

SAMPLE SCHEDULE FOR THURSDAY MAY 23, 1991

ANALYSIS \ SAMPLE	WPINF	WPEFF	RESERVOIR	CWCNL1	CWCNL2	CWCNL3	EVAP 1	EVAP 2
pH	1	1	1	1	1	1	1	1
Free Chlorine Residual, mg/l	1	1	1	1	1	1	1	1
Total Suspended Solids, mg/l	1	1	1	1	1	1	1	1
Standard Plate Count, colonies/ml	1	1	1	1	1	1	1	1
Fecal Coliform	2	2	2	2	2	2	2	2
Fecal Streptococci	2	2	2	2	2	2	2	2
5-Day Biochemical Oxygen Demand, mg/l	2	2	2	2	2	2	2	2
Legionella	3	3	3	3	3	3	3	3
Enteric Virus		4		4				4
Giardia Lamblia		4		4				4
Ascaris Lumbricoides		4		4				4

LAB RESPONSIBLE FOR ANALYSIS: 1 = WRF TSD PROCESS CHEMISTRY LAB
 2 = ARIZONA TESTING LABS
 3 = BOLIN LABS
 4 = UNIVERSITY OF ARIZONA LAB

SAMPLE RESULTS FOR THURSDAY MAY 23, 1991

ANALYSIS \ SAMPL	WPINF	WPEFF	RESERVOIR	CWCNL1	CWCNL2	CWCNL3	EVAP 1	EVAP 2
pH	7.1	9.1		7.3	7.3	7.3		
Free Chlorine Residual, mg/l	<0.1	<0.1	<0.1	0.3	0.5	0.1	<0.1	<0.1
Total Suspended Solids, mg/l	11	2		81	76	410		
Standard Plate Count, colonies/ml	120000	66		34	29	25		
Fecal Coliform	>80	<2	<2	<2	<2	<2	<2	2
Fecal Streptococci	>80	<2		<2	<2	31		
5-Day Biochemical Oxygen Demand, mg/l	21	<5		13	13	7		
Legionella	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
Enteric Virus (per 40 liters)		1		0				
Giardia Lamblia (per 40 liters)		0		0				
Ascaris Lumbricoides		NEG.		NEG.				

NOTE: Common Large Tapeworm and Entamoeba histolytica were also analyzed at the WPEFF, CWCNL1, and Evaporation Pond # 2 and found to be negative.

Copy to: → Robert Ott
7-16-91

THE UNIVERSITY OF ARIZONA
Tucson, Arizona 85721

University Department of Microbiology
and Immunology

Building #90
AC 602 621 6903

Date July 9, 1991

FROM: Charles P. Gerba
Department of Microbiology and
Immunology
Building #90
University of Arizona
Tucson, AZ 85721
Phone: (602) 621-6163

TO: Palo Verde Nuclear Plant
WWTP

RESULTS OF VIRUS AND/OR PARASITE ANALYSIS

Location of Sample Collection	<u>Wastewater Plant Effluent</u>
Date of Sample Collection	<u>5/23/91</u>
Volume of Sample	<u>228</u> liters
Enterovirus (MPN) (Enteric Virus)	<u> </u> liters
<u>Ascaris lumbricoides</u>	<u> </u> liters
<u>Giardia lamblia</u>	<u>0/40</u> liters
Common Large Tapeworm	<u>negative</u> liters
<u>Entamoeba histolitica</u>	<u>negative</u> liters
<u>Cryptosporidium</u>	<u> </u> liters
Other:	<u> </u> liters

Results approved by Jaime Naranjo
Jaime Naranjo
Laboratory Supervisor

THE UNIVERSITY OF ARIZONA
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RESULTS OF VIRUS AND/OR PARASITE ANALYSIS

Location of Sample Collection	<u>Cooling Tower (CWCNL 1)</u>
Date of Sample Collection	<u>5/23/91</u>
Volume of Sample	<u>88</u> liters
Enterovirus (MPN) (Enteric Virus)	<u> </u> liters
<u>Ascaris lumbricoides</u>	<u> </u> liters
<u>Giardia lamblia</u>	<u>0/40</u> liters
Common Large Tapeworm	<u>negative</u> liters
<u>Entamoeba histolitica</u>	<u>negative</u> liters
<u>Cryptosporidium</u>	<u> </u> liters
Other: <u> </u>	<u> </u> liters

Results approved by
Jaime Naranjo
Laboratory Supervisor

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TO: Palo Verde Nuclear Plant
WWTP

RESULTS OF VIRUS AND/OR PARASITE ANALYSIS

=====
Location of Sample Collection Evaporative Reservoir (EVAP. 2)

Date of Sample Collection 5/23/91

Volume of Sample 165 liters
Enterovirus (MPN) _____ liters
(Enteric Virus)
Ascaris lumbricoides _____ liters
Giardia lamblia 0/40 liters
Common Large Tapeworm negative liters
Entamoeba histolitica negative liters
Cryptosporidium _____ liters
Other: _____ liters

Results approved by J. Naranjo
Jaime Naranjo
Laboratory Supervisor

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RESULTS OF VIRUS AND/OR PARASITE ANALYSIS

=====
Location of Sample Collection Wastewater Plant Effluent
=====
Date of Sample Collection 5/23/91
Volume of Sample one liters
Enterovirus (MPN) liters
(Enteric Virus)
Ascaris lumbricoides negative liters
Giardia lamblia liters
Common Large Tapeworm liters
Entamoeba histolitica liters
Cryptosporidium liters
Other: liters

Results approved by
Jaime Naranjo
Laboratory Supervisor

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WWTP

RESULTS OF VIRUS AND/OR PARASITE ANALYSIS

=====
Location of Sample Collection Cooling Tower (CWCNLI)
=====
Date of Sample Collection 5/23/91
Volume of Sample one liters
Enterovirus (MPN) liters
(Enteric Virus)
Ascaris lumbricoides negative liters
Giardia lamblia liters
Common Large Tapeworm liters
Entamoeba histolitica liters
Cryptosporidium liters
Other: liters

Results approved by
Jaime Naranjo
Laboratory Supervisor

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RESULTS OF VIRUS AND/OR PARASITE ANALYSIS

Location of Sample Collection Evaporative Reservoir (EVAP. 2)

Date of Sample Collection 5/23/91

Volume of Sample one liters

Enterovirus (MPN)
(Enteric Virus) _____ liters

Ascaris lumbricoides negative liters

Giardia lamblia _____ liters

Common Large Tapeworm _____ liters

Entamoeba histolitica _____ liters

Cryptosporidium 7 liters

Other: _____ liters

Results approved by Jaime Naranjo
Laboratory Supervisor

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RESULTS OF VIRUS AND/OR PARASITE ANALYSIS

=====
Location of Sample Collection Wastewater Effluent

Date of Sample Collection 5/23/91

Volume of Sample 303 liters
Enterovirus (MPN) 1/40 liters
(Enteric Virus)
Ascaris lumbricoides _____ liters
Giardia lamblia _____ liters
Common Large Tapeworm _____ liters
Entamoeba histolitica _____ liters
Cryptosporidium _____ liters
Other: _____ liters

Results approved by Jaime Naranjo
Laboratory Supervisor

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WWTP

RESULTS OF VIRUS AND/OR PARASITE ANALYSIS

=====
Location of Sample Collection: Cooling Tower (CWCNLI)
=====
Date of Sample Collection 5/23/91
Volume of Sample 142 liters
Enterovirus (MPN) 0/40 liters
(Enteric Virus)
Ascaris lumbricoides _____ liters
Giardia lamblia _____ liters
Common Large Tapeworm _____ liters
Entamoeba histolitica _____ liters
Cryptosporidium _____ liters
Other: _____ liters

Results approved by Jaime Naranjo
Laboratory Supervisor

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RESULTS OF VIRUS AND/OR PARASITE ANALYSIS

=====
Location of Sample Collection Evaporative Reservoir (EVAP. 2)
=====
Date of Sample Collection 5/23/91
Volume of Sample 70 liters
Enterovirus (MPN) 2/40 liters
(Enteric Virus)
Ascaris lumbricoides _____ liters
Giardia lamblia _____ liters
Common Large Tapeworm _____ liters
Entamoeba histolitica _____ liters
Cryptosporidium _____ liters
Other: _____ liters

Results approved by

Jaime Naranjo
Laboratory Supervisor



Analytical Technologies
of Colorado, Inc.

QUALITY ASSURANCE
DATA REVIEW

Date: 12-13-95

ATI Workorder: 95-11-180 Analysis: 8270

The data contained in the following report have been reviewed and approved by the personnel listed below:

Joyce Kelley
Organic Chemist

CERTIFICATION

Analytical Technologies, Inc. certifies that the analyses reported herein are true, complete, and correct within the limits of the methods employed

A case narrative is is not included in this report.



Analytical Technologies of Colorado, Inc.

GC/MS SEMIVOLATILES CASE NARRATIVE

Client	ATI-CO	Date <u>Received</u>	Date <u>Collected</u>	Date <u>Extracted</u>	Date <u>Analyzed</u>
EP #1SL	95-11-180-01	11-16-95	11-14-95	11-28-95	12-06-95
EP #1AQ	95-11-180-02	11-16-95	11-14-95	11-21-95	11-30-95
EP #2SL	95-11-180-03	11-16-95	11-14-95	11-28-95	12-05-95
EP #2AQ	95-11-180-04	11-16-95	11-14-95	11-21-95	11-30-95

EP = EVAP POND SL = SLUDGE OR BOTTOM MATERIAL
 AQ = WATER SAMPLE

1. This report consists of 2 water samples and 2 sludge samples.
2. These samples were prepared and analyzed according to SW-846, 3rd Edition procedures. Specifically, the water samples were extracted using continuous liquid-liquid extractors, based on Method 3520 and the soil samples were extracted via soxhlet based on Method 3540. The soil extracts were then processed using GPC cleanup by Method 3640 in an attempt to remove potential interferences.
3. The samples were analyzed using GC/MS with a DB-5.625 capillary column according to protocols based on SW-846 Method 8270. As specified by the method, all positive results were quantitated using the response of the daily calibration standard using the internal standard technique. The identification of positive results were achieved by a comparison of the retention time and mass spectrum of the sample versus the daily calibration standard.
4. All samples were analyzed within the established holding times.
5. The method blank associated with the sludge project was below the reporting limits for all analytes.

The method blank associated with the water samples had bis(2-ethylhexyl)phthalate detected at levels below our reporting limit, but above our detection limit. This compound was detected in both water samples, so the data were flagged accordingly.

6. The matrix spike and matrix spike duplicate recoveries and RPDs for the samples extracted on 11-28-95 were within acceptance criteria for the soil extraction.

Matrix spikes and Matrix Spike Duplicates for the samples extracted on 11-21-95 could not be performed because of insufficient sample volume for the water samples.



A Blank Spike and Blank Spike Duplicate were performed instead. See Item 7 for details on recoveries.

7. The blank spike and blank spike duplicate recoveries and RPDs for the samples extracted on 11-21-95 were within the acceptance criteria for the water extraction.
8. All surrogate recoveries were within acceptable limits with the following exceptions;

Sample	Surrogate	Sample	Surrogate
EP #1SL	2-Fluorobiphenyl	EP #2SL	2-Fluorobiphenyl

The method permits one base/neutral and one acid surrogate having recoveries outside the control limits, so no further action was required.

9. All internal standard recoveries were within acceptance criteria.
10. All initial and continuing calibration criteria were within acceptance criteria.

Joyce Kelley
Joyce Kelley
Organic Chemist

12-13-95
Date

Shaf
Reviewer's Initials

12-13-95
Date



SEMIVOLATILE ORGANICS

Modified Method 8270

Sample ID

Reagent
Blank

Lab Name: Analytical Technologies of Colorado, Inc.

Client Name: Arizona Public Service

Client Project: EVAP Ponds

Lab Sample ID.: SRB1 11-28-95

Date Collected: N/A

Date Extracted: 11-28-95

Date Analyzed: 12-05-95

Sample Matrix: Sodium Sulfate

Cleanup: None

Results are reported on a wet weight basis.

Sample Weight: 30 g

Final Volume: 1 mL

Analyte	Results (ug/kg)	Detection Limit (ug/kg)
Pyridine	ND	330
n-Nitrosodimethylamine	ND	330
Aniline	ND	830
Phenol	ND	330
bis (2-Chloroethyl) ether	ND	330
2-Chlorophenol	ND	330
1,3-Dichlorobenzene	ND	330
1,4-Dichlorobenzene	ND	330
1,2-Dichlorobenzene	ND	330
Benzyl alcohol	ND	330
bis (2-Chloroisopropyl) ether	ND	330
2-Methylphenol	ND	330
N-Nitroso-di-n-propylamine	ND	330
4-Methylphenol	ND	330
Hexachloroethane	ND	330
Nitrobenzene	ND	330
Isophorone	ND	330
2-Nitrophenol	ND	330
2,4-Dimethylphenol	ND	330
bis (2-Chloroethoxy) methane	ND	330
2,4-Dichlorophenol	ND	330
Benzoic acid	ND	1700
1,2,4-Trichlorobenzene	ND	330
Naphthalene	ND	330
4-Chloroaniline	ND	830
Hexachlorobutadiene	ND	330
4-Chloro-3-methylphenol	ND	330
2-Methylnaphthalene	ND	330
Hexachlorocyclopentadiene	ND	330
2,4,6-Trichlorophenol	ND	330
2,4,5-Trichlorophenol	ND	1700
2-Chloronaphthalene	ND	330
2-Nitroaniline	ND	1700
Dimethyl phthalate	ND	330
2,6-Dinitrotoluene	ND	330
Acenaphthylene	ND	330
3-Nitroaniline	ND	1700
Acenaphthene	ND	330
2,4-Dinitrophenol	ND	1700



SEMIVOLATILE ORGANICS

Modified Method 8270

Lab Name: Analytical Technologies of Colorado, Inc.
 Lab Sample ID.: SRB1 11-28-95

Sample ID

Reagent

Blank

Analyte	Results (ug/kg)	Detection Limit (ug/kg)
4-Nitrophenol	ND	1700
Dibenzofuran	ND	330
2,4-Dinitrotoluene	ND	330
Diethyl phthalate	ND	330
Fluorene	ND	330
4-Chlorophenyl phenyl ether	ND	330
4-Nitroaniline	ND	1700
Azobenzene	ND	330
4,6-Dinitro-2-methylphenol	ND	1700
N-Nitrosodiphenylamine	ND	330
4-Bromophenyl phenyl ether	ND	330
Hexachlorobenzene	ND	330
Pentachlorophenol	ND	1700
Phenanthrene	ND	330
Anthracene	ND	330
Carbazole	ND	330
Di-n-butyl phthalate	ND	330
Fluoranthene	ND	330
Benzidine	ND	1700
Pyrene	ND	330
Butyl benzyl phthalate	ND	330
Benzo(a)anthracene	ND	330
3,3'-Dichlorobenzidine	ND	1700
Chrysene	ND	330
Bis(2-ethylhexyl)phthalate	ND	330
Di-n-octyl phthalate	ND	330
Benzo(b)fluoranthene	ND	330
Benzo(k)fluoranthene	ND	330
Benzo(a)pyrene	ND	330
Indeno(1,2,3-cd)pyrene	ND	330
Dibenz(a,h)anthracene	ND	330
Benzo(g,h,i)perylene	ND	330

SURROGATE RECOVERIES

Analyte	% Recovery	% Rec Limits
2-Fluorophenol	55	25-121
Phenol-d5	60	24-113
Nitrobenzene-d5	55	23-120
2-Fluorobiphenyl	47	30-115
2,4,6-Tribromophenol	47	19-122
Terphenyl-d14	59	18-137

ND = Not Detected

Page 2 of 2

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SEMIVOLATILE ORGANICS
Modified Method 8270

Sample ID

GPC

Reagent Blank

Lab Name: Analytical Technologies of Colorado, Inc.

Client Name: Arizona Public Service

Client Project: EVAP Ponds

Lab Sample ID.: GPCRB1 11-30-95

Date Collected: N/A

Date Extracted: N/A

Date Analyzed: 12-05-95

Sample Matrix: Methylene Chloride

Cleanup: None

Results are reported on a wet weight basis.

Sample Weight: N/A

Final Volume: 1 mL

Analyte	Results (ug/kg)	Detection Limit (ug/kg)
Pyridine	ND	330
n-Nitrosodimethylamine	ND	330
Aniline	ND	830
Phenol	ND	330
bis (2-Chloroethyl) ether	ND	330
2-Chlorophenol	ND	330
1,3-Dichlorobenzene	ND	330
1,4-Dichlorobenzene	ND	330
1,2-Dichlorobenzene	ND	330
Benzyl alcohol	ND	330
bis (2-Chloroisopropyl) ether	ND	330
2-Methylphenol	ND	330
N-Nitroso-di-n-propylamine	ND	330
4-Methylphenol	ND	330
Hexachlorocyclohexane	ND	330
Nitrobenzene	ND	330
Isophorone	ND	330
2-Nitrophenol	ND	330
2,4-Dimethylphenol	ND	330
bis (2-Chloroethoxy) methane	ND	330
2,4-Dichlorophenol	ND	330
Benzoic acid	ND	1700
1,2,4-Trichlorobenzene	ND	330
Naphthalene	ND	330
4-Chloroaniline	ND	830
Hexachlorobutadiene	ND	330
4-Chloro-3-methylphenol	ND	330
2-Methylnaphthalene	ND	330
Hexachlorocyclopentadiene	ND	330
2,4,6-Trichlorophenol	ND	330
2,4,5-Trichlorophenol	ND	1700
2-Chloronaphthalene	ND	330
2-Nitroaniline	ND	1700
Dimethyl phthalate	ND	330
2,6-Dinitrotoluene	ND	330
Acenaphthylene	ND	330
3-Nitroaniline	ND	1700
Acenaphthene	ND	330
2,4-Dinitrophenol	ND	1700



SEMIVOLATILE ORGANICS

Modified Method 8270

Lab Name: Analytical Technologies of Colorado, Inc.
 Lab Sample ID.: GPCRB1 11-30-95

Sample ID
GPC
Reagent Blank

Analyte	Results (ug/kg)	Detection Limit (ug/kg)
4-Nitrophenol	ND	1700
Dibenzofuran	ND	330
2,4-Dinitrotoluene	ND	330
Diethyl phthalate	ND	330
Fluorene	ND	330
4-Chlorophenyl phenyl ether	ND	330
4-Nitroaniline	ND	1700
Azobenzene	ND	330
4,6-Dinitro-2-methylphenol	ND	1700
N-Nitrosodiphenylamine	ND	330
4-Bromophenyl phenyl ether	ND	330
Hexachlorobenzene	ND	330
Pentachlorophenol	ND	1700
Phenanthrene	ND	330
Anthracene	ND	330
Carbazole	ND	330
Di-n-butyl phthalate	ND	330
Fluoranthene	ND	330
Benzidine	ND	1700
Pyrene	ND	330
Butyl benzyl phthalate	ND	330
Benzo(a)anthracene	ND	330
3,3'-Dichlorobenzidine	ND	1700
Chrysene	ND	330
Bis(2-ethylhexyl)phthalate	ND	330
Di-n-octyl phthalate	ND	330
Benzo(b)fluoranthene	ND	330
Benzo(k)fluoranthene	ND	330
Benzo(a)pyrene	ND	330
Indeno(1,2,3-cd)pyrene	ND	330
Dibenz(a,h)anthracene	ND	330
Benzo(g,h,i)perylene	ND	330

SURROGATE RECOVERIES

Analyte	% Recovery	% Rec Limits
2-Fluorophenol	N/A	25-121
Phenol-d5	N/A	24-113
Nitrobenzene-d5	N/A	23-120
2-Fluorobiphenyl	N/A	30-115
2,4,6-Tribromophenol	N/A	19-122
Terphenyl-d14	N/A	18-137

ND = Not Detected

Page 2 of 2



SEMIVOLATILE ORGANICS

Modified Method 8270

Sample ID

Reagent Blank

Lab Name: Analytical Technologies of Colorado, Inc.

