends and holidays. Flow rates for weekends and holidays shall be averaged from the flow totalizer readings taken the next working day.

i) Fecal coliform daily average shall be reported as the geometric mean of the values for the effluent samples collected during the calendar month.

j) The term "low volume waste sources" means, wastewaters from, but not limited to: wet scrubber air pollution control systems, ion exchange water treatment system, water treatment, evaporator and boiler blowdown, laboratory and sampling streams, floor drainage, cooling tower basin cleaning wastes and blowdown from recirculation house service water systems. Sanitary and air conditioning wastes are not included.

k) If more than one source is associated with the particular waste category, the permittee may obtain grab samples from each source. The permittee may either analyze the samples individually and report the highest value for reporting purposes or follow the appropriate procedure below:

Total Suspended Solids:	Grab samples obtained from each source may either be individually analyzed for reporting the arithmetic average and the maximum values or physically combined into a single flow-weighted sample for analysis and reporting.
Oil and Grease:	Luminant submitted a letter dated July 28, 1999 from Mr. Gerald Johnson to Mr. Chris Linendoll of the TCEQ, which requested and described an alternate sampling procedure using EPA approved method 1664A, hexane extractable material (HEM) method in order to maintain the ability to composite samples by flow weighting from individual sources. This alternate sampling procedure has been approved by the Executive Director of the TCEQ and may be used to obtain oil and grease samples as described in the letter from multiple discharge locations for a single outfall.
pH:	Samples shall be obtained from each source and shall be analyzed separately for pH. The highest and lowest value recorded for pH shall be utilized for reporting purposes.

(TCEQ 2004)

6.7 SUMMARY OF MONITORING PROGRAMS

Environmental monitoring is needed to establish baseline or reference environmental conditions preceding plant construction and operation to identify and evaluate potential changes to the environment during plant construction and operation, and to evaluate the effects of the programs aimed at eliminating or mitigating adverse impacts during construction or operation. This section provides a summary of the environmental monitoring programs necessary for all phases of the CPNPP Units 3 and 4 project as outlined in previous sections of Chapter 6. The environmental monitoring program sections include the following:

- Thermal Monitoring (Section 6.1).
- Radiological Monitoring (Section 6.2).
- Hydrological Monitoring (Section 6.3).
- Meteorological Monitoring (Section 6.4).
- Ecological Monitoring (Section 6.5).
- Chemical Monitoring (Section 6.6).

This summary is divided into three sections: (1) site preparation and construction monitoring, (2) preoperational monitoring, and (3) operational monitoring. The site preparation and construction, preoperational, and operational monitoring programs, along with sections and subsections where related details can be found, are listed in Table 6.7-1.

6.7.1 SITE PREPARATION AND CONSTRUCTION MONITORING

Site preparation and construction monitoring requirements for CPNPP Units 3 and 4 are fulfilled by the monitoring programs as described in Chapter 6 and are summarized below.

- Site preparation and construction thermal monitoring and modeling programs are detailed in Section 6.1.1, and include:
  - Anticipated thermal effects of cooling system discharges from operation of CPNPP Units 3 and 4 on Lake Granbury were modeled using CORMIX Version 4.3 part CORMIX2 (multiport diffuser). Further details and results of this modeling are provided in Section 5.3.
  - Site preparation and construction baseline thermal monitoring data that were input to the CORMIX2 model reflect actual Lake Granbury conditions in the vicinity of the intake and discharge (blowdown) structures of the condenser cooling water system. These data support the impact analyses detailed in Sections 5.2 and 5.3.
- Radiological monitoring during the site preparation and construction phases is detailed in Section 6.2, and includes the following:

- Because CPNPP Units 1 and 2 are operational, there is a commitment to continue the current operational radiological monitoring program. The current operational radiological monitoring program adequately characterizes the radiological environment of the biosphere in the vicinity of CPNPP for all four nuclear units.

- After construction starts, one of the existing combined air monitor and TLD locations is planned to be moved in the northwest direction to be out of the construction zone (Subsection 6.2.2).

- Historical data on measurable levels of radiation and radioactive materials in the vicinity environs provide baseline data on principal pathways of exposure to the public. The pathways of exposure are basically the same for all four of the nuclear units (Subsection 6.2.2).

• The REMP is described and controlled by the current ODCM for CPNPP Units 1 and 2. The ODCM is planned to be revised to include CPNPP Units 3 and 4 in the program (Subsections 6.2.1 and 6.2.2).