Client Name: Arizona Public Service

Client Project: EVAP Ponds

Lab Sample ID.: WRB1 11-21-95

Date Collected: N/A

Date Extracted: 11-21-95

Date Analyzed: 11-30-95

Sample Matrix: Water

Cleanup: None

Sample Volume: 1000 mL

Final Volume: 1 mL

Analyte	Results (ug/L)	Detection Limit (ug/L)
Pyridine	ND	10
n-Nitrosodimethylamine	ND	10
Aniline	ND	25
Phenol	ND	10
bis (2-Chloroethyl) ether	ND	10
2-Chlorophenol	ND	10
1,3-Dichlorobenzene	ND	10
1,4-Dichlorobenzene	ND	10
1,2-Dichlorobenzene	ND	10
Benzyl alcohol	ND	10
bis (2-Chloroisopropyl) ether	ND	10
2-Methylphenol	ND	10
N-Nitroso-di-n-propylamine	ND	10
4-Methylphenol	ND	10
Hexachloroethane	ND	10
Nitrobenzene	ND	10
Isophorone	ND	10
2-Nitrophenol	ND	10
2,4-Dimethylphenol	ND	10
bis (2-Chloroethoxy) methane	ND	10
2,4-Dichlorophenol	ND	10
Benzoic acid	ND	50
1,2,4-Trichlorobenzene	ND	10
Naphthalene	ND	10
4-Chloroaniline	ND	25
Hexachlorobutadiene	ND	10
4-Chloro-3-methylphenol	ND	10
2-Methylnaphthalene	ND	10
Hexachlorocyclopentadiene	ND	10
2,4,6-Trichlorophenol	ND	10
2,4,5-Trichlorophenol	ND	50
2-Chloronaphthalene	ND	10
2-Nitroaniline	ND	50
Dimethyl phthalate	ND	10
2,6-Dinitrotoluene	ND	10
Acenaphthylene	ND	10
3-Nitroaniline	ND	50
Acenaphthene	ND	10
2,4-Dinitrophenol	ND	50

Page 1 of 2

gk



SEMIVOLATILE ORGANICS
Modified Method 8270

Lab Name: Analytical Technologies of Colorado, Inc.
Lab Sample ID: WRB1 11-21-95

Sample ID

Reagent Blank

Analyte	Results (ug/L)	Detection Limit (ug/L)
4-Nitrophenol	ND	50
Dibenzofuran	ND	10
2,4-Dinitrotoluene	ND	10
Diethyl phthalate	ND	10
Fluorene	ND	10
4-Chlorophenyl phenyl ether	ND	10
4-Nitroaniline	ND	50
Azobenzene	ND	10
4,6-Dinitro-2-methylphenol	ND	50
N-Nitrosodiphenylamine	ND	10
4-Bromophenyl phenyl ether	ND	10
Hexachlorobenzene	ND	10
Pentachlorophenol	ND	50
Phenanthrene	ND	10
Anthracene	ND	10
Carbazole	ND	10
Di-n-butyl phthalate	ND	10
Fluoranthene	ND	10
Benzidine	ND	50
Pyrene	ND	10
Butyl benzyl phthalate	ND	10
Benzo(a)anthracene	ND	10
3,3'-Dichlorobenzidine	ND	50
Chrysene	ND	10
Bis(2-ethylhexyl)phthalate	2 J	10
Di-n-octyl phthalate	ND	10
Benzo(b)fluoranthene	ND	10
Benzo(k)fluoranthene	ND	10
Benzo(a)pyrene	ND	10
Indeno(1,2,3-cd)pyrene	ND	10
Dibenz(a,h)anthracene	ND	10
Benzo(g,h,i)perylene	ND	10

SURROGATE RECOVERIES

Analyte	% Recovery	% Rec Limits
2-Fluorophenol	63	21-110
Phenol-d5	71	10-110
Nitrobenzene-d5	71	35-114
2-Fluorobiphenyl	72	43-116
2,4,6-Tribromophenol	73	10-123
Terphenyl-d14	76	33-141

ND = Not Detected

J = Estimated value, analyte found below detection limit

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SEMIVOLATILE ORGANICS BLANK SPIKE/BLANK SPIKE DUPLICATE RESULTS
 Modified Method 8270

Lab Name: Analytical Technologies of Colorado, Inc.
 Client Name: Arizona Public Service
 Client Project: EVAP Ponds
 Lab Sample ID: WBS 11-21-95

Sample ID
Blank Spike
 Date Collected: N/A
 Date Extracted: 11-21-95
 Date Analyzed: 11-30-95

Sample Matrix: Water
 Cleanup: None

Sample Volume: 1000 mL
 Final Volume: 1 mL

Analyte	Spike Added (ug/L)	Sample Concentration (ug/L)	BS Concentration (ug/L)	BS % Rec	QC Limit Recovery
Phenol	75	N/A	43.9	59	12-110
2-Chlorophenol	75	N/A	44.6	59	27-123
1,4-Dichlorobenzene	50	N/A	26.1	52	36-97
N-Nitroso-di-n-propylamine	50	N/A	38.6	77	41-116
1,2,4-Trichlorobenzene	50	N/A	30.1	60	39-98
4-Chloro-3-methylphenol	75	N/A	47.1	63	23-97
Accnaphthene	50	N/A	34.9	70	46-118
4-Nitrophenol	75	N/A	50.9	68	10-80
2,4-Dinitrotoluene	50	N/A	40.0	80	24-96
Pentachlorophenol	75	N/A	49.9	67	9-103
Pyrene	50	N/A	37.8	76	26-127

Analyte	Spike Added (ug/L)	BSD Concentration (ug/L)	BSD % REC #	% RPD	QC LIMITS RPD REC.
Phenol	75	49.4	66	12	42 12-110
2-Chlorophenol	75	51.3	68	14	40 27-123
1,4-Dichlorobenzene	50	30.3	61	15	28 36-97
N-Nitroso-di-n-propylamine	50	37.6	75	3	38 41-116
1,2,4-Trichlorobenzene	50	34.1	68	12	28 39-98
4-Chloro-3-methylphenol	75	52.2	70	10	42 23-97
Accnaphthene	50	38.7	77	10	31 46-118
4-Nitrophenol	75	50.2	67	1	50 10-80
2,4-Dinitrotoluene	50	41.7	83	4	38 24-96
Pentachlorophenol	75	49.1	65	2	50 9-103
Pyrene	50	39.7	79	5	31 26-127

SURROGATE RECOVERIES

Analyte	BS % Recovery	BSD % Recovery	% Rec Limits
2-Fluorophenol	60	66	21-110
Phenol-d5	62	69	10-110
Nitrobenzene-d5	65	73	35-114
2-Fluorobiphenyl	67	74	43-116
2,4,6-Tribromophenol	75	78	10-123
Terphenyl-d14	72	78	33-141

N/A = Not applicable

gh



QUALITY ASSURANCE DATA REVIEW

Date: 12/4/95

ATI Workorder: 95-11-180 Analysis: TCLP G

The data contained in the following report have been reviewed and approved by the personnel listed below:

Steve Workman

Steve Workman
Technical Specialist

CERTIFICATION

Analytical Technologies, Inc. certifies that the analyses reported herein are true, complete, and correct within the limits of the methods employed.

A case narrative is is not included with this report.

TCLP CHROMIUM
Modified Method 6010

Lab Name: Analytical Technologies of Colorado, Inc.
Client Name: Arizona Public Service
Client Project ID: EVAP Ponds
Work Order Number: 95-11-180

Date Collected: 11/14/95
Prep Date: 11/22/95
Date Analyzed: 11/30/95

Sample Matrix: TCLP Leachate

EPA HW Number: D007
CAS Number: 7440-47-3

Analyte	Client Sample ID	Lab Sample ID	Concentration mg/L	Detection Limit mg/L
Chromium	Reagent Blank	RB 95-11-180	ND	0.1
Chromium	SG Solids	95-11-180-05	1.2	0.1

ND = Not Detected

Handwritten mark or signature.

**TCLP CHROMIUM
MATRIX SPIKE**



Lab Name: Analytical Technologies of Colorado, Inc.
 Client Name: Arizona Public Service
 Lab Sample ID: 95-11-182-01

Sample ID
In House

Prep Date: 11/22/95
 Date Analyzed: 11/30/95

Sample Matrix: TCLP Leachate

Analyte	Spike Added mg/L	Sample Conc. mg/L	MS Conc. mg/L	% Rec (limits 80-120%)	Flags
Chromium	2.0	< 0.1	1.9	95	

Analyte	MSD Conc. mg/L	MSD % Rec (limits 80-120%)	Relative % Difference (limits 0-20%)	Flags
Chromium	1.9	95	0	

W



QUALITY ASSURANCE DATA REVIEW

Date: 12-01-95

ATI Workorder: 95-11-180 Analysis: 8260

The data contained in the following report have been reviewed and approved by the personnel listed below:

A handwritten signature in cursive script, appearing to read "P. D. Hayden", is written over a horizontal line.

Organic Chemist

CERTIFICATION

Analytical Technologies, Inc. certifies that the analyses reported herein are true, complete, and correct within the limits of the methods employed.

A case narrative is is not included with this report.



Analytical Technologies of Colorado, Inc.

GC/MS VOLATILES CASE NARRATIVE

<u>Client</u>	<u>ATI-CO</u>	<u>Date Collected</u>	<u>Date Received</u>	<u>Date Analyzed</u>
EP #1SL	95-11-180-01	11/14/95	11/16/95	11/22/95
EP #1AQ	95-11-180-02	11/14/95	11/16/95	11/27/95
EP #2SL	95-11-180-03	11/14/95	11/16/95	11/22/95
EP #2AQ	95-11-180-04	11/14/95	11/16/95	11/27/95

1. This report consists of 2 water samples and 2 soil samples.
2. These samples were prepared and analyzed according to SW-846, 3rd Edition procedures. Specifically, the water samples were prepared by purging 5 mls using purge and trap procedures based on Method 5030. The soil samples were prepared by purging a heated 5 grams of sample mixed with 5 mls of reagent water. The calibration curve was also prepared using the heated purge. This procedure, including the heating step, is based on Method 5030.
3. The samples were analyzed using GC/MS with a DB-624 capillary column according to protocols based on SW-846 Method 8260. As specified by the method, all positive results were quantitated using the response of the daily calibration standard using the internal standard technique. The identification of positive results were achieved by a comparison of the retention time and mass spectrum of the sample versus the daily calibration standard.
4. All samples were analyzed within the established holding times.
5. The method blank associated with this project was below the reporting limits for all analytes.
6. All matrix spike and matrix spike duplicate recoveries and RPDs were within acceptance criteria.
7. All surrogate recoveries were within acceptance criteria.
8. All internal standard recoveries were within acceptance criteria.



9. All initial and continuing calibration criteria were within acceptance criteria.

Jill Layden
Jill Layden
Chemist

12-01-95
Date

Shaf
Reviewer's Initials

12-1-95
Date



VOLATILE ORGANICS
Method 8280

Lab Name: Analytical Technologies of Colorado, Inc.
Client Name: Arizona Power Service
Client Project ID: EVAP Ponds
Lab Sample ID: SRB1 11/21/95

Sample ID

Reagent Blank

Date Collected: N/A
Date Analyzed: 11/21/95

Sample Matrix: Soil
Sample Weight: 5 g

Analyte	Results (ug/kg)	Detection Limit (ug/kg)
Chloromethane	ND	10
Bromomethane	ND	10
Vinyl chloride	ND	10
Chloroethane	ND	10
Methylene chloride	ND	5
Acetone	ND	10
Carbon disulfide	ND	5
1,1-Dichloroethene	ND	5
1,1-Dichloroethane	ND	5
cis-1,2-Dichloroethene	ND	5
trans-1,2-Dichloroethene	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
1,1,1-Trichloroethane	ND	5
Carbon tetrachloride	ND	5
Vinyl acetate	ND	10
Bromodichloromethane	ND	5
1,2-Dichloropropane	ND	5
cis-1,3-Dichloropropene	ND	5
Trichloroethene	ND	5
Dibromochloromethane	ND	5
1,1,2-Trichloroethane	ND	5
Benzene	ND	5
trans-1,3-Dichloropropene	ND	5
Bromoform	ND	5
2-Hexanone	ND	10
4-Methyl-2-pentanone	ND	10
Tetrachloroethene	ND	5
1,1,2,2-Tetrachloroethane	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethylbenzene	ND	5
Styrene	ND	5
Total Xylenes	ND	5

SURROGATE RECOVERIES

Analyte	% Recovery	%Rec Limits
Dibromofluoromethane	102	80 - 120
Toluene-d8	103	81 - 117
Bromofluorobenzene	79	74 - 121

ND = Not Detected

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VOLATILE ORGANICS
Method 8280

Lab Name: Analytical Technologies of Colorado, Inc.
Client Name: Arizona Power Service
Client Project ID: EVAP Ponds
Lab Sample ID: SRB1 11/22/95

Sample ID

Reagent Blank

Date Collected: N/A
Date Analyzed: 11/22/95

Sample Matrix: Soil
Sample Weight: 5 g

Analyte	Results (ug/kg)	Detection Limit (ug/kg)
Chloromethane	ND	10
Bromomethane	ND	10
Vinyl chloride	ND	10
Chloroethane	ND	10
Methylene chloride	ND	5
Acetone	4 J	10
Carbon disulfide	ND	5
1,1-Dichloroethene	ND	5
1,1-Dichloroethane	ND	5
cis-1,2-Dichloroethene	ND	5
trans-1,2-Dichloroethene	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
1,1,1-Trichloroethane	ND	5
Carbon tetrachloride	ND	5
Vinyl acetate	ND	10
Bromodichloromethane	ND	5
1,2-Dichloropropane	ND	5
cis-1,3-Dichloropropene	ND	5
Trichloroethene	ND	5
Dibromochloromethane	ND	5
1,1,2-Trichloroethane	ND	5
Benzene	ND	5
trans-1,3-Dichloropropene	ND	5
Bromoform	ND	5
2-Hexanone	ND	10
4-Methyl-2-pentanone	ND	10
Tetrachloroethene	ND	5
1,1,2,2-Tetrachloroethane	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethylbenzene	ND	5
Styrene	ND	5
Total Xylenes	ND	5

SURROGATE RECOVERIES

Analyte	% Recovery	%Rec Limits
Dibromofluoromethane	104	80 - 120
Toluene-d8	102	81 - 117
Bromofluorobenzene	79	74 - 121

ND = Not Detected
J = Estimated value, analyte found below detection limit

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VOLATILE ORGANICS
Method 8260

Lab Name: Analytical Technologies of Colorado, Inc.
Client Name: Arizona Power Service
Client Project ID: EVAP Ponds
Lab Sample ID: WRB1 11/27/95

Sample ID
Reagent Blank

Date Collected: N/A
Date Analyzed: 11/27/95

Sample Matrix: Water
Sample Volume: 5 mL

Analyte	Conc. (ug/L)	Detection Limit (ug/L)
Chloromethane	ND	10
Bromomethane	ND	10
Vinyl chloride	ND	10
Chloroethane	ND	10
Methylene chloride	ND	5
Acetone	ND	10
Carbon disulfide	ND	5
1,1-Dichloroethene	ND	5
1,1-Dichloroethane	ND	5
cis-1,2-Dichloroethane	ND	5
trans-1,2-Dichloroethane	ND	5
Chloroform	ND	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
1,1,1-Trichloroethane	ND	5
Carbon tetrachloride	ND	5
Vinyl acetate	ND	10
Bromodichloromethane	ND	5
1,2-Dichloropropane	ND	5
cis-1,3-Dichloropropene	ND	5
Trichloroethene	ND	5
Dibromochloromethane	ND	5
1,1,2-Trichloroethane	ND	5
Benzene	ND	5
trans-1,3-Dichloropropene	ND	5
Bromoform	ND	5
2-Hexanone	ND	10
4-Methyl-2-pentanone	ND	10
Tetrachloroethene	ND	5
1,1,2,2-Tetrachloroethane	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethylbenzene	ND	5
Styrene	ND	5
Total Xylenes	ND	5

SURROGATE RECOVERIES

Analyte	% Recovery	%Rec Limits
Dibromofluoromethane	97	86 - 118
Toluene-d8	99	88 - 110
Bromofluorobenzene	100	86 - 115

ND = Not Detected

TR



VOLATILE ORGANICS
Method 8280

Lab Name: Analytical Technologies of Colorado, Inc.
Client Name: Arizona Power Service
Client Project ID: EVAP Ponds
Lab Sample ID: 95-11-180-01

Sample ID
EP #18L

Date Collected: 11/14/95
Date Analyzed: 11/22/95

Sample Matrix: Soil
Sample Weight: 5 g
Results are reported on a wet weight basis.

Analyte	Results (ug/kg)	Detection Limit (ug/kg)
Chloromethane	ND	10
Bromomethane	ND	10
Vinyl chloride	ND	10
Chloroethane	ND	10
Methylene chloride	ND	5
Acetone	ND	10
Carbon disulfide	ND	5
1,1-Dichloroethene	ND	5
1,1-Dichloroethane	ND	5
cis-1,2-Dichloroethene	ND	5
trans-1,2-Dichloroethene	ND	5
Chloroform	16	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
1,1,1-Trichloroethane	ND	5
Carbon tetrachloride	ND	5
Vinyl acetate	ND	10
Bromodichloromethane	ND	5
1,2-Dichloropropane	ND	5
cis-1,3-Dichloropropene	ND	5
Trichloroethene	ND	5
Dibromochloromethane	ND	5
1,1,2-Trichloroethane	ND	5
Benzene	ND	5
trans-1,3-Dichloropropene	ND	5
Bromoform	ND	5
2-Hexanone	ND	10
4-Methyl-2-pentanone	ND	10
Tetrachloroethene	ND	5
1,1,2,2-Tetrachloroethane	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethylbenzene	ND	5
Styrene	ND	5
Total Xylenes	ND	5

SURROGATE RECOVERIES

Analyte	% Recovery	%Rec Limits
Dibromofluoromethane	109	80 - 120
Toluene-d8	98	81 - 117
Bromofluorobenzene	95	74 - 121

ND = Not Detected

TR



SEMIVOLATILE ORGANICS
Modified Method 8270

Sample ID

EP #18L

Lab Name: Analytical Technologies of Colorado, Inc.
Client Name: Arizona Public Service
Client Project: EVAP Ponds
Lab Sample ID.: 95-11-180-01

Date Collected: 11-14-95
Date Extracted: 11-28-95
Date Analyzed: 12-06-95

Sample Matrix: Soil
Cleanup: None

Sample Weight: 30 g
Final Volume: 1 mL

Results are reported on a wet weight basis.

Analyte	Results (ug/kg)	Detection Limit (ug/kg)
Pyridine	ND	330
n-Nitrosodimethylamine	ND	330
Aniline	ND	830
Phenol	ND	330
bis (2-Chloroethyl) ether	ND	330
2-Chlorophenol	ND	330
1,3-Dichlorobenzene	ND	330
1,4-Dichlorobenzene	ND	330
1,2-Dichlorobenzene	ND	330
Benzyl alcohol	ND	330
bis (2-Chloroisopropyl) ether	ND	330
2-Methylphenol	ND	330
N-Nitroso-di-n-propylamine	ND	330
4-Methylphenol	ND	330
Hexachloroethane	ND	330
Nitrobenzene	ND	330
Isophorone	ND	330
2-Nitrophenol	ND	330
2,4-Dimethylphenol	ND	330
bis (2-Chloroethoxy) methane	ND	330
2,4-Dichlorophenol	ND	330
Benzoic acid	ND	1700
1,2,4-Trichlorobenzene	ND	330
Naphthalene	ND	330
4-Chloroaniline	ND	830
Hexachlorobutadiene	ND	330
4-Chloro-3-methylphenol	ND	330
2-Methylnaphthalene	ND	330
Hexachlorocyclopentadiene	ND	330
2,4,6-Trichlorophenol	ND	330
2,4,5-Trichlorophenol	ND	1700
2-Chloronaphthalene	ND	330
2-Nitroaniline	ND	1700
Dimethyl phthalate	ND	330
2,6-Dinitrotoluene	ND	330
Acenaphthylene	ND	330
3-Nitroaniline	ND	1700
Acenaphthene	ND	330
2,4-Dinitrophenol	ND	1700

gk



SEMIVOLATILE ORGANICS

Modified Method 8270

Lab Name: Analytical Technologies of Colorado, Inc.
 Lab Sample ID.: 95-11-180-01

Sample ID

EP #1SL

Analyte	Results (ug/kg)	Detection Limit (ug/kg)
4-Nitrophenol	ND	1700
Dibenzofuran	ND	330
2,4-Dinitrotoluene	ND	330
Diethyl phthalate	ND	330
Fluorene	ND	330
4-Chlorophenyl phenyl ether	ND	330
4-Nitroaniline	ND	1700
Azobenzene	ND	330
4,6-Dinitro-2-methylphenol	ND	1700
N-Nitrosodiphenylamine	ND	330
4-Bromophenyl phenyl ether	ND	330
Hexachlorobenzene	ND	330
Pentachlorophenol	ND	1700
Phenanthrene	ND	330
Anthracene	ND	330
Carbazole	ND	330
Di-n-butyl phthalate	ND	330
Fluoranthene	ND	330
Benzidine	ND	1700
Pyrene	ND	330
Butyl benzyl phthalate	ND	330
Benzo(a)anthracene	ND	330
3,3'-Dichlorobenzidine	ND	1700
Chrysene	ND	330
Bis(2-ethylhexyl)phthalate	ND	330
Di-n-octyl phthalate	ND	330
Benzo(b)fluoranthene	ND	330
Benzo(k)fluoranthene	ND	330
Benzo(a)pyrene	ND	330
Indeno(1,2,3-cd)pyrene	ND	330
Dibenz(a,h)anthracene	ND	330
Benzo(g,h,i)perylene	ND	330

SURROGATE RECOVERIES

Analyte	% Recovery	% Rec Limits
2-Fluorophenol	51	25-121
Phenol-d5	56	24-113
Nitrobenzene-d5	59	23-120
2-Fluorobiphenyl	25*	30-115
2,4,6-Tribromophenol	73	19-122
Terphenyl-d14	41	18-137

ND = Not Detected
 * = Outside QC limits

gll



VOLATILE ORGANICS
Method 8260

Lab Name: Analytical Technologies of Colorado, Inc.
Client Name: Arizona Power Service
Client Project ID: EVAP Ponds
Lab Sample ID: 95-11-180-02

Sample ID

EP #1AQ

Date Collected: 11/14/95
Date Analyzed: 11/27/95

Sample Matrix: Water
Sample Volume: 5 mL

Analyte	Results (ug/L)	Detection Limit (ug/L)
Chloromethane	ND	10
Bromomethane	ND	10
Vinyl chloride	ND	10
Chloroethane	ND	10
Methylene chloride	ND	5
Acetone	ND	10
Carbon disulfide	ND	5
1,1-Dichloroethene	ND	5
1,1-Dichloroethane	ND	5
cis-1,2-Dichloroethene	ND	5
trans-1,2-Dichloroethene	ND	5
Chloroform	6	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
1,1,1-Trichloroethane	ND	5
Carbon tetrachloride	ND	5
Vinyl acetate	ND	10
Bromodichloromethane	ND	5
1,2-Dichloropropane	ND	5
cis-1,3-Dichloropropene	ND	5
Trichloroethene	ND	5
Dibromochloromethane	ND	5
1,1,2-Trichloroethane	ND	5
Benzene	ND	5
trans-1,3-Dichloropropene	ND	5
Bromoform	ND	5
2-Hexanone	ND	10
4-Methyl-2-pentanone	ND	10
Tetrachloroethene	ND	5
1,1,2,2-Tetrachloroethane	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethylbenzene	ND	5
Styrene	ND	5
Total Xylenes	ND	5

SURROGATE RECOVERIES

Analyte	% Recovery	%Rec Limits
Dibromofluoromethane	95	86 - 118
Toluene-d8	100	88 - 110
Bromofluorobenzene	100	86 - 115

ND - Not Detected

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VOLATILE ORGANICS
Method 8260



Lab Name: Analytical Technologies of Colorado, Inc.
Client Name: Arizona Power Service
Client Project ID: EVAP Ponds
Lab Sample ID: 95-11-180-03

Sample ID
EP #28L

Date Collected: 11/14/95
Date Analyzed: 11/22/95

Sample Matrix: Soil
Sample Weight: 5 g
Results are reported on a wet weight basis.

Analyte	Results (ug/kg)	Detection Limit (ug/kg)
Chloromethane	ND	10
Bromomethane	ND	10
Vinyl chloride	ND	10
Chloroethane	ND	10
Methylene chloride	ND	5
Acetone	ND	10
Carbon disulfide	ND	5
1,1-Dichloroethene	ND	5
1,1-Dichloroethane	ND	5
cis-1,2-Dichloroethene	ND	5
trans-1,2-Dichloroethene	ND	5
Chloroform	19	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
1,1,1-Trichloroethane	ND	5
Carbon tetrachloride	ND	5
Vinyl acetate	ND	10
Bromodichloromethane	ND	5
1,2-Dichloropropane	ND	5
cis-1,3-Dichloropropene	ND	5
Trichloroethene	ND	5
Dibromochloromethane	ND	5
1,1,2-Trichloroethane	ND	5
Benzene	ND	5
trans-1,3-Dichloropropene	ND	5
Bromoform	ND	5
2-Hexanone	ND	10
4-Methyl-2-pentanone	ND	10
Tetrachloroethene	ND	5
1,1,2,2-Tetrachloroethane	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethylbenzene	ND	5
Styrene	ND	5
Total Xylenes	ND	5

SURROGATE RECOVERIES

Analyte	% Recovery	%Rec Limits
Dibromofluoromethane	110	80 - 120
Toluene-d8	96	81 - 117
Bromofluorobenzene	100	74 - 121

ND = Not Detected

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VOLATILE ORGANICS
Method 8260

Lab Name: Analytical Technologies of Colorado, Inc.
Client Name: Arizona Power Service
Client Project ID: EVAP Ponds
Lab Sample ID: 95-11-180-04

Sample ID
EP #2AQ

Date Collected: 11/14/95
Date Analyzed: 11/27/95

Sample Matrix: Water
Sample Volume: 5 mL

Analyte	Results (ug/L)	Detection Limit (ug/L)
Chloromethane	6	10
Bromomethane	ND	10
Vinyl chloride	ND	10
Chloroethane	ND	10
Methylene chloride	ND	5
Acetone	ND	10
Carbon disulfide	ND	5
1,1-Dichloroethene	ND	5
1,1-Dichloroethane	ND	5
cis-1,2-Dichloroethene	ND	5
trans-1,2-Dichloroethene	ND	5
Chloroform	6	5
1,2-Dichloroethane	ND	5
2-Butanone	ND	10
1,1,1-Trichloroethane	ND	5
Carbon tetrachloride	ND	5
Vinyl acetate	ND	10
Bromodichloromethane	ND	5
1,2-Dichloropropane	ND	5
cis-1,3-Dichloropropene	ND	5
Trichloroethene	ND	5
Dibromochloromethane	ND	5
1,1,2-Trichloroethane	ND	5
Benzene	ND	5
trans-1,3-Dichloropropene	ND	5
Bromoform	ND	5
2-Hexanone	ND	10
4-Methyl-2-pentanone	ND	10
Tetrachloroethene	ND	5
1,1,2,2-Tetrachloroethane	ND	5
Toluene	ND	5
Chlorobenzene	ND	5
Ethylbenzene	ND	5
Styrene	ND	5
Total Xylenes	ND	5

SURROGATE RECOVERIES

Analyte	% Recovery	%Rec Limits
Dibromofluoromethane	99	86 - 118
Toluene-d8	101	88 - 110
Bromofluorobenzene	100	86 - 115

ND = Not Detected
J = Estimated value; analyte found below detection limit

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VOLATILE MATRIX SPIKE RECOVERY

Method 8260

Lab Name: Analytical Technologies of Colorado, Inc.
 Client Name: Arizona Power Service
 Client Project ID: EVAP Ponds
 Lab Sample ID: 95-11-176-13
 Sample Matrix: Soil
 Sample Weight: 5 g

Sample ID
In House

Date Collected: 11/15/95
 Date Analyzed: 11/21,22/95

Results are reported on a wet weight basis.

Analyte	Spike Added (ug/L)	Sample Concentration (ug/L)	MS Concentration (ug/L)	MS % Rec	QC Limit Recovery
1,1-Dichloroethene	50.0	ND	48.4	97	59-172
Trichloroethene	50.0	ND	48.6	97	62-137
Benzene	50.0	ND	51.1	102	60-133
Toluene	50.0	ND	54.4	109	59-139
Chlorobenzene	50.0	ND	49.1	98	66-142

Analyte	Spike Added (ug/L)	MSD Concentration (ug/L)	MSD % Recovery	% RPD	QC Limits RPD Rec
1,1-Dichloroethene	50.0	46.5	93	4	22 59-172
Trichloroethene	50.0	47.5	95	2	24 62-137
Benzene	50.0	49.7	99	3	21 60-133
Toluene	50.0	53.8	108	1	21 59-139
Chlorobenzene	50.0	47.8	96	3	21 66-142

SURROGATE RECOVERIES MS/MSD

Analyte	%Rec (MS)	%Rec (MSD)	% Rec Limits
Dibromofluorobenzene	107	103	80 - 120
Toluene-d8	95	97	81 - 117
Bromofluorobenzene	100	101	74 - 121

ND = Not Detected

12



VOLATILE MATRIX SPIKE RECOVERY
Method 8260

Lab Name: Analytical Technologies of Colorado, Inc.
 Client Name: Arizona Power Service
 Client Project ID: EVAP Ponds
 Lab Sample ID: 95-11-180-04
 Sample Matrix: Water
 Sample Volume: 5 mL

Sample ID
EP #2AQ

Date Collected: 11/14/95
 Date Analyzed: 11/27/95

Analyte	Spike Added (ug/L)	Sample Concentration (ug/L)	MS Concentration (ug/L)	MS % Rec	QC Limit Recovery
1,1-Dichloroethene	50.0	ND	50.8	102	61-145
Trichloroethene	50.0	ND	51.7	103	71-120
Benzene	50.0	ND	48.9	98	76-127
Toluene	50.0	ND	49.7	99	76-125
Chlorobenzene	50.0	ND	49.1	98	75-130

Analyte	Spike Added (ug/L)	MSD Concentration (ug/L)	MSD % Recovery	% RPD	QC Limits RPD Rec
1,1-Dichloroethene	50.0	53.2	106	5	14 61-145
Trichloroethene	50.0	52.7	105	2	14 71-120
Benzene	50.0	50.1	100	2	11 76-127
Toluene	50.0	51.2	102	3	13 76-125
Chlorobenzene	50.0	50.9	102	4	13 75-130

SURROGATE RECOVERIES MS/MSD

Analyte	%Rec (MS)	%Rec (MSD)	% Rec Limits
Dibromofluorobenzene	103	104	86 - 118
Toluene-d8	101	101	88 - 110
Bromofluorobenzene	101	101	86 - 115

ND = Not Detected

rh



CHAIN OF CUSTODY

DATE: 11/14/95 PAGE: 1 OF 1

ATTN: LAB ID: 1180

ANALYSIS REQUEST

PROJECT MANAGER: Thomas Hillmer

COMPANY: ARIZONA PUBLIC SERVICE

ADDRESS: 5801 SOUTH WINTERSBURG RD,
TOLSON, AZ. 85354-7529

PHONE: (602) 393-3730

FAX: (602) 393-3898

BLT TO: SAME (ABOVE)

COMPANY: CONTRACT # PV95-22870

ADDRESS: MAIL STATION 7845

TEST	DATE	TIME	MATRIX	LAB ID	NUMBER OF CONTAINERS
Petroleum Hydrocarbons (418.1)	11/14/95	5:00	SLUG	1180	1
(MOD.8015) Fuel Fingerprint	11/14/95	5:00	SLUG	1180	1
M8015 Gas	11/14/95	5:00	SLUG	1180	1
(RLS-191) Diesel	11/14/95	5:00	SLUG	1180	1
BTX/MTBE (8020)	11/14/95	5:00	SLUG	1180	1
Chlorinated Hydrocarbons (501/8010)	11/14/95	5:00	SLUG	1180	1
Aromatic Hydrocarbons (802/8020)	11/14/95	5:00	SLUG	1180	1
SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.	11/14/95	5:00	SLUG	1180	1
Pesticides/PB (609/8090)	11/14/95	5:00	SLUG	1180	1
Herbicides (615/8150)	11/14/95	5:00	SLUG	1180	1
Base/Neutral/Acid Compounds GC/MS (625/8270)	11/14/95	5:00	SLUG	1180	1
Volatile Organics GC/MS (624/8240)	11/14/95	5:00	SLUG	1180	1
Polynuclear Aromatics (610/8310)	11/14/95	5:00	SLUG	1180	1
SDWA Primary Standards - Arizona	11/14/95	5:00	SLUG	1180	1
SDWA Secondary Standards - Arizona	11/14/95	5:00	SLUG	1180	1
SDWA Primary Standards - Federal	11/14/95	5:00	SLUG	1180	1
SDWA Secondary Standards - Federal	11/14/95	5:00	SLUG	1180	1
TCLP Chromatogram	11/14/95	5:00	SLUG	1180	1
The 13 Priority Pollutant Metals	11/14/95	5:00	SLUG	1180	1
PCRA Metals by Total Digestion	11/14/95	5:00	SLUG	1180	1
PCRA Metals by TCLP (1311)	11/14/95	5:00	SLUG	1180	1

SAMPLE ID EP1SL
DATE 11/14/95
TIME 5:00
MATRIX SLUG
LAB ID 1180

SAMPLE ID EP#1AQ
DATE 11/14/95
TIME 5:00
MATRIX LIQ
LAB ID 1180

SAMPLE ID EP#2SL
DATE 11/14/95
TIME 5:00
MATRIX SLUG
LAB ID 1180

SAMPLE ID EP#2AQ
DATE 11/14/95
TIME 5:00
MATRIX LIQ
LAB ID 1180

SAMPLE ID SG SOLIDS
DATE 11/14/95
TIME 5:00
MATRIX SOL.
LAB ID 1180

SAMPLE ID TRIP BLANK
DATE 11/14/95
TIME 5:00
MATRIX SOL.
LAB ID 1180

SAMPLE ID SUBSTRATE MILEY ON CO.

PROJECT INFORMATION

PROJECT NO. 1180

PROJECT NAME: EVAP PAVES

PO NO. 80278

SHIP DATE: 11/95-22870

SHIP TO: A.S. Hillmer

SAMPLED & RELINQUISHED BY:

Signature: [Signature] Time: 11/14/95

Printed Name: Thomas Hillmer Date: 11/14/95

Company: APS (602) 393-3730

RECEIVED BY:

Signature: [Signature] Time: 11/15/95

Printed Name: Robert Davies Date: 11-15-95

Company: APS

RECEIVED BY:

Signature: [Signature] Time: 11/15/95

Printed Name: Robert Davies Date: 11-15-95

Company: APS

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

RUSH 24 HRS 48 HRS 72 HRS 1 WEEK (NORMAL) 2 WEEK

Comments: CALL Tom Hillmer (602) 393-3730 with PRELIMINARY RESULTS as soon as available.

PLEASE FILL THIS FORM COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

CONDITION OF SAMPLE UPON RECEIPT

CLIENT: APS

SHIPPING CONTAINER ID: Cooler

WORKORDER NO. 95-11-180

INITIALS: LD

DATE: _____

		Yes	No
1.	Does this project require special handling according to NEESA, Level 3, or CLP protocols? If yes, complete a. and b. a. Cooler Temperature _____ b. Lot No's. _____		<input checked="" type="radio"/>
2.	Are custody seals on the cooler intact?	<input checked="" type="radio"/>	<input type="radio"/>
3.	Are custody seals on sample containers intact?	<input checked="" type="radio"/>	<input type="radio"/>
4.	Is there a Chain of Custody (COC) or other representative documents, letters or shipping memos?	<input checked="" type="radio"/>	<input type="radio"/>
5.	Is the COC complete? Relinquished: Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/> Requested Analysis: Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/>	<input checked="" type="radio"/>	<input type="radio"/>
6.	Is the COC in agreement with the samples received? No. of Samples: Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/> Sample ID's: Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/> Matrix: Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/> No. of Containers: Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/>	<input checked="" type="radio"/>	<input type="radio"/>
7.	Are the samples preserved correctly?	<input checked="" type="radio"/>	<input type="radio"/>
8.	Is there enough sample for all the requested analyses?	<input checked="" type="radio"/>	<input type="radio"/>
9.	Are all samples within holding times for the requested analyses?	<input checked="" type="radio"/>	<input type="radio"/>
10.	Were the sample received on ice?	<input checked="" type="radio"/>	<input type="radio"/>
11.	Were all sample containers received intact? (not broken or leaking, etc.)	<input checked="" type="radio"/>	<input type="radio"/>
12.	Are samples requiring no headspace, headspace free?	<input checked="" type="radio"/>	<input type="radio"/>
13.	Do the samples require quarantine?	<input checked="" type="radio"/>	<input type="radio"/>
14.	Do samples require ATI disposal?	<input checked="" type="radio"/>	<input type="radio"/>
15.	Did the client return any unused bottles?	<input checked="" type="radio"/>	<input type="radio"/>

Describe "NO" items (except No's 1, 13, & 14): (3) On Sludge Samples - only 480 ml's sent for 8240 & 8270.
(1) Sludge Samples all have leadline

Was the client contacted? Yes _____ No _____
If yes, Date: _____ Name of person contacted: _____
Describe actions taken or client instructions: _____

Group Leader's Signature: [Signature] Date: 11/79

Cooler Temperature: 6

From: Z58123 --APSVMB60
To: Z47777 --APSVMB60 HILLMER, THOMAS P.
cc: Z99002 --APSVMB60 YARBROUGH, MARK E.

Date and time 12/05/94 11:51:00

* Reply to note of 12/05/94 11:15

FROM: WLABELLE

Subject: POND TEMPERATURES

Evap. Pond Temps. are not recorded routinely, just upon request. Have the facts been released as far as confirmation of the cause of the recent env. senario?

In reference to monthly Reservoir temp. reads:

Jan > 16

Feb > 15

Mar > 17

Apr > 23

May > 27

Jun > 27

Jul > 33

Aug > 32

Sep > 32

Oct > 27

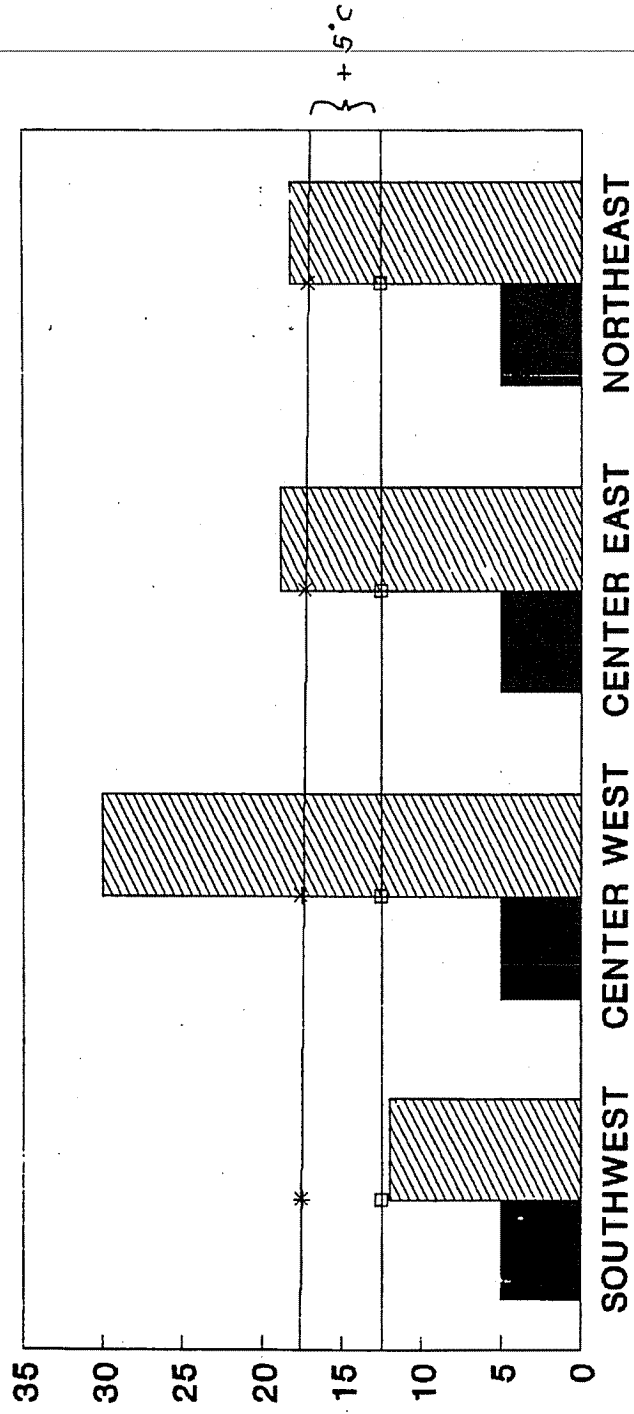
Nov > 27

Dec > 21

Let me know if this satisfies your request.