• Hydrological site preparation and construction monitoring programs are detailed in Subsections 6.3.1 and 6.3.2, respectively. These programs include the following:

- Because CPNPP Units 1 and 2 are operational, surfacewater data for SCR are available indicating compliance with the TPDES permit (TCEQ 2004). Thermal monitoring is performed daily. To establish baseline water quality, quarterly surfacewater sampling programs were conducted on SCR and Lake Granbury, from January 2007 through October 2007 and from April 2007 through January 2008, respectively (Subsections 6.3.1 and 6.3.2).

- A bathymetric study was conducted on Lake Granbury in April through May 2007 in the vicinity of the proposed intake and discharge structures (Subsection 6.3.1.1).

- A bathymetric study was conducted on SCR in April through May 2007 for supplemental information to support the project (Subsection 6.3.1.1).

- Forty-seven new groundwater monitoring wells were installed in and around the CPNPP Units 3 and 4 site to better characterize the site hydrology as discussed in Section 2.3.

- Monthly measurements of groundwater depth have been collected from all 47 site wells and quarterly samples were collected from 10 wells on-site to establish baseline groundwater quality (Subsections 6.3.1.2).

• On-site preparation and construction meteorological monitoring programs for CPNPP Units 3 and 4 are detailed in Subsection 6.4.1. These programs include the following:

- A commitment by Luminant to maintain the current operational meteorological program. Because CPNPP Units 1 and 2 are operational, the meteorological monitoring program was operational before CPNPP Unit 1 began operation in April 1990. CPNPP Unit 1 preconstruction meteorological data date from May 1972 to May 1976 (Section 6.4).

- Details and results of the meteorological monitoring program for the years 2001 – 2005 were used in analyses and calculations supporting this application (Subsection 6.4.1.3).

- Temporary relative humidity instrumentation was used onsite in 2008 to support calculations, such as cooling tower plume analysis, and to assure correlation with off-site data sources (Subsection 6.4.1).

- Meteorological conditions are being monitored to determine the representative site meteorological conditions. The observation of temperature, wind, and other parameters provides input for developing statistical meteorological models.

• Monitoring programs for site preparation and construction regarding terrestrial ecology and land use are discussed in Subsection 6.5.1, and aquatic ecology is discussed in Subsection 6.5.2. These programs ensure the following:

  - The responsibility of Luminant for the ecological monitoring programs associated with the CPNPP Units 3 and 4 are fulfilled.

  - Pre-construction studies addressed water quality and aquatic resources in the vicinity of the site to establish an aquatic baseline for the operational phase of aquatic impacts, especially noting conditions existing as a result of CPNPP Units 1 and 2 being in operation.

  - Data on terrestrial resources have been collected and studied by Luminant. There are no federally listed threatened or endangered plant species in Hood or Somervell counties (Subsection 6.5.1).

  - Surveys were conducted in April and May 2007 to determine if endangered golden-cheeked warblers were residing in the undisturbed scrub and treed area adjacent to CPNPP Units 3 and 4 cooling towers. No golden-cheeked warblers or other listed species were found during the surveys (Section 2.4). Additional surveys are conducted in the March through May 2008 time frame to verify the absence of nesting golden-cheeked warblers. The surveys confirmed the absence of this bird.

  - Details in Subsections 4.3.1 and 5.3.1.2 conclude that the impacts of construction and operation of CPNPP Units 3 and 4 on terrestrial resources are characterized as SMALL.

  - Impacts associated with construction and operation on aquatic resources are identified in Subsection 4.3.2 and Section 5.3, respectively, and are categorized as SMALL.

- Aquatic monitoring currently performed by CPNPP within SCR and Lake Granbury as part of the monitoring program is designed to determine community structure as a measure of overall reservoir conditions (Section 2.4).
- Four seasons of ecological and fish monitoring were performed by CPNPP as a part of other environmental reviews. Ongoing ecological monitoring at the CPNPP site continues into the foreseeable future.

- Details of the site preparation and construction chemical monitoring program are provided in Subsections 6.6.1 and 6.6.2, and include the following:
  - Site preparation and construction chemical monitoring program is composed of surfacewater and groundwater monitoring programs that are required under the TPDES permit.
  - Surfacewater quality parameters that are included in the current TPDES permit are listed in Table 6.6-1.
  - Quarterly surfacewater samples were collected at seven sample points on SCR, one sample point on Squaw Creek, one sample point on the Brazos River below the confluence of the Paluxy River, and one sample point from the existing makeup water intake on Lake Granbury. Additionally, quarterly surfacewater samples were collected from nine sample points on Lake Granbury in the immediate vicinity of the CPNPP Units 3 and 4 intake and discharge structures. The quarterly surfacewater sampling data provide a baseline of water quality in the vicinity of the CPNPP site and adequately characterize seasonal variations throughout an annual cycle (Subsections 6.6.1 and 6.6.2).