Bill

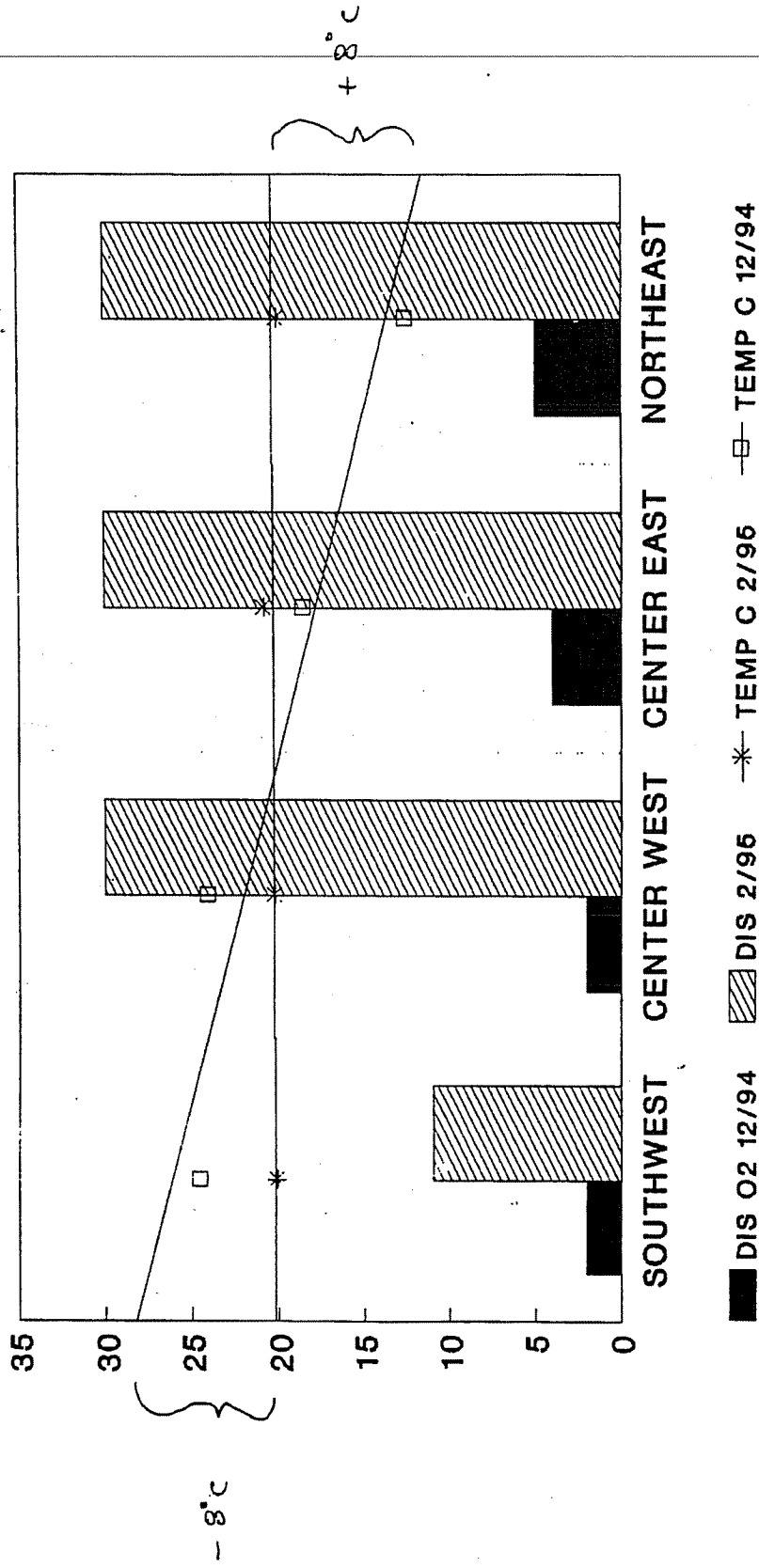
EVAP POND #2 SURFACE VALUES



■ DIS O2 12/94 ▨ DIS O2 2/95
 *— TEMP C 2/94 —□— TEMP C 12/94

CHEMISTRY VALUES IN mg/l

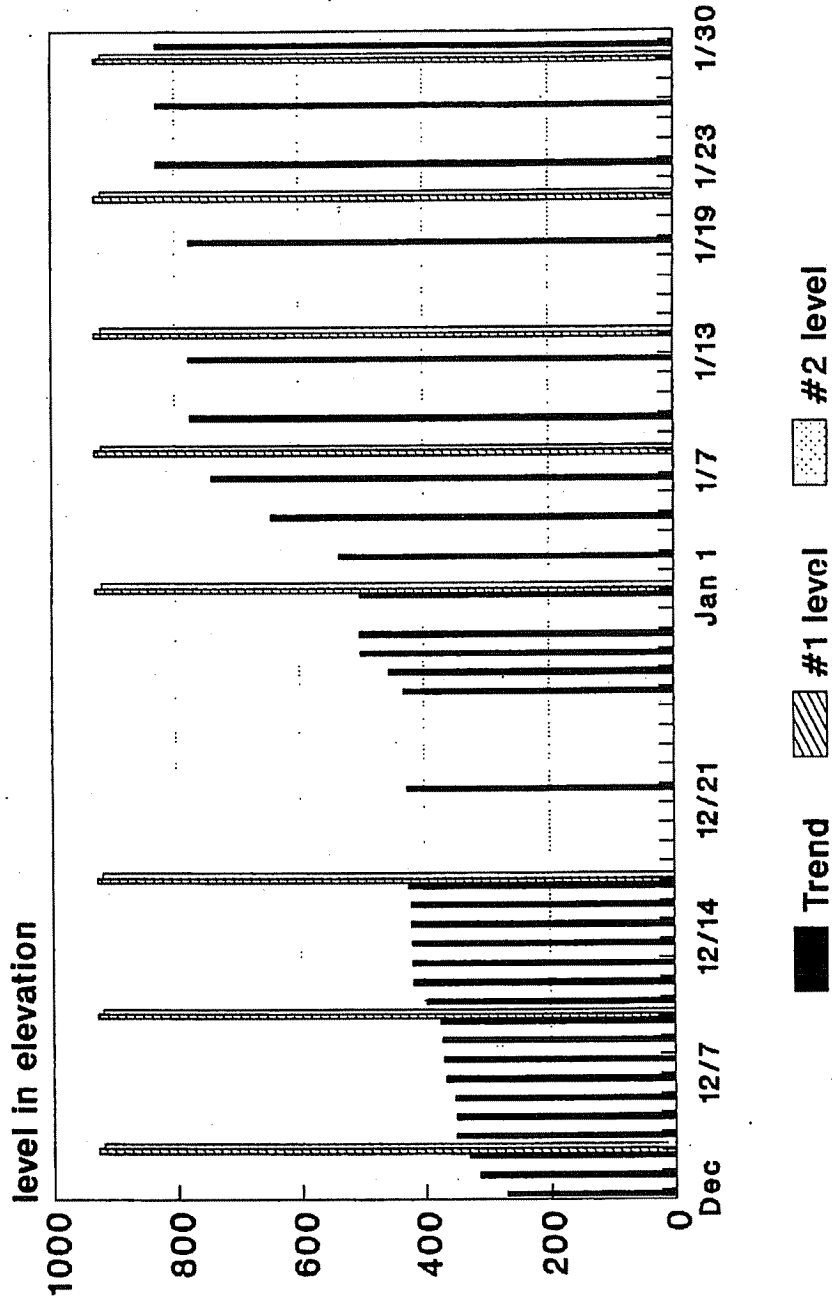
EVAP POND #2 BOTTOM VALUES



CHEMISTRY VALUES IN mg/l

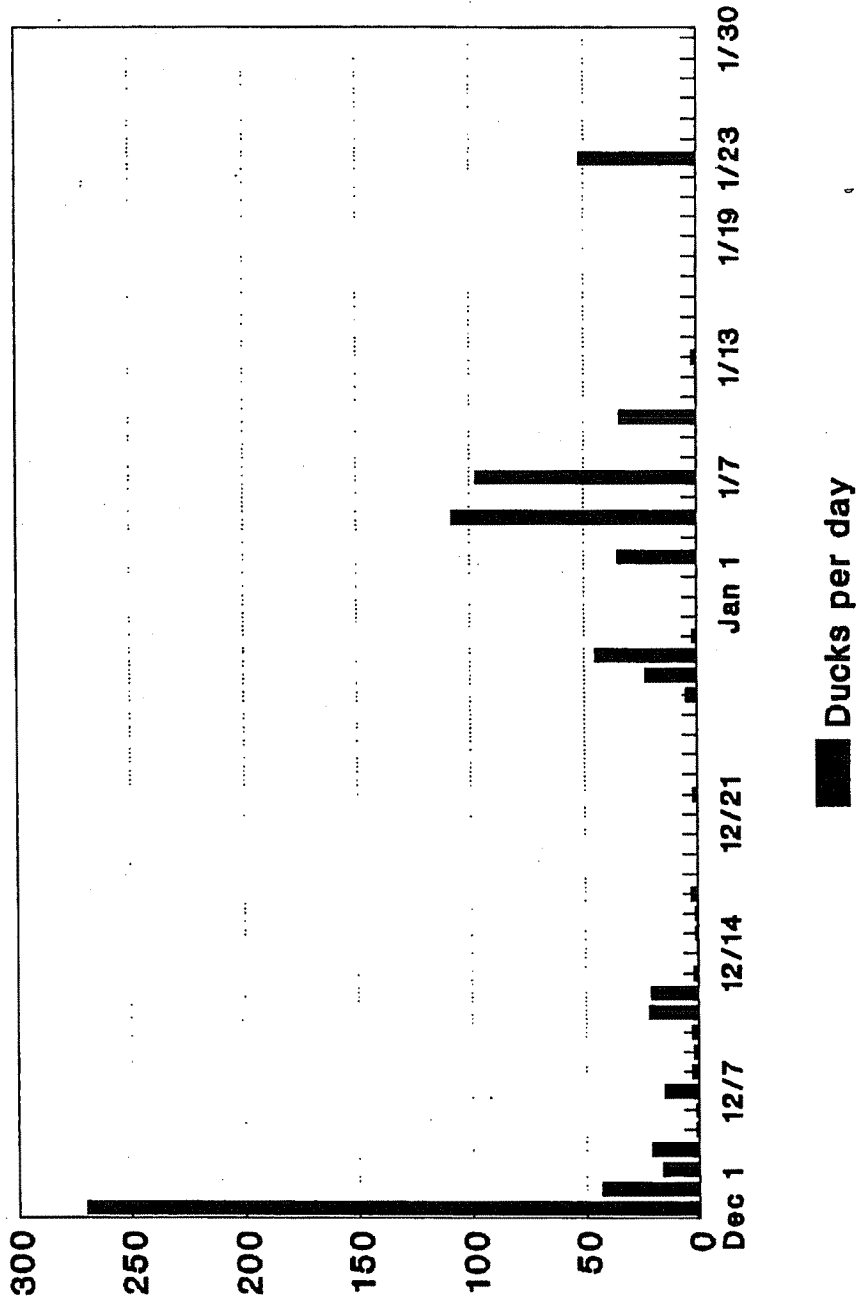
Duck Collection

Cumulative Total and Evap Pond Level

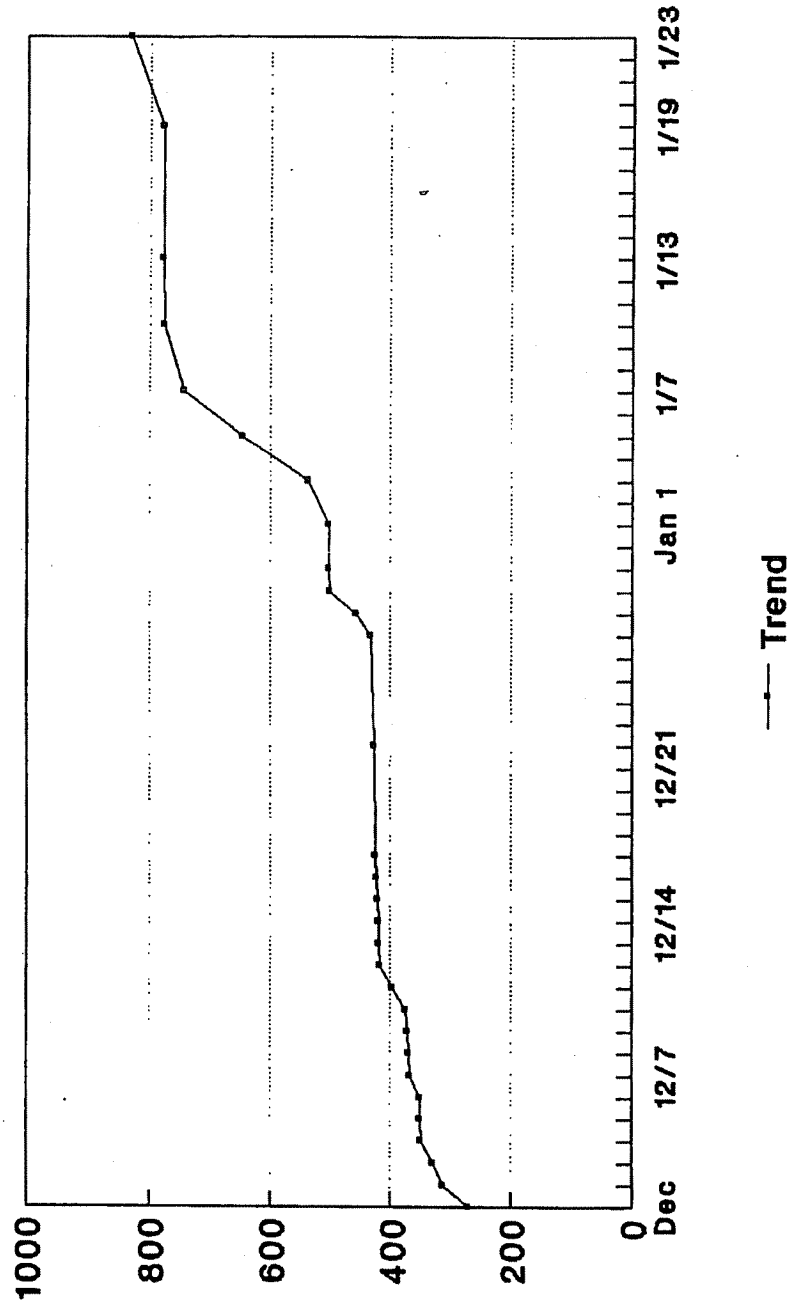


Ducks collected by date

Duck Collection

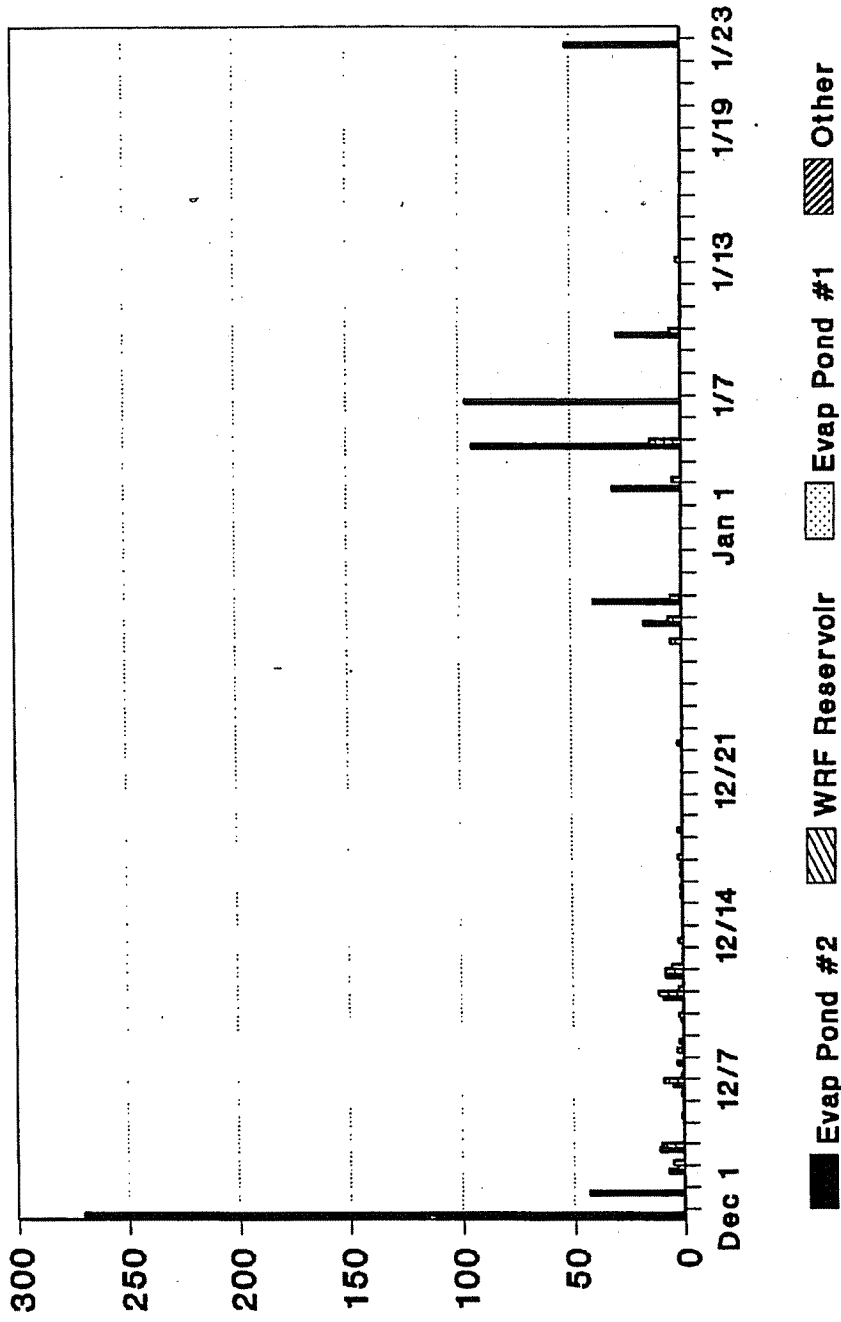


Duck Collection Cumulative Total

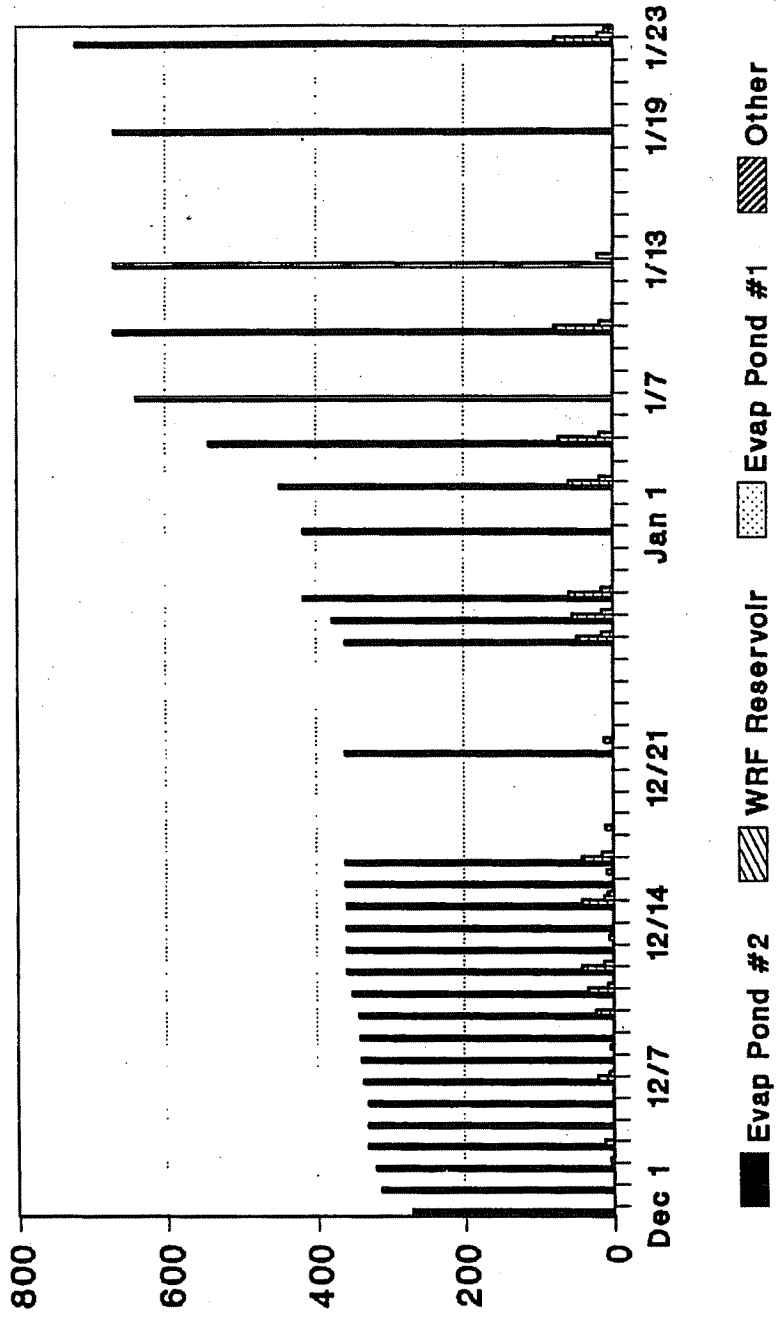


Ducks collected by date

Duck Collection

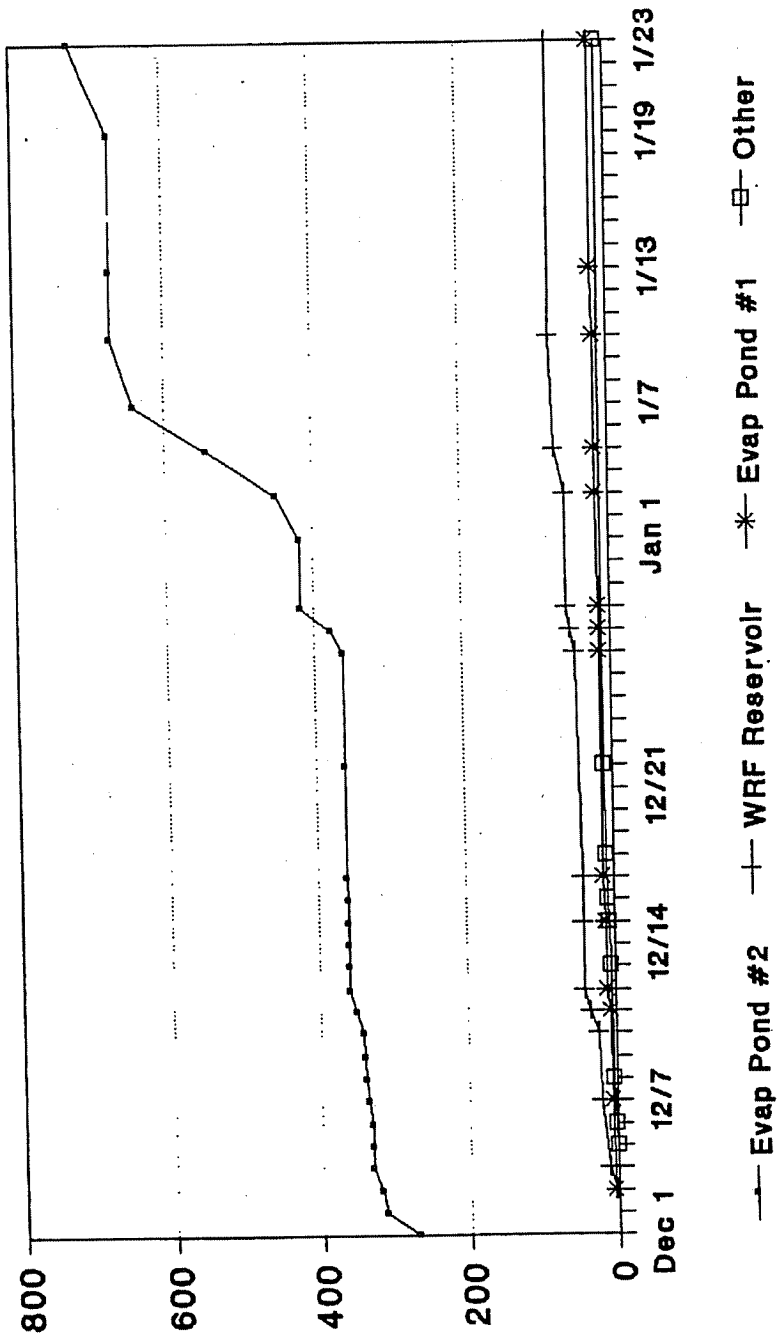


Duck Collection Cumulative Total



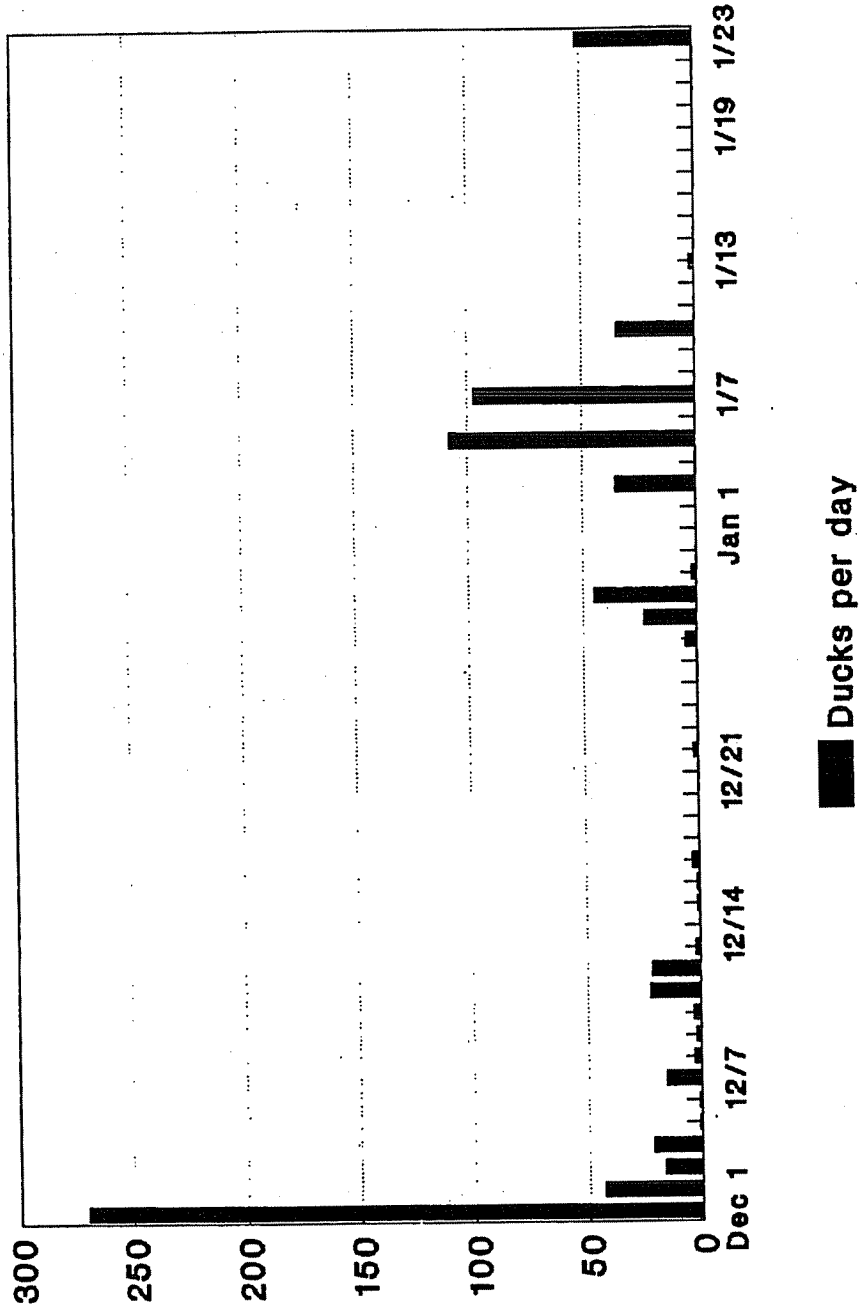
Cum total by source

Duck Collection Cumulative Total

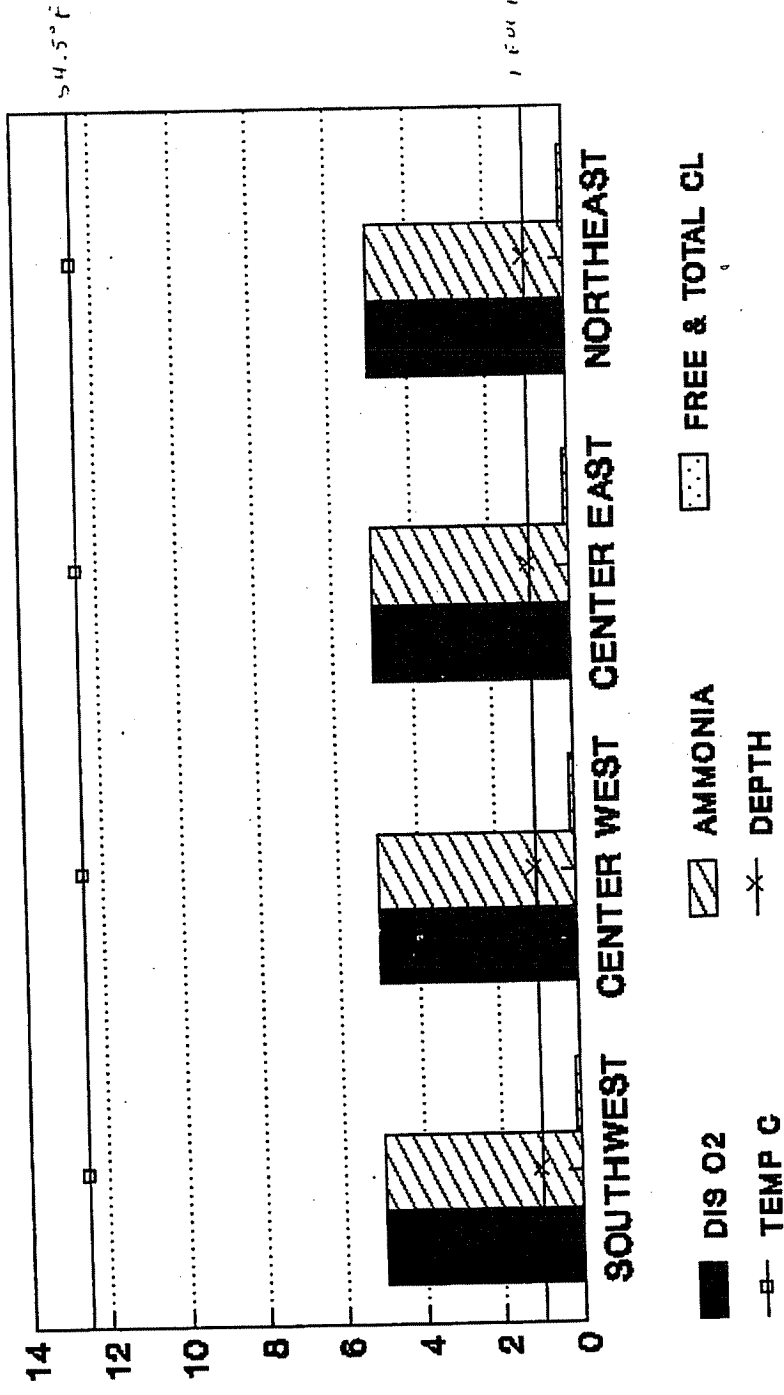


Cum total by source

Duck Collection

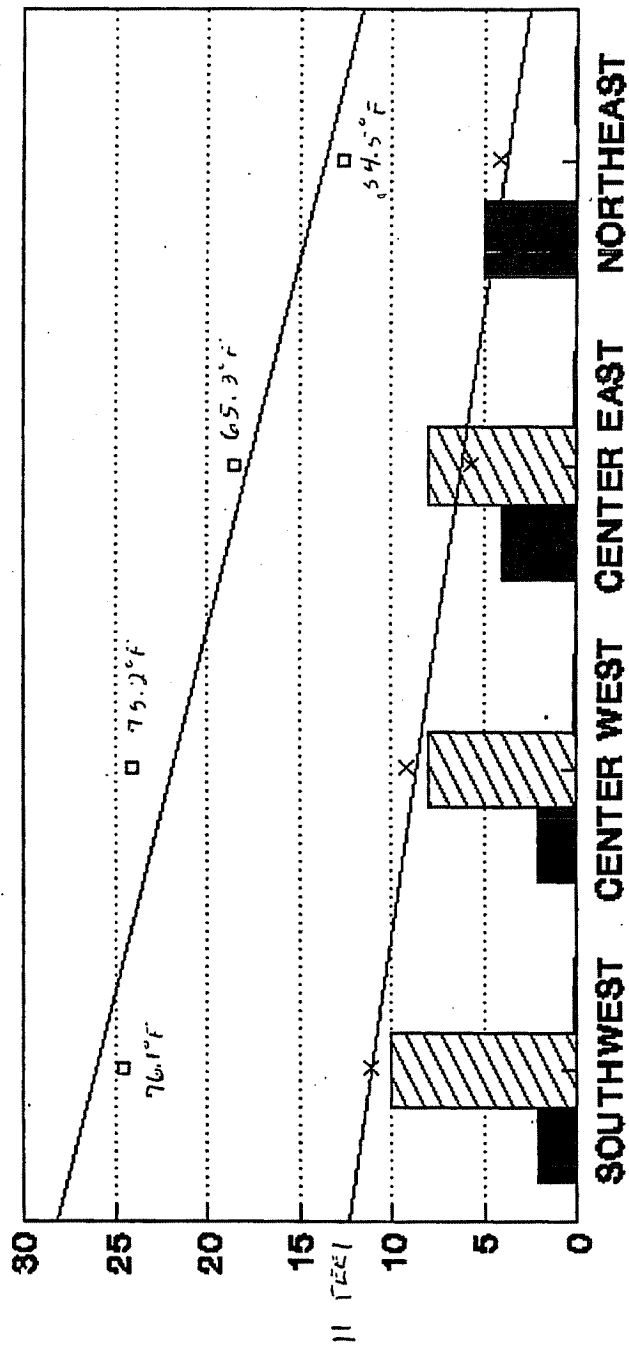


EVAP POND #2 SURFACE VALUES



CHEMISTRY VALUES IN mg/l

EVAP POND #2 BOTTOM VALUES



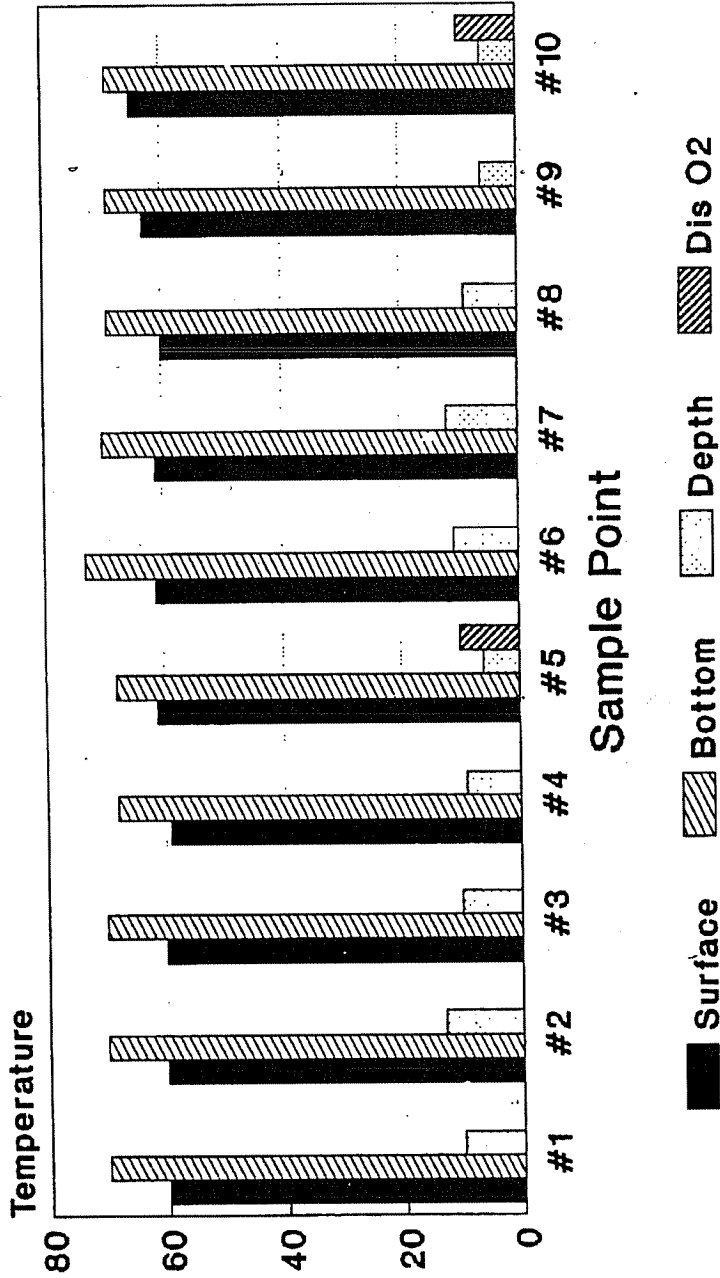
- DIS O2
- ▨ AMMONIA
- ▤ FREE & TOTAL CL
- TEMP C
- X— DEPTH

CHEMISTRY VALUES IN mg/l

4 FEET

EVAP POND TEMPERATURES

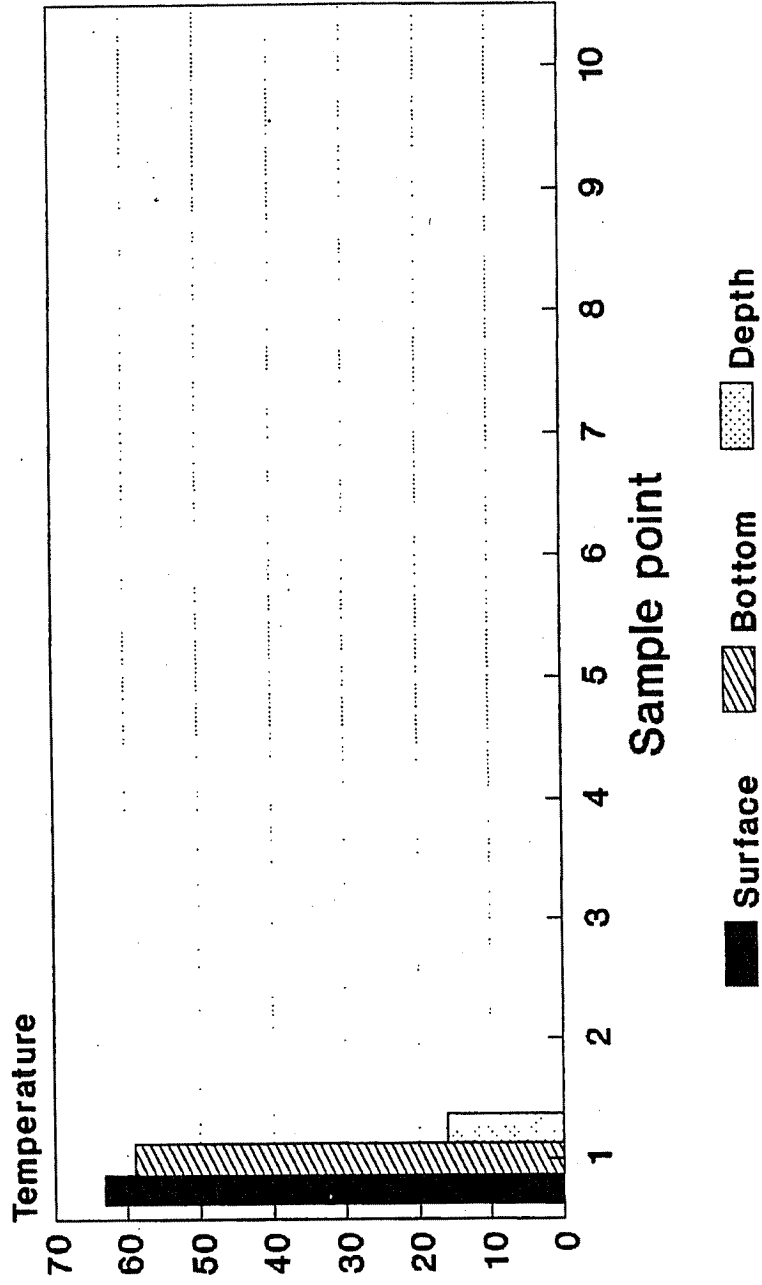
POND #2 on 2/17/95



Temp in F degrees, Depth in feet
 Samples taken diagonal SW to NE 1 to 6
 SE to NW samples 6 thru 10

Evap Pond Temperatures

Pond #1 2/17/95



Sampling discontinued due to leak in boat.

ATTACHMENT F

LEGAL REQUIREMENTS & ASPECTS

MIGRATORY BIRD TREATY ACT

§ 703. Taking, killing, or possessing migratory birds unlawful

Unless and except as permitted by regulations made as hereinafter provided, it shall be unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export, any migratory bird, any part, nest, or egg of any such bird, or any product, whether or not manufactured, which consists, or is composed in whole or part, of any such bird or any part, nest, or egg thereof, included in the terms of the conventions between the United States and Great Britain for the protection of migratory birds concluded August 16, 1916, the United States and the United Mexican States for the protection of migratory birds and game mammals concluded February 7, 1936, the United States and the Government of Japan for the protection of migratory birds and birds in danger of extinction, and their environment concluded March 4, 1972 and the convention between the United States and the Union of Soviet Socialist Republics for the conservation of migratory birds and their environments concluded November 19, 1976.

HISTORY: (July 3, 1918, c. 128, § 2, 40 Stat. 755; June 20, 1936, c. 634, § 3, 49 Stat. 1556; June 1, 1974, P.L. 93-300, § 1, 88 Stat. 190.) (As amended Dec. 13, 1989, P.L. 101-233, § 15, 103 Stat. 1977.)

§ 704. Determination as to when and how migratory birds may be taken, killed, or possessed

Subject to the provisions and in order to carry out the purposes of the conventions, the Secretary of Agriculture [Interior] is authorized and directed, from time to time, having due regard to the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds, to determine when, to what extent, if at all, and by what means, it is compatible with the terms of the conventions to allow hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any such bird, or any part, nest, or egg thereof, and to adopt suitable regulations permitting and governing the same, in accordance with such determinations, which regulations shall become effective when approved by the President.

HISTORY: (July 3, 1918, c. 128, § 3, 40 Stat. 755; June 20, 1936, c. 634, § 2, 49 Stat. 1556.)

§ 705. Transportation or importation of migratory birds or game mammals; when unlawful

It shall be unlawful to ship, transport, or carry, by any means whatever, from one State, Territory, or district to or through another State, Territory, or district, or to or through a foreign country, any bird, or any part, nest, or egg thereof, captured, killed, taken, shipped, transported, or carried at any time contrary to the laws of the State, Territory, or district in which it was captured, killed, or taken, or from which it was shipped, transported, or carried. It shall be unlawful to import any bird, or any part, nest, or egg thereof, captured, killed, taken, shipped, transported, or carried contrary to the laws of any Province of the Dominion of Canada in which the same was captured, killed, or taken, or from which it was shipped, transported, or carried.

HISTORY: (July 3, 1918, c. 128, § 4, 40 Stat. 755; June 20, 1936, c. 634, § 4, 49 Stat. 1556; Dec. 5, 1969, P.L. 91-135, § 10, 83 Stat. 282.)

§ 706. Arrests; search warrants

Any employee of the Department of Agriculture [Interior] authorized by the Secretary of Agriculture [Interior] to enforce the provisions of this Act shall have power, without warrant, to arrest any person committing a violation of this Act in his presence or view and to take such person immediately for examination or trial before an officer or court of competent jurisdiction; shall have power to execute any warrant or other process issued by an officer or court of competent jurisdiction for the enforcement of the provisions of this Act; and shall have authority, with a search warrant, to search any place. The several judges of the courts established under the laws of the United States, and United States

There is authorized to be appropriated, from time to time, out of any money in the Treasury not otherwise appropriated, such amounts as may be necessary to carry out the provisions and to accomplish the purposes of said conventions and this Act and regulations made pursuant thereto, and the Secretary of Agriculture [Interior] is authorized out of such moneys to employ in the city of Washington and elsewhere such persons and means as he may deem necessary for such purpose and may cooperate with local authorities in the protection of migratory birds and make the necessary investigations connected therewith.

HISTORY: (July 3, 1918, c. 128, § 9, 40 Stat. 756; June 20, 1936, c. 634, § 5, 49 Stat. 1556.)