Many of the site preparation and construction hydrological, meteorological, radiological, chemical, ecological, and other applicable monitoring programs continue through the preoperational phases of the project.

6.7.2 PREOPERATIONAL MONITORING

Details of the preoperational environmental monitoring programs are located in the following sections and subsections:

- Preoperational thermal monitoring is addressed in Subsection 6.1.2 and includes the following:
  - The preoperational CORMIX 4.3 modeling conducted and detailed in Subsection 6.1.2 is intended to supplement the site preparation and construction monitoring (Section 5.3).
  - Effluents from CPNPP Units 3 and 4 cooling tower blowdown are directed by pipeline to Lake Granbury, and discharge through diffusers.

- Radiological monitoring is addressed in Section 6.2 and includes the following:

   - Because CPNPP Units 1 and 2 are operational, there is a commitment to continue the current operational radiological monitoring program. The current operational radiological monitoring program adequately characterizes the radiological environment of the biosphere in the vicinity of CPNPP for all four nuclear units.

   - The REMP is described and controlled by the current CPNPP ODCM, Units 1 and 2. The ODCM is expected to be revised to include the CPNPP Units 3 and 4 in the program (Subsections 6.2.1 and 6.2.2).

- Preoperational hydrological monitoring is addressed in Subsection 6.3.3 and includes the following:

   - The monitoring is expected to be conducted to establish a baseline for identifying and assessing environmental impacts resulting from CPNPP Units 3 and 4 operations.

   - The monitoring is used to verify existing hydrologic conditions and evaluate alterations in surfacewater and groundwater flow, impacts of retained wastewater on water quality, and alterations of sediment transport, floodplains, or wetlands.

- Preoperational meteorological monitoring is addressed in Section 6.4 and includes the following:

   - A commitment by Luminant to maintain the current operational meteorological program. Because CPNPP Units 1 and 2 are operational, the meteorological monitoring program was operational before CPNPP Unit 1 began operation in April 1990. CPNPP Unit 1 preconstruction meteorological data date from May 1972 to May 1976 (Section 6.4).

- Preoperational terrestrial ecology and land-use monitoring is detailed in Subsection 6.5.1. Subsection 6.5.2 contains details on monitoring aquatic ecology and includes the following:

   - To determine whether or not endangered fish were residing in SCR and Lake Granbury in the vicinity of the CPNPP Units 3 and 4 intake and discharge structures, surveys and research were conducted in the area (Subsection 2.4.2).

   - To predict biological impacts on Lake Granbury of the blowdown (CPNPP Units 1 and 2 SCR return line has not been used and was not included in CORMIX) water discharges that include time-temperature relationships, CORMIX modeling results were used (Section 5.3).

- Preoperational chemical monitoring is addressed in Subsection 6.6.3:

   - Because site preparation and construction monitoring was conducted, a preoperational monitoring program is not required (Subsections 6.6.1 and 6.6.2).

6.7.3 OPERATIONAL MONITORING

While specific operational monitoring requirements and programs for CPNPP Units 3 and 4 have not yet been defined, they are expected to be similar to, and tiered from or added to, the monitoring programs summarized in Subsection 6.7.1. The following sections and subsections provide details of the anticipated operational monitoring programs:

- Operational thermal monitoring is addressed in Subsection 6.1.3 and provides the following:
    - Establishment of routine thermal monitoring of discharges to SCR and Lake Granbury.
    - Requirements, limits, and conditions similar or identical to those found in the existing TPDES permit for thermal monitoring are anticipated to also apply for operation of CPNPP Units 3 and 4.
- Operational radiological monitoring is addressed in Section 6.2 and Subsection 6.2.5 and includes the following:
    - Collection of environmental samples and determination of concentrations of radioactive constituents in the samples in accordance with ODCM requirements. Samples are taken from stations in the general area and vicinity of CPNPP and from areas, such as control locations, not directly influenced by CPNPP operations.
    - Sampling of air, water, sediment, fish, and food products, as well as direct radiation levels.
    - Reporting of monitoring results in the CPNPP Annual Radiological Environmental Monitoring Report submitted to the NRC each year (Subsection 6.2.3).
- Operational hydrological monitoring is addressed in Subsection 6.3.4 and includes the following:
    - Monitoring and subsequent sediment removal from the cooling tower system intake is anticipated periodically to minimize any impact to the raw water system operation.
    - Commencement of a bathymetric survey of the intake is expected following the first year of operation to measure sediment build up and determine future dredging requirements.
    - Monitoring of surfacewater are expected to be performed as specified in the TPDES permit. Quarterly groundwater samples are expected to be taken for the first year of operation and yearly afterwards.