§ 710. Partial invalidity

If any clause, sentence, paragraph, or part of this Act shall, for any reason, be adjudged by any court of competent jurisdiction to be invalid, such judgment shall not affect, impair, or invalidate the remainder thereof, but shall be confined in its operation to the clause, sentence, paragraph, or part thereof directly involved in the controversy in which such judgment shall have been rendered.

HISTORY: (July 3, 1918, c. 128, § 10, 40 Stat. 757.)

§ 711. Breeding and sale for food supply

Nothing in this Act shall be construed to prevent the breeding of migratory game birds on farms and preserves and the sale of birds so bred under proper regulations for the purpose of increasing the food supply.

HISTORY: (July 3, 1918, c. 128, § 12, 40 Stat. 757.)

§ 712. Regulations

In accordance with the various migratory bird treaties and conventions with Canada, Japan, Mexico, and the Union of Soviet Socialist Republics, the Secretary of the Interior is authorized to issue such regulations as may be necessary to assure that the taking of migratory birds and the collection of their eggs, by the indigenous inhabitants of the State of Alaska, shall be permitted for their own nutritional and other essential needs, as determined by the Secretary of the Interior, during seasons established so as to provide for the preservation and maintenance of stocks of migratory birds.

The Secretary of the Interior is authorized to issue such regulations as may be necessary to implement the provisions of the convention between the United States and Great Britain for the protection of migratory birds concluded August 16, 1916, the convention between the United States and the United Mexican States for the protection of migratory birds and game mammals concluded February 7, 1936, the convention between the United States and the Government of Japan for the protection of migratory birds in danger of extinction, and their environment concluded March 4, 1972, and the convention between the United States and the Union of Soviet Socialist Republics for the conservation of migratory birds and their environment concluded November 19, 1976.

HISTORY: (As amended Nov. 8, 1978, P.L. 95-616, § 3(h)(2), (3), 92 Stat. 3112.)

Injurious Wildlife means any wildlife for which a permit is required under subpart B of part 16 of this subchapter before being imported into or shipped between the continental United States, the District of Columbia, Hawaii, the Commonwealth of Puerto Rico, or any possession of the United States.

Mammal means a member of the class, Mammalia; including any part, product, egg, or offspring, or the dead (skull), whether or not included in a manufactured product or in a processed food product.

Migratory bird means any bird, whatever its origin and whether or not raised in captivity, which belongs to a species listed in §10.13, or which is a mutation or a hybrid of any such species, including any part, nest, or egg of any such bird, or any product, whether or not manufactured, which consists, or is composed in whole or part, of any such bird or any part, nest, or egg thereof.

Migratory game birds: See §20.11 of this subchapter.

Mollusk means a member of the phylum, Mollusca, including but not limited to, snails, mussels, clams, oysters, scallops, abalone, squid, and octopuses; including any part, product, egg, or offspring thereof, or the dead body or parts thereof (excluding fossils), whether or not included in a manufactured product or in a processed food product.

Permit means any document designated as a "permit," "license," "certificate," or any other document issued by the Service to authorize, limit, or describe activity and signed by an authorized official of the Service.

Person means any individual, firm, corporation, association, partnership, club, or private body, any one or all, as the context requires.

Plant means any member of the plant kingdom, including seeds, roots and other parts thereof.

Possession means the detention and control, or the manual or ideal custody of anything which may be the subject of property, for one's use and enjoyment, either as owner or as the proprietor of a qualified right in it, and either held personally or by another who exercises it in one's place and name.

Possession includes the act or state of

possessing and that condition of facts under which one can exercise his power over a corporeal thing at his pleasure to the exclusion of all other persons. Possession includes constructive possession which means not actual but assumed to exist, where one claims to hold by virtue of some title, without having actual custody.

Public as used in referring to museums, zoological parks, and scientific or educational institutions, refers to such as are open to the general public and are either established, maintained, and operated as a governmental service or are privately endowed and organized but not operated for profit.

Reptile means a member of the class, Reptilia, including but not limited to, turtles, snakes, lizards, crocodiles, and alligators; including any part, product, egg, or offspring thereof, or the dead body or parts thereof, whether or not included in a manufactured product or in a processed food product.

Secretary means the Secretary of the Interior or his authorized representative.

Service means the United States Fish and Wildlife Service, Department of the Interior.

Shellfish means an aquatic invertebrate animal having a shell, including, but not limited to, (a) an oyster, clam, or other mollusk; and (b) a lobster or other crustacean; or any part, product, egg, or offspring thereof, or the dead body or parts thereof (excluding fossils), whether or not included in a manufactured product or in a processed food product.

State means any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, American Samoa, the Virgin Islands, and Guam.

Take means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect, (With reference to marine mammals, see Part 18 of this subchapter.)

Transportation means to ship, convey, carry or transport by any means whatever, and deliver or receive for such shipment, conveyance, carriage, or transportation.

United States means the several States of the United States of America,

the District of Columbia, the Commonwealth of Puerto Rico, American Samoa, the Virgin Islands, and Guam.

Whoever means the same as fish or wildlife.

[38 FR 22015, Aug. 15, 1973, as amended at 42 FR 52377, June 24, 1977; 42 FR 56559, Nov. 16, 1977; 45 FR 56673, Aug. 25, 1980; 50 FR 52689, Dec. 26, 1985]

§ 10.13 List of Migratory Birds.

The following is a list of all species of migratory birds protected by the Migratory Bird Treaty Act (16 U.S.C. 703-711) and subject to the regulations on migratory birds contained in this subchapter B of title 50 CFR. The species listed are those protected by the Convention for the Protection of Migratory Birds, August 16, 1916, United States-Great Britain (on behalf of Canada), 39 Stat. 1702, T.S. No. 628; the Convention for the Protection of Migratory Birds and Game Mammals, February 7, 1926, United States-Mexico, 50 Stat. 1311, T.S. No. 912; the Convention for the Protection of Migratory Birds and Birds in Danger of Extinction, and Their Environment, March 4, 1972, United States-Japan, 25 U.S.T. 3329, T.I.A.S. No. 7890; and the Convention for the Conservation of Migratory Birds and Their Environment, United States-U.S.S.R., November 26, 1976, 92 Stat. 3116, T.I.A.S. 9073, 16 U.S.C. 703, 712. The species are listed two ways. In the first part of the list species are arranged alphabetically by English (common) name groups, with the scientific name following the English (common) name. All species of ducks are listed together under the heading "Ducks". In the second part of the list, species are listed by scientific name arranged in taxonomic order. Taxonomy and nomenclature follows the American Ornithologists' Union's Check-list of North American Birds (6th Edition, 1983).

I. ALPHABETICAL LISTING

- Acanthor, Siberian, *Puffinus montanella*
- Albatross:
- Black-footed, *Diomedea nigripes*
- Laysan, *Diomedea immutabilis*
- Short-tailed, *Diomedea altavira*
- Yellow-nosed, *Diomedea chlororhynchos*
- Anhinga, *Anhinga anhinga*
- Ani:
- Groove-billed, *Crotophaga sulcirostris*

Smooth-billed, *Crotophaga ani*

- Auklet:
- Cassin's, *Ptychorampus aleuticus*
- Crested, *Aethia cristatella*
- Least, *Aethia pusilla*
- Parakeet, *Cyrtorhynchus ptiliacula*
- Rhinoceros, *Cororhinca monacrata*
- Whiskered, *Aethia gymnaea*
- Black-billed, *Phaethon rubricauda*
- Black-throated, *Phaethon rubricauda*
- Complutana interioe
- Blackbird:
- Beard, rose-throated, *Pachyrhamphus aglai*
- American, *Botaurus lentiginosus*
- Chinese, *Izobrychus sinensis*
- Least, *Izobrychus exilis*
- Schrenk's, *Izobrychus eurhynchus*
- Black-Hawk, Common.
- Blackbird:
- Brewer's, *Euphagus cyanocephalus*
- Red-winged, *Agelaius phoeniceus*
- Rusty, *Euphagus carolinus*
- Tawny-shouldered, *Agelaius humeralis*
- Tricolored, *Agelaius tricolor*
- Yellow-headed, *Xanthocephalus xanthocephalus*
- Yellow-shouldered, *Agelaius zanthomus*
- Bluebird:
- Eastern, *Sialia sialis*
- Mountain, *Sialia currucoides*
- Western, *Sialia mexicana*
- Bluethroat, *Luscinia svecica*
- Bobolink, *Dolichonyx oryzivorus*
- Booby:
- Blue-footed, *Sula nebouxi*
- Brown, *Sula leucogaster*
- Masked, *Sula dactylatra*
- Red-footed, *Sula sula*
- Brambling, *Fringilla montifringilla*
- Brant, *Branta bernicla*
- Bufflehead, *Bucefala albeola*
- Bullfinch:
- Eurasian, *Pyrrhula pyrrhula*
- Puerto Rican, *Loxigilla portoricensis*
- Bunting:
- Indigo, *Passerina cyanea*
- Lark, *Calamospiza melanocorys*
- Lezuli, *Passerina amoena*
- McKay's, *Plectrophenax hyperboreus*
- Fainted, *Passerina ciris*
- Reed (see Reed-Bunting)
- Ruslic, *Emberiza rufica*
- Snow, *Plectrophenax nivalis*
- Varied, *Passerina versicolor*
- Buehlt, *Psittiparus minimus*
- Canebrake (see DUCKS)
- Caracara, Crested, *Polyborus plancus*
- Cardinal, Northern, *Cardinalis cardinalis*
- Carib, Green-throated, *Eutamias holosericeus*
- Catbird, Gray, *Dumetella carolinensis*
- Chat, Yellow-breasted, *Icteria virens*
- Chickadee (see TIT)
- Black-capped, *Parus atricapillus*
- Boreal, *Parus hudsonicus*
- Carolina, *Parus carolinensis*

Chestnut-backed, *Tarus rufescens*
Mexican, *Tarus sclateri*
Mountain, *Tarus gambeli*
Thicket-willow, *Caprimulgus carolinensis*
Golden, *Gymnagyna californiana*

Booby:
American, *Fulica americana*
Caribbean, *Fulica caribaea*
European, *Fulica atra*

Booby:
American, *Phalacrocorax penicillatus*
Great, *Phalacrocorax auritus*
Olivaceous, *Phalacrocorax carbo*
Pelagic, *Phalacrocorax olivaceus*
Red-faced, *Phalacrocorax urile*

Booby:
Bronzed, *Molothrus aeneus*
Brown-headed, *Molothrus aler*
Sibiny, *Molothrus bonariensis*

Booby:
Cruz, *Cruz cruz*
Yellow-breasted, *Porzana flaviventris*

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Ducks
American Black Duck, *Anas rubripes*
Blue-winged, *Bucephala albeola*
Cinnamon Teal, *Aythya valisineria*

Ducks
Common, *Somateria mollissima*
King, *Somateria spectabilis*
Speckled, *Somateria fischeri*
Steller's, *Polysticcia stelleri*
Gadwall, *Anas strepera*
Goldeneye:

Ducks
Barrow's, *Bucephala islandica*
Common, *Bucephala clangula*
Harlequin Duck, *Histrionacus histrionicus*
Hawaiian Duck, *Anas wyvilliana*
Laysan Duck, *Anas layanensis*
Masked Duck, *Oxyura dominica*
Merganser:

Ducks
Common, *Mergus mergamus*
Hooded, *Lophodytes cucullatus*
Red-breasted, *Mergus serrator*
Mottled Duck, *Anas fulvigula*
Oldsquaw, *Clangula hyemalis*

Ducks
Northern, *Anas acuta*
White-cheeked, *Anas bahamensis*
Pochard:

Ducks
Baer's, *Aythya baeri*
Common, *Aythya ferina*
American, *Aythya americana*
Ring-necked Duck, *Aythya collaris*
Scaup:

Ducks
Greater, *Aythya marila*
Lesser, *Aythya ajajinis*
Black, *Melanitta nigra*
Surf, *Melanitta perspicillata*
White-winged, *Melanitta fusca*
Lesser, *Melanitta cinerea*
Black, *Melanitta alpestris*

Ducks
Black, *Anas formosa*
Blue-winged, *Anas diazora*
Cinnamon, *Anas cyanoptera*
Paleated, *Anas fulcata*
Green-winged, *Anas crecca*
Turked Duck, *Aythya jingdongensis*
Whistling-Duck:

Ducks
Black-bellied, *Dendrocygna autumnalis*
Fulvous, *Dendrocygna bicolor*
West Indian, *Dendrocygna arborea*
Wigeon:

Ducks
European, *Anas americana*
Wood Duck, *Anas penelope*
END OF DUCKS

Ducks
Dunlin, *Calidris alpina*
Eagle:

Ducks
Bald, *Haliaeetus leucocapillus*
Golden, *Aquila chrysaetos*
Sea (see Sea-Eagle)

Ducks
White-tailed, *Haliaeetus albicilla*
Secret:

Ducks
American, *Subuaticus ibis*
Chilide, *Erethia eulophos*
Great, *Casmerodius albus*
Plumed, *Erethia intermedia*
Red-tailed, *Erethia rufescens*
Elder (see DUCKS)

Ducks
Elder (see DUCKS)
Emerald, *Chelidon cyanoptera*
Emerald, *Chelidon cyanoptera*
Euphonia, *Euphonia musica*
Falcon:

Ducks
Aplomado, *Falco femoralis*
Peregrine, *Falco peregrinus*
Prairie, *Falco mexicanus*
Fieldfare, *Turdus pilaris*
Fluch:

Ducks
Cassin's, *Corpodacus castanell*
House, *Corpodacus mexicanus*
Purple, *Corpodacus purpureus*
Rox, *Leucosticte arctos*

Ducks
Flamingo, *Greater, Phoenicopterus ruber*
Flicker, *Northern, Colaptes auratus*
Flycatcher:

Ducks
Acadian, *Empidonax vitreus*
Alder, *Empidonax alpinum*
Ash-throated, *Myiarchus cinerascens*
Brown-crested, *Myiarchus tyrannulus*
Buff-breasted, *Empidonax fulvifrons*
Dusky, *Empidonax oberholseri*
Dusky-capped, *Myiarchus tuberculifer*
Fork-lalled, *Tyrannus sanana*

Ducks
Gray, *Empidonax griseus*
Great, *Empidonax griseus*
Hammond's, *Empidonax hammondi*
Least, *Empidonax minimus*
Nashville, *Empidonax nashville*
Nutting's, *Empidonax nuttingi*
Olive-sided, *Contopus borealis*
Puerto Rican, *Myiarchus arifillarum*
Scissor-tailed, *Tyrannus forficatus*
Subsolar-bellied, *Myiodynastes luteiventris*
Vermilion, *Pyrocephalus rubinus*
Western, *Empidonax difficilis*
Willow, *Empidonax traillii*

Ducks
Frigatebird:
Great, *Fregata minor*
Magnificent, *Fregata magnificens*
Lesser, *Fregata ariel*
Fulmar, *Northern, Fulmarus glacialis*
Gadwall (see DUCKS)

Ducks
Gannet, *Northern, Sula bassanus*
Garganey (see DUCKS)
Gnatcatcher:
Black-capped, *Poiloptila nigricaps*
Black-tailed, *Poiloptila melanura*
Blue-gray, *Poiloptila caerulea*
Godwit:

Ducks
Bar-tailed, *Limosa lapponica*
Black-tailed, *Limosa limosa*
Hudsonian, *Limosa haemastica*
Marbled, *Limosa fedoa*
Golden-Plover, *Lesser, Ptilinopus dominica*
Goldeneye (see DUCKS)
Goldfinch:

Ducks
American, *Carduelis tristis*
Lawrence's, *Carduelis lawrencet*
Lesser, *Carduelis palmaria*
Goose:

Ducks
Barnacle, *Branta leucopsis*
Black, *Anser fabalis*
Lesser, *Branta canadensis*
Empidonax, *Chen canagica*
Greater White-fronted, *Anser albifrons*
Hawaiian, *Neoschen sandulacensis*
Rose's, *Chen rossii*
Snow, *Chen caerulescens*
Goshawk, *Northern, Accipiter gentilis*
Grackle:

Ducks
Boat-tailed, *Quiscalus major*
Common, *Quiscalus quiscula*
Great-tailed, *Quiscalus mexicanus*
Greater Antillean, *Quiscalus niger*
Grasshopper-Warbler, *Locustella ochotensis*
Grassquit:

Ducks
Black-faced, *Tiaria bicolor*
Yellow-faced, *Tiaria olivacea*
Podiceps nigricollis
Lesser, *Podiceps cornutus*
Lesser, *Tachyopterus dominicus*
Pied-billed, *Podilymbus podiceps*
Lesser, *Podiceps grisegera*
Lesser, *Podiceps grisegera*
Greenfinch, *Oriental, Carduelis sinica*
Greenfinch, *Common, Tringa nebularia*
Groatbeak:

Ducks
Black-headed, *Phaeucticus melanocephalus*
Blue, *Guiraca caerulea*
Crimson-collared, *Rhodothraupis celano*
Evening, *Coccothraustes vespertinus*
Pine, *Pintaila enucleator*
Rose-breasted, *Phaeucticus ludovicianus*
Yellow, *Phaeucticus chrysoprepis*
Quillmot:

Western, *Larus occidentalis*
 Yellow-footed, *Larus livens*
 Laysan, *Phaethon rubricauda*
 Lark, Northern, *Circus cyaneus*
 Lark, Variable, *Circus hawaiiensis*
 Lark:
 Aleutian Sparrow, *Accipiter gularis*
 Black (see Black Hawk)
 Broad-winged, *Buteo platypterus*
 Cooper's, *Accipiter cooperii*
 Ferruginous, *Buteo regalis*
 Gray, *Buteo nitidus*
 Harris', *Parabuteo unicinctus*
 Hawaiian, *Buteo solitarius*
 Red-tailed, *Buteo lineatus*
 Road-runner, *Geococcyx maculosa*
 Rough-legged, *Buteo lineatus*
 Sharp-shinned, *Accipiter striatus*
 Short-tailed, *Buteo brachyurus*
 Swainson's, *Buteo swainsoni*
 White-tailed, *Buteo albicaudatus*
 Zone-tailed, *Buteo albionatus*
 Hawk-Cuckoo, Hodgson's, *Circus jugosus*
 Great Horned, Northern, *Surnia ulia*
 Great Horned, *Ardea herodias*
 Green-backed, *Butorides striatus*
 Little Blue, *Egretta caerulea*
 Night (see Night Heron)
 Pacific Reef, *Egretta sacra*
 Tricolored, *Egretta tricolor*
 Tropicbird, *Upupa epops*
 Zone-Martin, Common, *Delichon urbica*
 Zebra-tailed (see Carib. Emerald, Mango, Allen's, Sceloporus saxin)
 Anna's, *Calypte anna*
 Antillean Crested, *Orthorhynchus cristatus*
 Berrylline, *Amazilia beryllina*
 Black-chinned, *Archilochus alexandri*
 Blue-throated, *Lampornis clemenciae*
 Broad-billed, *Cyananthus latirostris*
 Broad-tailed, *Sceloporus platycercus*
 Buff-billed, *Amazilia yucatanensis*
 Calliope, *Stellula calliope*
 Coats's, *Calypte costae*
 Lucifer, *Colaptes auratus*
 Magnificent, *Eugenes fulgens*
 Ruby-throated, *Archilochus colubris*
 Rufous, *Sceloporus rufus*
 Violet-crowned, *Amazilia violiceps*
 White-eared, *Hyalocichla leucotis*

Belted, *Ceryle alcyon*
 Green, *Chyrocyte americana*
 Ringed, *Ceryle torquata*
 Kinglet:
 Golden-crowned, *Regulus satrapa*
 Ruby-crowned, *Regulus calendula*
 Kiskadee, Great, *Pitangus sulphuratus*
 Kite:
 American Swallow-tailed, *Elanoides forficatus*
 Black, *Milvulus migrans*
 Black-shouldered, *Elanus caeruleus*
 Hook-billed, *Chondrohierax uncinatus*
 Mississippi, *Ictinia mississippiensis*
 Small, *Rostrhamus sociabilis*
 Kingbird:
 Black-legged, *Larus tridactylus*
 Red-legged, *Larus delawarensis*
 Knot:
 Great, *Chlidris tenuirostris*
 Red, *Chlidris canutus*
 Lapwing, Northern, *Vanelius vanellus*
 Lark, Horned, *Strophophila alpestris*
 Limpkin, *Aramus guarana*
 Lizard-Cuckoo, Puerto Rican, *Saurola villosa*
 Longspur:
 Chestnut-collared, *Colaptes auratus*
 Lapland, *Colaptes lapponicus*
 McCown's, *Colaptes mcconnelli*
 Smith's, *Colaptes pictus*
 Loon:
 Arctic, *Gavia arctica*
 Common, *Gavia immer*
 Red-throated, *Gavia stellata*
 Yellow-billed, *Gavia adamsii*
 Mergler:
 Black-billed, *Fica pica*
 Yellow-billed, *Fica nivalis*
 Mallard (see Ducks)
 Mergler:
 American, *Antracoceros dominicus*
 Green, *Antracoceros viridis*
 Martin:
 Caribbean, *Fregata dominicensis*

Gray-breasted, *Aphelocoma ultramarina*
 Green, *Cyanocorax yucas*
 Pinon, *Gymnorhinus cyanocephalus*
 Scrub, *Aphelocoma coerulescens*
 Steiller's, *Cyanocitta stelleri*
 Junco:
 Dark-eyed, *Junco hyemalis*
 Yellow-eyed, *Junco phaeonotus*
 Keenel:
 American, *Falco sparverius*
 Eurasian, *Falco tinnunculus*
 Kinglet-Charadrius vociferans
 Cassin's, *Tyrannus vociferans*
 Couch's, *Tyrannus couchii*
 Eastern, *Tyrannus tyrannus*
 Gray, *Tyrannus dominicensis*
 Loggerhead, *Tyrannus caudifasciatus*
 Thick-billed, *Tyrannus crassirostris*
 Tropical, *Tyrannus melancholicus*
 Western, *Tyrannus verticalis*
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Cuban, *Progne cryptoleuca*
 Gray-breasted, *Progne chalybea*
 House (see House-Martin)
 Purple, *Progne subis*
 Meadowlark:
 Eastern, *Sturnella magna*
 Western, *Sturnella neglecta*
 Merrimack (see Ducks)
 Merlin, *Falco columbarius*
 Mockingbird, Northern, *Mimus polyglottos*
 Moorhen, Common, *Gallinula chloropus*
 Murres:
 Common, *Uria aalge*
 Thick-billed, *Uria lomvia*
 Murrelet:
 Ancient, *Synthliboramphus antiquus*
 Craver's, *Synthliboramphus craveri*
 Kittitz's, *Brachyramphus brevirostris*
 Marbled, *Brachyramphus marmoratus*
 Xantus', *Synthliboramphus hypoleucos*
 Needle-tail, White-throated, *Hirundapus caudacutus*
 Night-Heron:
 Black-crowned, *Nycticorax nycticorax*
 Japanese, *Nycticorax goussagi*
 Malay, *Nycticorax melanolephus*
 Yellow-crowned, *Nycticorax stolonatus*
 Nighthawk:
 Antillean, *Chordeiles gundlachi*
 Common, *Chordeiles minor*
 Lesser, *Chordeiles acutipennis*
 Nighthawk:
 Buff-collared, *Caprimulgus ridgwayi*
 Jungle, *Caprimulgus indicus*
 Puerto Rican, *Caprimulgus noctitherus*
 Noddy:
 Black, *Anous minutus*
 Blue-gray, *Procelsterna cerulea*
 Brown, *Anous stolidus*
 Lesser, *Anous tenuirostris*
 Nuthatch:
 Nutcracker, Clark's, *Nucifraga columbiana*
 Brown-headed, *Sitta pusilla*
 Pygmy, *Sitta pygmaea*
 Red-breasted, *Sitta canadensis*
 White-breasted, *Sitta carolinensis*
 Olive-backed, *Sitta carolinensis*
 Olive:
 Altimira, *Icterus gularis*
 Audubon's, *Icterus graduacauda*
 Black-cowled, *Icterus dominicensis*
 Black-vented, *Icterus wagleri*
 Hooded, *Icterus cucullatus*
 Northern, *Icterus galbula*
 Orchard, *Icterus spurius*
 Scott's, *Icterus parisorum*
 Striped-backed, *Icterus parvulus*
 Blue-headed, *Seturus aurocapillus*
 Quito, *Icterus gularis*
 Barn (see Barn-Owl)
 Barred, *Syrinx varia*
 Boreal, *Agelaius phoeniceus*
 Burrowing, *Aythya americana*
 Elf, *Micrathene whitneyi*
 Flammulated, *Otus flammeolus*
 Great Gray, *Syrinx nebulosa*

Snowy, *Charadrius alexandrinus*
 Wilson's, *Charadrius wilsonia*
 Poorhard (see DUCKS)
 Sulfur, Common, *Phalaropus nuttallii*
 Atlantic, *Falcula arctica*
 Horned, *Falcula corniculata*
 Tufted, *Falcula cirrhata*
 Yungy-Owl:
 Ferruginous, *Glaucidium brasilianum*
 Northern, *Glaucidium gnoma*
 Yrrhulosis, *Cardinalis sinuatus*
 Juall-Dove:
 Bridled, *Geotrygon mystacea*
 Key West, *Geotrygon chrysa*
 Ruddy, *Geotrygon montana*
 Black, *Lateralus lomalenis*
 King, *Rallus elegans*
 Sora (see Sora)
 Virginia, *Rallus limicola*
 Yellow, *Coturnicops noveboracensis*
 Lays:
 Chihuahuan, *Corvus cryptoleucus*
 Common, *Corvus corax*
 Razorbill, *Alca torda*
 Redpoll (see DUCKS)
 Common, *Carduelis flammea*
 Heary, *Carduelis hornemanni*
 Redbank, Spotted, *Tringa erythropus*
 Redpoll:
 American, *Sceloporus undulatus*
 Painted, *Mnioborus pictus*
 Slaty-throated, *Mnioborus miniatus*
 Common, *Embertia schoeniculus*
 Pallas', *Embertia pallasi*
 Leadrunner, Greater, *Geococcyx californianus*
 Loblili:
 American, *Turdus migratorius*
 Clay-colored, *Turdus grayi*
 Rufous-backed, *Turdus rufopallatus*
 Long-tailed, Common, *Corpodacus erythrinus*
 Trough-winged Swallow, Northern,
Regiopetrogale serripennis
 Ruby-throated, Siberian, *Luscinia caliope*
 Surf, *Phalacrocorax pygmaeus*
 Underling, *Colidris alba*
 Baird's, *Colidris bairdii*
 Broad-billed, *Limicola falcinellus*
 Buff-breasted, *Tyringites subruficollis*
 Common, *Actitis hypoleucos*
 Curlew, *Colidris ferruginea*
 Marsh, *Tringa stagnatilis*
 Pectoral, *Colidris melanotos*
 Purple, *Colidris maritima*
 Rock, *Colidris pilifrons*
 Semipalmated, *Colidris pusilla*
 Sharp-tailed, *Colidris acuminata*
 Solitary, *Tringa solitaria*
 Spoonbill, *Euryrhynchus pygmaeus*
 Spotted, *Actitis macularia*
 Sibley, *Colidris himantopus*

Golden-crowned, *Zonotrichia atricapilla*
 Grasshopper, *Ammodramus sabiniarum*
 Harris', *Zonotrichia querula*
 Henslow's, *Ammodramus henslowii*
 Lark, *Chondestes grammacus*
 Le Conte's, *Ammodramus lecontei*
 Lincoln's, *Melospiza lincolni*
 Olive, *Arremonops rufifragatus*
 Rufous-winged, *Almophila ruficeps*
 Sage, *Amphispiza belli*
 Savannah, *Pezoscopus sandwicensis*
 Sharp-tailed, *Ammodramus caudacutus*
 Song, *Melospiza melodia*
 Swamp, *Melospiza pompano*
 Vesper, *Poocetes grammacus*
 White-crowned, *Zonotrichia leucophrys*
 White-throated, *Zonotrichia albicollis*
 Worthen's, *Spizella wortheni*
 Spoonbill, *Rossata, Ajaja ajaja*
 Starling:
 Ashy, *Sturnus cineraceus*
 Violet-backed, *Sturnus philippensis*
 Starthroat, Plain-capped, *Heliomaster constantii*
 Stilt, Black-necked, *Himantopus mexicanus*
 Sittic:
 Little, *Colidris minima*
 Long-toed, *Colidris subminuta*
 Rufous-necked, *Colidris ruficollis*
 Temminck's, *Colidris temminckii*
 Storm-Petrel, *Mycicerta americana*
 Storm-Wood:
 Ashy, *Oceanodroma hutchinsonii*
 Band-rumped, *Oceanodroma castro*
 Black, *Oceanodroma melania*
 Fork-tailed, *Oceanodroma furcata*
 Leach's, *Oceanodroma leucorhoa*
 Least, *Oceanodroma microstoma*
 Sooty, *Oceanodroma tristrami*
 Wedge-rumped, *Oceanodroma leucorhoa*
 White-faced, *Phaethon nigrifrons*
 Surtbird, *Aptasia virgata*
 Swallow:
 Bahama, *Tachycineta cyanoventris*
 Bank, *Riparia riparia*
 Barn, *Hirundo rustica*
 Cave, *Hirundo fulva*
 Cliff, *Hirundo pyrrhonola*
 Rough-winged (see Rough-winged Swallow)
 Tree, *Tachycineta bicolor*
 Violet-green, *Tachycineta thalassina*
 Swan:
 Trumpeter, *Cygnus buccinator*
 Tundra, *Cygnus columbianus*
 Whooper, *Cygnus cygnus*
 Swift:
 Antillean Palm, *Tachornis phoenicobia*
 Black, *Cypseloides niger*
 Chimney, *Chaetura pelagica*
 Common, *Apus apus*
 Fork-tailed, *Apus pacificus*
 Needle-tailed (see Needle-tail)
 Vaux's, *Chaetura vauxi*
 White-collared, *Streptoprocne zonaris*

White-throated, *Aeronautes saxatalis*
 Tanager:
 Hepatic, *Piranga flava*
 Puerto Rican, *Neospingus speculiferus*
 Scarlet, *Piranga olivacea*
 Stripe-headed, *Spinidalia zena*
 Summer, *Piranga rubra*
 Western, *Piranga ludoviciana*
 Tattler:
 Gray-tailed, *Heteroscelus brevipes*
 Wandering, *Heteroscelus incanus*
 Yellow (see DUCKS)
 Aleutian, *Sterna oleutica*
 Arctic, *Sterna paradisaea*
 Black, *Chlidonias niger*
 Black-naped, *Sterna sumatrana*
 Bridled, *Sterna anaethetus*
 Caspian, *Sterna caspia*
 Common, *Sterna hirundo*
 Elegant, *Sterna elegans*
 Forster's, *Sterna forsteri*
 Gray-backed, *Sterna lunata*
 Gull-billed, *Sterna nilotica*
 Least, *Sterna antillarum*
 Little, *Sterna albifrons*
 Roseate, *Sterna dougallii*
 Royal, *Sterna maxima*
 Sandwich, *Sterna sandwicensis*
 Sooty, *Sterna fuscata*
 White, *Gygis alba*
 White-winged, *Chlidonias leucoplerus*
 Thrasher:
 Bendire's, *Toxostoma bendirei*
 Brown, *Toxostoma rufum*
 California, *Toxostoma redipulum*
 Griseal, *Toxostoma crissale*
 Curve-billed, *Toxostoma curvirostre*
 Le Conte's, *Toxostoma lecontei*
 Long-billed, *Toxostoma longirostre*
 Pearly-eyed, *Margarops fuscatus*
 Sage, *Oreoscoptes montanus*
 Thrush:
 Astec, *Ridgwavia pinctola*
 Blue Rock, *Monticola solitarius*
 Dusky, *Turdus naumanni*
 Eye-browed, *Turdus obscurus*
 Gray-checked, *Catharus minimus*
 Hawaiian, *Phaeornis obscurus*
 Hermit, *Catharus guttatus*
 Red-legged, *Turdus plumbeus*
 Swainson's, *Catharus ustulatus*
 Varied, *Icterus neivus*
 Wood, *Hyllocichla miniata*
 Tit, Siberian, *Parus cinctus*
 Titmouse:
 Bridled, *Parus wollweberi*
 Plain, *Parus inornatus*
 Tufted, *Parus bicolor*
 Towhee:
 Abert's, *Pipilo aberti*
 Brown, *Pipilo fuscus*
 Green-tailed, *Pipilo chlorurus*
 Rufous-sided, *Pipilo erythrophthalmus*
 Tree-Pipit, Olive, *Anthus hodgsoni*
 Trogon:

Eared, *Euphiletus neoxenus*
 Elegant, *Trogon elegans*
 Tropicbird:
 Red-billed, *Phaethon aethereus*
 Red-tailed, *Phaethon rubricauda*
 White-tailed, *Phaethon lepturus*
 Turnstone:
 Black, *Arenaria melanoccephala*
 Ruddy, *Arenaria interpres*
 Veery, *Catharus fuscescens*
 Verdin, *Auriparus flaviceps*
 Violet-Ear, Green, *Colibri thalassinus*
 Vireo:
 Bell's *Vireo bellii*
 Black-capped, *Vireo atricapillus*
 Black-whiskered, *Vireo altiloquus*
 Gray, *Vireo vicinior*
 Hutton's, *Vireo huttoni*
 Philadelphia, *Vireo philadelphicus*
 Puerto Rican, *Vireo laciniatus*
 Red-eyed, *Vireo olivaceus*
 Solitary, *Vireo solitarius*
 Warbling, *Vireo gilvus*
 White-eyed, *Vireo griseus*
 Yellow-throated, *Vireo flavifrons*
 Vulture:
 Black, *Coragyps atratus*
 Turkey, *Cathartes aura*
 Wagtail:
 Black-backed, *Motacilla lugens*
 Gray, *Motacilla chreola*
 White, *Motacilla alba*
 Yellow, *Motacilla flava*
 Warbler:
 Adair's, *Dendroica adalidae*
 Arctic, *Phytolopus borealis*
 Bachman's, *Vermivora bachmanii*
 Bay-breasted, *Dendroica castanea*
 Black-and-white, *Mniotilta varia*
 Black-throated Blue, *Dendroica caerulescens*
 Black-throated Gray, *Dendroica nigrescens*
 Blackburnian, *Dendroica fusca*
 Blackpoll, *Dendroica striata*
 Blue-winged, *Vermivora pinus*
 Canada, *Wilsonia canadensis*
 Cape May, *Dendroica ligna*
 Cerulean, *Dendroica cerulea*
 Chestnut-sided, *Dendroica cristata*
 Collins, *Vermivora cristata*
 Connecticut, *Oporornis agilis*
 Elfin Woods, *Dendroica angela*
 Golden-cheeked, *Dendroica chrysoparia*
 Golden-crowned, *Basileuterus culicivorus*
 Golden-winged, *Vermivora chrysoptera*
 Grace's, *Dendroica graciae*
 Grasshopper (see Grasshopper-Warbler)
 Hermit, *Dendroica occidentalis*
 Hooded, *Wilsonia citrina*
 Kentucky, *Oporornis formosus*
 Kirtland's, *Dendroica kirtlandii*
 Lucy's, *Vermivora luciae*
 MacGillivray's, *Oporornis tolmiei*
 Magnolia, *Dendroica magnolia*
 Mourning, *Oporornis phalaenoptilus*
 Nashville, *Vermivora ruficapilla*
 Olive, *Faucettus fauchettii*

Orange-crowned, *Vermivora cetaea*
 Palm, *Dendroica palmarum*
 Parula (see Parula)
 Pine, *Dendroica pinus*
 Prairie, *Dendroica discolor*
 Proboscitor, *Protonotaria citrea*
 Red-faced, *Cardellina rubrifrons*
 Rufous-capped, *Basileuterus rufifrons*
 Swainson's, *Limnithlypis swainsonii*
 Tennessee, *Vermivora peregrina*
 Townsend's, *Dendroica townsendi*
 Virginia's, *Vermivora virginiae*
 Willow, *Phytolopus trichitis*
 Wilson's, *Wilsonia pusilla*
 Worm-eating, *Helminthophila vermivorus*
 Yellow, *Dendroica petechia*
 Yellow-rumped, *Dendroica coronata*
 Yellow-throated, *Dendroica dominica*
 Waterthrush:
 Louisiana, *Seturus motacilla*
 Northern, *Seturus nortoniensis*
 Waxwing:
 Bohemian, *Bomb. cilia garrulus*
 Cedar, *Bombicilla cedrorum*
 Whistler, Northern, *Oenanthe oenanthe*
 Whimbrel, *Marematus phaeopus*
 Whip-poor-will, *Caprimulgus vociferus*
 Whistling-Duck (see DUCKS)
 Wilson (see DUCKS)
 White, *Catoptrophus semipalmatus*
 Wood-Pewee:
 Eastern, *Contopus virens*
 Western, *Contopus sordidulus*
 Woodcock:
 American, *Colaptes auratus*
 Eurasian, *Colaptes auratus*
 Woodpecker:
 Acorn, *Melanerpes formicivorus*
 Black-backed, *Picoides arcticus*
 Downy, *Picoides pubescens*
 Gila, *Melanerpes uropygialis*
 Hairy, *Picoides villosus*
 Ivory-billed, *Campephilus principalis*
 Ladder-backed, *Picoides scalaris*
 Lewis', *Melanerpes lewis*
 Nuttall's, *Picoides nuttalli*
 Pileated, *Dryocopus pileatus*
 Puerto Rican, *Melanerpes portoricensis*
 Red-bellied, *Melanerpes carolinus*
 Red-cockaded, *Picoides borealis*
 Red-headed, *Melanerpes erythrocephalus*
 Strickland's, *Picoides stricklandi*
 Three-toed, *Picoides tridactylus*
 White-headed, *Picoides albicollis*
 Woodstar, Bahama, *Callipepla baahamae*
 Wren:
 Bewick's, *Thryomanes bewickii*
 Cactus, *Campylorhynchus brunneicapillus*
 Canyon, *Catherpes mexicanus*
 Carolina, *Thryothorus ludovicianus*
 House, *Troglodytes aedon*
 Marsh, *Cistothorus palustris*
 Rock, *Salpinctes obsoletus*
 Sedge, *Cistothorus pinetis*

Pelecanodroma marina, White-faced Storm-Petrel
Oceanodroma furcata, Fork-tailed Storm-Petrel
Oceanodroma leucorhoa, Laysan Storm-Petrel
Oceanodroma homochroa, Ashy Storm-Petrel
Oceanodroma castro, Band-rumped Storm-Petrel
Oceanodroma leithys, Wedge-rumped Storm-Petrel
Oceanodroma melanota, Black Storm-Petrel
Oceanodroma tristrami, Sooty Storm-Petrel
Oceanodroma microsoma, Least Storm-Petrel
 ORDER PELECANIFORMES
 FAMILY PHAETHONTIDAE
Phaethon lepturus, White-tailed Tropicbird
Phaethon adleri, Red-billed Tropicbird
Phaethon rubricauda, Red-tailed Tropicbird
 FAMILY SULIDAE
Sula dactylatra, Masked Booby
Sula nebulosa, Blue-footed Booby
Sula leucogaster, Brown Booby
Sula sula, Red-footed Booby
Sula bassana, Northern Gannet
 FAMILY PELECANIDAE
Pelecanus erythrorhynchos, American White Pelican
Pelecanus occidentalis, Brown Pelican
 FAMILY PHALACROCORACIDAE
Phalacrocorax carbo, Great Cormorant
Phalacrocorax auritus, Double-crested Cormorant
Phalacrocorax olivaceus, Olivaceous Cormorant
Phalacrocorax penicillatus, Brandt's Cormorant
Phalacrocorax pelagicus, Pelagic Cormorant
Phalacrocorax urile, Red-faced Cormorant
 FAMILY ANHINGIDAE
Anhinga anhinga, Anhinga
 FAMILY FRIGATIDAE
Fregata magnificens, Magnificent Frigatebird
Fregata minor, Great Frigatebird
Fregata ariel, Lesser Frigatebird
 ORDER CICONIIFORMES
 FAMILY ARDEIDAE
Botaurus lentiginosus, American Bittern
Isobrychus exilis, Least Bittern
Isobrychus eurhythmus, Chinese Bittern
Ardea herodias, Great Blue Heron
Camerodius albus, Great Egret
Egretta eulophotes, Chinese Egret
Egretta sacra, Pacific Reef Heron
Egretta intermedia, Plumed Egret
Egretta thula, Snowy Egret
Egretta caerulea, Little Blue Heron
Egretta tricolor, Tricolored Heron
Egretta rufescens, Reddish Egret
Winter, Troglodytes troglodytes
Wynneck, Eurasian, Jynx torquilla
 Yellowlegs:
 Greater, *Tringa melanoleuca*
 Lesser, *Tringa flavipes*
 Yellowthroat:
 Common, *Geothlypis trichas*
 Gray-crowned, *Geothlypis poliocephala*
 II. TAXONOMIC LISTING
 ORDER GAVIIFORMES
 FAMILY GAVIIDAE
Gavia stellata, Red-throated Loon
Gavia arctica, Arctic Loon
Gavia immer, Common Loon
Gavia adamsi, Yellow-billed Loon
 ORDER PODICIPEDIFORMES
 FAMILY PODICIPEDIDAE
Tachypterus dominicus, Least Grebe
P. ditropus, Potters Grebe
Podiceps grisegera, Red-necked Grebe
Podiceps nigricollis, Eared Grebe
Aechmophorus occidentalis, Western Grebe
 ORDER PROCELLARIIFORMES
 FAMILY DIOMEDEIDAE
Diomedea albatrus, Short-tailed Albatross
Diomedea nigripes, Black-footed Albatross
Diomedea immutabilis, Laysan Albatross
Diomedea chlororhynchos, Yellow-nosed Albatross
 FAMILY PROCELLARIIDAE
Fulmarus glacialis, Northern Fulmar
Pterodroma hastata, Black-capped Petrel
Pterodroma phaeopygia, Dark-rumped Petrel
Pterodroma externa, White-necked Petrel
Pterodroma inexpectata, Mottled Petrel
Pterodroma ultima, Murphy's Petrel
Pterodroma neglecta, Kermadec Petrel
Pterodroma arminotiana, Herald Petrel
Pterodroma cookii, Cook's Petrel
Pterodroma hypoleuca, Booby Petrel
Bulweria bulwerii, Bulwer's Petrel
Calonectris diomedea, Cory's Shearwater
Puffinus creatopus, Pink-footed Shearwater
Puffinus cornetps, Flesh-footed Shearwater
Puffinus gravis, Greater Shearwater
Puffinus pacificus, Wedge-tailed Shearwater
Puffinus puffinus, Bulwer's Shearwater
Puffinus tenuirostris, Short-tailed Shearwater
Puffinus nativitatis, Christmas Shearwater
Puffinus puffinus, Manx Shearwater
Puffinus opisthomelas, Black-vented Shearwater
Puffinus auricularis, Townsend's Shearwater
Puffinus assimilis, Little Shearwater
Puffinus lherminieri, Audubon's Shearwater
 FAMILY HYDROBATIDAE
Oceanites oceanicus, Wilson's Storm-Petrel