  - Modification of the program may occur as improved equipment and analysis methods are developed, or as needed to meet updated regulatory program requirements.

- Operational meteorological monitoring is addressed in Section 6.4 and includes the following:

  - A commitment by CPNPP to maintain the current operational meteorological program. Because CPNPP Units 1 and 2 are operational, the meteorological monitoring program was operational before CPNPP Unit 1 began operation in April 1990. CPNPP Unit 1 preconstruction meteorological data date from May 1972 to May 1976 (Section 6.4).

- Operational terrestrial ecology and land use are addressed in Subsection 6.5.1. Subsection 6.5.2 addresses aquatic ecology including:

  - Terrestrial species and habitats that could be adversely affected by CPNPP operations are monitored according to established permits or other regulatory approvals required to operate CPNPP Units 3 and 4, if required.

  - Fish and aquatic species, and habitats that could be affected by the intake or discharge of cooling water or other operational impacts, are sampled and monitored according to established permits or other regulatory approvals required to operate CPNPP Units 3 and 4, if required.

- Operational chemical monitoring is addressed in Subsection 6.6.4, and includes the following:

  - Discharges made through designated outfalls are monitored for compliance with the TPDES permit. The designated outfalls are listed in Table 6.6-1 and the TPDES lists the surfacewater-quality parameters that are included in the current permit.

  - Discussion of plant water use and water balance (Subsections 3.3.1 and 3.3.2), liquid radioactive waste management systems (Subsection 3.5.1), nonradioactive waste systems (Section 3.6), blowdown (Section 3.5), and wastewater treatment systems (Section 3.6) and chemicals.

Specific procedures for performing the monitoring and sampling programs are provided to address the requirements of various environmental permits, manuals, and regulations. The procedures define the required schedules, locations, methodology, and sampling criteria for each monitoring program. The principal monitoring programs include collecting data on:

- Site meteorological conditions.

- Groundwater flow, depth, and quality.

- Stormwater runoff and water quality monitoring of any applicable water bodies such as wetlands and streams.
- Ecological surveys of wetlands, and aquatic species and habitats.
- Ecological surveys of terrestrial species and habitats.
- Radiological monitoring.
- Material holding tanks, ponds, and waste.
- Employee radiological and health monitoring.

A program designed to monitor, identify, and report accidents and employee safety issues, provide health screening, monitor breathing air program issues, and provide on-site safety and medical personnel currently is in place for the CPNPP Units 1 and 2 and is planned to be available to cover all workers involved with CPNPP Units 3 and 4. The program data are used to modify work procedures and practices so as to promote a safe working environment.

6.7.4 REFERENCES

(TCEQ 2004) Texas Commission on Environmental Quality. Texas Pollutant Discharge Elimination System Permit, TXU Energy Company, L.L.C., Comanche Peak Nuclear Power Plant, Permit No.WQ0001854000. April 23, 2004.

TABLE 6.7-1 (Sheet 1 of 2)
SUMMARY OF MONITORING PROGRAMS

Monitoring Period	Type of Monitoring	Applicable Section/Subsection for Additional Details
General	Thermal	6.1
	Radiological	6.2
	Hydrological	6.3
	Meteorological	6.4
	Ecological	6.5
	Chemical	6.6
Site Preparation and Construction	Thermal	6.1.1 (preapplication)
	Radiological	6.2
	Hydrological	6.3.1 (preapplication) 6.3.2 (construction)
	Meteorological	6.4
	Ecological	6.5.1 (terrestrial ecology and land use) 6.5.2 (aquatic ecology)
	Chemical	6.6.1 (preapplication) 6.6.2 (construction)
Preoperational Monitoring	Thermal	6.1.2
	Radiological	6.2
	Hydrological	6.3.3
	Meteorological	6.4
	Ecological	6.5.1 (terrestrial ecology and land use) 6.5.2 (aquatic ecology)

TABLE 6.7-1 (Sheet 2 of 2)
SUMMARY OF MONITORING PROGRAMS

Monitoring Period	Type of Monitoring	Applicable Section/Subsection for Additional Details
	Chemical	6.6.3
Operational Monitoring	Thermal	6.1.3
	Radiological	6.2
	Hydrological	6.3.4
	Meteorological	6.4
	Ecological	6.5.1 (terrestrial ecology and land use) 6.5.2 (aquatic ecology)
	Chemical	6.6.4