Larus ridibundus, Common Black-headed Gull
Larus philadelphia, Bonaparte's Gull
Larus heermanni, Heermann's Gull
Larus calurus, Mew Gull
Larus delawarensis, Ring-billed Gull
Larus californicus, California Gull
Larus argentatus, Herring Gull
Larus argentatus, Thayer's Gull
Larus glaucoides, Iceland Gull
Larus fuscus, Lesser Black-backed Gull
Larus schistirogus, Slaty-backed Gull
Larus livens, Yellow-footed Gull
Larus occidentalis, Western Gull
Larus glaucescens, Glaucous-winged Gull
Larus hyperboreus, Glaucous Gull
Larus marinus, Great Black-backed Gull
Rissa tridactyla, Black-legged Kittiwake
Rissa brevirostris, Red-legged Kittiwake
Rhodostethia rosea, Rose Gull
Xema sabini, Sabine's Gull
Pagophila eburnea, Ivory Gull
Sterna nilotica, Gull-billed Tern
Sterna caspia, Caspian Tern
Sterna maxima, Royal Tern
Sterna elegans, Elegant Tern
Sterna sandvicensis, Sandwich Tern
Sterna dougalli, Roseate Tern
Sterna hirundo, Common Tern
Sterna paradisaea, Arctic Tern
Sterna aleutica, Aleutian Tern
Sterna forsteri, Forster's Tern
Sterna antillarum, Least Tern
Sterna aethiops, Little Tern
Sterna fuscata, Black-naped Tern
Sterna fuscata, Black-naped Tern
Sterna fuscata, Gray-backed Tern
Sterna anaethetus, Bridled Tern
Sterna fuscata, Sooty Tern
Chlidonias leucoplerus, White-winged Tern
Chlidonias niger, Black Tern
Anous stolidus, Brown Noddy
Anous minutus, Black Noddy
Anous tenuirostris, Lesser Noddy
Proceliterna cerulea, Blue-Gray Noddy
Gygis alba, White Tern
Rynchops niger, Black Skimmer

FAMILY ALCIDAE

Alca alle, Dovekie
Uria adae, Common Murre
Uria lomvia, Thick-billed Murre
Alca torda, Razorbill
Cepphus grylle, Black Guillemot
Cepphus columba, Pigeon Guillemot
Brachyramphus marmoratus, Marbled Murrelet
Brachyramphus brevirostris, Kittlitz's Murrelet
Synthliboramphus hypoleucis, Xantus' Murrelet
Synthliboramphus craveri, Craveri's Murrelet
Synthliboramphus antiquus, Ancient Murrelet
Puffinramphus alencicus, Cassin's Auklet
Cyrtorhynchus pacificus, Parakeet Auklet
Aethya pusilla, Least Auklet

Caprimulgus vociferus, White-poor-will
Caprimulgus noctitherus, Puerto Rican Nighthawk
Caprimulgus indicus, Jungle Nighthawk
Cypseloides niger, Black Swift
Streptoprocne zonaria, White-collared Swift
Chaetura pelagica, Chimney Swift
Chaetura vauxi, Vaux's Swift
Hirundo caudacutus, White-throated Noddy
Apus apus, Common Swift
Apus pacificus, Fork-tailed Swift
Aeronautes saxatilis, White-throated Swift
Tachornis phoenicobia, Antillean Palm Swift

FAMILY TROCHILIDAE

Colibri thalassinus, Green Violet-ear
Anthracoceros dominicus, Antillean Mango
Eulampis holosericeus, Green-throated Carib
Orthorhynchus cristatus, Antillean Crested Hummingbird
Chlorostilbon maugaeus, Puerto Rican Emerald
Cyananthus latirostris, Broad-billed Hummingbird
Myiarchus leucotis, White-eared Hummingbird
Anasiza beryllina, Berylline Hummingbird
Anasiza yucatanensis, Buff-bellied Hummingbird
Anasiza violiceps, Violet-crowned Hummingbird
Lampornis clemenciae, Blue-throated Hummingbird
Eugenes fulgens, Magnificent Hummingbird
Hellonaster constantii, Plain-capped Starthroat
Calliphlox enellynae, Bahama Woodstar
Colothorax lucifer, Lucifer Hummingbird
Archilochus colubris, Ruby-throated Hummingbird
Archilochus alexandri, Black-chinned Hummingbird
Colaptes auratus, Anna's Hummingbird
Colaptes cafer, Costa's Hummingbird
Selasphorus calliope, Calliope Hummingbird
Selasphorus platycircus, Broad-tailed Hummingbird
Selasphorus rufus, Rufous Hummingbird

U.S. Fish and Wildlife Serv., Interior

Agelaius acadicus, Northern Saw-whet Owl
ORDER CAPRIMULGIFORMES
FAMILY CAPRIMULGIDAE
Chordeiles acutipennis, Lesser Nighthawk
Chordeiles fundulchii, Antillean Nighthawk
Nyctidromus albicollis, Common Poorwill
Phalaenoptilus nuttallii, Common Poorwill
Caprimulgus carolinensis, Chuck-will's-widow
Caprimulgus ridgwayi, Buff-collared Nighthawk
Caprimulgus vociferus, White-poor-will
Caprimulgus noctitherus, Puerto Rican Nighthawk
Caprimulgus indicus, Jungle Nighthawk
ORDER APODIFORMES
FAMILY APODIDAE
Cypseloides niger, Black Swift
Streptoprocne zonaria, White-collared Swift
Chaetura pelagica, Chimney Swift
Chaetura vauxi, Vaux's Swift
Hirundo caudacutus, White-throated Noddy
Apus apus, Common Swift
Apus pacificus, Fork-tailed Swift
Aeronautes saxatilis, White-throated Swift
Tachornis phoenicobia, Antillean Palm Swift
FAMILY TROCHILIDAE
Colibri thalassinus, Green Violet-ear
Anthracoceros dominicus, Antillean Mango
Eulampis holosericeus, Green-throated Carib
Orthorhynchus cristatus, Antillean Crested Hummingbird
Chlorostilbon maugaeus, Puerto Rican Emerald
Cyananthus latirostris, Broad-billed Hummingbird
Myiarchus leucotis, White-eared Hummingbird
Anasiza beryllina, Berylline Hummingbird
Anasiza yucatanensis, Buff-bellied Hummingbird
Anasiza violiceps, Violet-crowned Hummingbird
Lampornis clemenciae, Blue-throated Hummingbird
Eugenes fulgens, Magnificent Hummingbird
Hellonaster constantii, Plain-capped Starthroat
Calliphlox enellynae, Bahama Woodstar
Colothorax lucifer, Lucifer Hummingbird
Archilochus colubris, Ruby-throated Hummingbird
Archilochus alexandri, Black-chinned Hummingbird
Colaptes auratus, Anna's Hummingbird
Colaptes cafer, Costa's Hummingbird
Selasphorus calliope, Calliope Hummingbird
Selasphorus platycircus, Broad-tailed Hummingbird
Selasphorus rufus, Rufous Hummingbird

Selasphorus sasin, Allen's Hummingbird
ORDER TROGONIFORMES
FAMILY TROGONIDAE
Trogon elegans, Elegant Trogon
Euphiletus nezareus, Eared Trogon
ORDER CORACIIFORMES
FAMILY UPUPIDAE
Upupa epops, Hoopoe
FAMILY ALCEDINIDAE
Ceryle forquata, Ringed Kingfisher
Ceryle alcyon, Belted Kingfisher
Chloroceryle americana, Green Kingfisher
ORDER PICIFORMES
FAMILY PICIDAE
Jynx torquilla, Eurasian Wrenneck
Melanerpes lewis, Lewis' Woodpecker
Melanerpes erythrocephalus, Red-headed Woodpecker
Melanerpes formicivorus, Acorn Woodpecker
Melanerpes uropygialis, Gilt Woodpecker
Melanerpes aurifrons, Golden-fronted Woodpecker
Melanerpes carolinus, Red-bellied Woodpecker
Melanerpes portoricensis, Puerto Rican Woodpecker
Sphyrapicus varius, Yellow-bellied Sapsucker
Sphyrapicus ruber, Red-breasted Sapsucker
Sphyrapicus thyroideus, Williamson's Sapsucker
Picoides scalaris, Ladder-backed Woodpecker
Picoides nuttalli, Nuttall's Woodpecker
Picoides pubescens, Downy Woodpecker
Picoides villosus, Hairy Woodpecker
Picoides stricklandi, Strickland's Woodpecker
Picoides borealis, Red-cockaded Woodpecker
Picoides albolarvatus, White-headed Woodpecker
Picoides tridactylus, Three-toed Woodpecker
Picoides arcticus, Black-backed Woodpecker
Colaptes auratus, Northern Flicker
Dryocopus pileatus, Pileated Woodpecker
Campophilus principalis, Ivory-billed Woodpecker
ORDER PASSERIFORMES
FAMILY TYRANNIDAE
Elaenia martinica, Caribbean Elaenia
Camptostoma imberbe, Northern Beardless Tyrannulet
Contopus borealis, Olive-sided Flycatcher
Contopus sordidatus, Western Wood-Pewee
Contopus virens, Eastern Wood-Pewee
Contopus latirostris, Lesser Antillean Pewee
Empidonax flaviventris, Yellow-bellied Flycatcher
Empidonax wirens, Acadian Flycatcher
Empidonax almarum, Alder Flycatcher
Empidonax traillii, Willow Flycatcher
Empidonax minimus, Least Flycatcher

Empidonax hammondi, Hammond's Flycatcher
Empidonax oberholseri, Dusky Flycatcher
Empidonax wrighti, Gray Flycatcher
Empidonax difficilis, Western Flycatcher
Empidonax fulvifrons, Buff-breasted Flycatcher
Sayornis nigricans, Black Phoebe
Sayornis phoebe, Eastern Phoebe
Sayornis saya, Say's Phoebe
Pyrocephalus rubinus, Vermillion Flycatcher
Mniotilta tuberculifer, Dusky-capped Flycatcher
Myiarchus cinerascens, Ash-throated Flycatcher
Myiarchus nuttallii, Nutting's Flycatcher
Myiarchus crinitus, Great Crested Flycatcher
Myiarchus tyrannulus, Brown-crested Flycatcher
Myiarchus anillarum, Puerto Rican Flycatcher
Pitangus sulphuratus, Great Kingadee
Mniotilta leuciventris, Sulphur-bellied Flycatcher
Tyrannus melancholicus, Tropical Kingbird
Tyrannus couchii, Couch's Kingbird
Tyrannus vociferans, Cassin's Kingbird
Tyrannus crassirostris, Thick-billed Kingbird
Tyrannus verticalis, Western Kingbird
Tyrannus tyrannus, Eastern Kingbird
Tyrannus dominicensis, Gray Kingbird
Tyrannus caudifasciatus, Loggerhead Kingbird
Tyrannus forficatus, Scissor-tailed Flycatcher
Tyrannus savana, Fork-tailed Flycatcher
Pachyrhamphus agelaius, Rose-throated Becard

FAMILY ALAUDIDAE
Alauda arvensis, European Skylark
Eremophila alpestris, Horned Lark

FAMILY HRUNDINIDAE
Progne subis, Purple Martin
Progne cryptoleuca, Cuban Martin
Progne dominicensis, Caribbean Martin
Progne chaileya, Gray-breasted Martin
Tachycineta bicolor, Tree Swallow
Tachycineta thalassina, Violet-green Swallow
Tachycineta cyanocephala, Bahama Swallow
Stelgidopteryx serripennis, Northern Rough-winged Swallow
Riparia riparia, Bank Swallow
Hirundo pyrrhonota, Cliff Swallow
Hirundo fulva, Cave Swallow
Hirundo rustica, Barn Swallow
Delichon urbica, Common House-Martin

FAMILY CORVIDAE
Perisoreus canadensis, Gray Jay
Cyanocitta stelleri, Steller's Jay
Cyanocitta cristata, Blue Jay
Cyanocorax yncas, Green Jay
Cyanocorax morpho, Brown Jay

Aphelocoma coerulescens, Scrub Jay
Aphelocoma ultramarina, Gray-breasted Jay
Gymnorhinus cyanocephalus, Pinyon Jay
Nucifraga columbiana, Clark's Nutcracker
Pica pica, Black-billed Magpie
Corvus brachyrhynchos, American Crow
Corvus curvirostris, Northwestern Crow
Corvus leucognathus, White-necked Crow
Corvus imparatus, Mexican Crow
Corvus ossifragus, Fish Crow
Corvus harrisi, Hawaiian Crow
Corvus cryptoleucus, Chihuahuan Raven
Corvus corax, Common Raven

FAMILY FARIDAE
Parus atricapillus, Black-capped Chickadee
Parus carolinensis, Carolina Chickadee
Parus sclateri, Mexican Chickadee
Parus gambeli, Mountain Chickadee
Parus cinctus, Siberian Tit
Parus hudsonicus, Boreal Chickadee
Parus rufescens, Chestnut-backed Chickadee
Parus wollweberi, Biedied Titmouse
Parus inornatus, Plain Titmouse
Parus bicolor, Tufted Titmouse

FAMILY REMIZIDAE
Auriparus flaviceps, Verdin

FAMILY AEGITHALIDAE
Psaltriparus minimus, Bush-tit

FAMILY SITTIDAE
Sitta canadensis, Red-breasted Nuthatch
Sitta carolinensis, White-breasted Nuthatch
Sitta pygmaea, Pygmy Nuthatch
Sitta pusilla, Brown-headed Nuthatch

FAMILY CERYTHIDAE
Certhia americana, Brown Creeper

FAMILY TROGLODYTIDAE
Campylorhynchus brunneicapillus, Cactus Wren
Sialia mexicana, Rock Wren
Thryothorus ludovicianus, Canyon Wren
Thryomanes bewickii, Bewick's Wren
Troglodytes aedon, House Wren
Troglodytes troglodytes, Winter Wren
Cistothorus palustris, Marsh Wren

FAMILY CINCLIDAE
Cinclus mexicanus, American Dipper

FAMILY MUSCICAPIDAE
Loxia orcalensis, Middendorf's Grass-hopper Warbler
Phylloscopus borealis, Arctic Warbler
Phylloscopus trachurus, Willow Warbler
Regulus satrapa, Golden-crowned Kinglet
Regulus calendula, Ruby-crowned Kinglet
Polioptila caerulea, Blue-gray Gnatcatcher
Polioptila melanura, Black-tailed Gnatcatcher

Polioptila nigriceps, Black-capped Gnatcatcher

SUBFAMILY MUSCICAPINAE
Muscicapa griseicauda, Gray-spotted Flycatcher
Muscicapa narsisina, Narcissus Flycatcher

SUBFAMILY TURDINAE
Luscinia caliope, Siberian Rubythroat
Luscinia svecica, Bluethroat
Monticola solitarius, Blue Rock Thrush
Oenanthe oenanthe, Northern Wheatear
Sialia sialis, Eastern Bluebird
Sialia mexicana, Western Bluebird
Sialia currucoides, Mountain Bluebird
Myadestes townsendi, Townsend's Solitaire
Phoenicurus phoenicurus, Hawaiian Thrush
Catharus fuscescens, Small Kauai Thrush
Catharus minimus, Gray-cheeked Thrush
Catharus ustulatus, Swainson's Thrush
Catharus guttatus, Hermit Thrush
Hylocichla ustulata, Wood Thrush
Turdus plumbeus, Red-legged Thrush
Turdus obscurus, Eye-browed Thrush
Turdus naumanni, Dusky Thrush
Turdus pilaris, Fieldfare
Turdus grayi, Clay-colored Robin
Turdus rufopectus, Rufous-backed Robin
Turdus migratorius, American Robin
Icterus nebulosus, Varied Thrush
Ridgwayia pinicola, Aztec Thrush

FAMILY MIMIDAE
Dumetella carolinensis, Gray Catbird
Mimus polyglottus, Northern Mockingbird
Oreoscoptes montanus, Sage Thrasher
Toxostoma rufum, Brown Thrasher
Toxostoma longirostre, Long-billed Thrasher
Toxostoma bendirei, Bendire's Thrasher
Toxostoma carolinense, Curve-billed Thrasher

or
Toxostoma tridecemlineatum, California Thrasher
Toxostoma crissale, Crissal Thrasher
Toxostoma lecontei, Le Conte's Thrasher
Margarops fuscatus, Peary-eyed Thrasher

FAMILY PRUNELLIDAE
Prunella montanella, Siberian Accentor

FAMILY MOTACILLIDAE
Motacilla flava, Yellow Wagtail
Motacilla cinerea, Gray Wagtail
Motacilla alba, White Wagtail
Motacilla lugens, Black-backed Wagtail
Anthus hodgsoni, Olive Tree-Pipit
Anthus gustavi, Pechora Pipit
Anthus cervinus, Red-throated Pipit
Anthus spinoletta, Water Pipit
Anthus spragueii, Sprague's Pipit

FAMILY BOMBYCILLIDAE
Bombycilla garrulus, Bohemian Waxwing
Bombycilla cedrorum, Cedar Waxwing

FAMILY PTILOGONATIDAE
Phainopepla nitens, Phainopepla

FAMILY LANIIDAE
Lanius excubitor, Northern Shrike

Lanius ludovicianus, Loggerhead Shrike

FAMILY STURNIDAE
Sturnus philipensis, Violet-backed Starling
Sturnus cinereus, Ash Starling

FAMILY VIREONIDAE
Vireo griseus, White-eyed Vireo
Vireo latimeri, Puerto Rican Vireo
Vireo bellii, Bell's Vireo
Vireo atricapillus, Black-capped Vireo
Vireo vicinior, Gray Vireo
Vireo solitarius, Solitary Vireo
Vireo flavifrons, Yellow-throated Vireo
Vireo huttoni, Hutton's Vireo
Vireo gilvus, Warbling Vireo
Vireo philadelphicus, Philadelphia Vireo
Vireo olivaceus, Red-eyed Vireo
Vireo altiloquus, Black-whiskered Vireo

FAMILY EMBERIZIDAE

SUBFAMILY PARULINAE
Vermivora bachmanii, Bachman's Warbler
Vermivora pinus, Blue-winged Warbler
Vermivora chrysopetra, Golden-winged Warbler
Vermivora peregrina, Tennessee Warbler
Vermivora cicta, Orange-crowned Warbler
Vermivora ruficapilla, Nashville Warbler
Vermivora virginica, Virginia's Warbler
Vermivora atricapilla, Colima Warbler
Parula americana, Northern Parula
Parula pitagorumi, Tropical Parula
Dendroica petechia, Yellow Warbler
Dendroica pensilvanica, Chestnut-sided Warbler
Dendroica magna, Magnolia Warbler
Dendroica tigrina, Cape May Warbler
Dendroica caerulescens, Black-throated Blue Warbler
Dendroica coronata, Yellow-rumped Warbler
Dendroica nigrescens, Black-throated Gray Warbler
Dendroica townsendi, Townsend's Warbler
Dendroica occidentalis, Hermit Warbler
Dendroica virens, Black-throated Green Warbler
Dendroica chrysoparia, Golden-cheeked Warbler
Dendroica fusca, Blackburnian Warbler
Dendroica dominica, Yellow-throated Warbler
Dendroica graciae, Grace's Warbler
Dendroica adelaidae, Adelaide's Warbler
Dendroica pinus, Pine Warbler
Dendroica kirilandi, Kirilandi's Warbler
Dendroica discolor, Prairie Warbler
Dendroica palmarum, Palm Warbler
Dendroica castanea, Bay-breasted Warbler
Dendroica striata, Blackpoll Warbler
Dendroica cerulea, Cerulean Warbler
Dendroica angela, Elin Woods Warbler
Mniotilta varia, Black-and-White Warbler
Setophaga ruticilla, American Redstart
Protonotaria citrea, Prothonotary Warbler
Helminthophila vermivorus, Worm-eating Warbler

Zonotrichia swainsonii, Swainson's Warbler
Seturus auricapillus, Ovenbird
Seturus ruficapillus, Northern Waterthrush
Seturus monticola, Louisiana Waterthrush
Oporornis formosus, Kentucky Warbler
Oporornis agilis, Connecticut Warbler
Oporornis philadelphia, Mourning Warbler
Oporornis tolmiei, MacGillivray's Warbler
Geothlypis trichas, Common Yellowthroat
Geothlypis poliocephala, Gray-crowned Yellowthroat
Wilsonia citrina, Hooded Warbler
Wilsonia pusilla, Wilson's Warbler
Wilsonia canadensis, Canada Warbler
Cardellina rubrifrons, Red-faced Warbler
Mnioborus pictus, Painted Redstart
Mnioborus miniatus, Redstart
Basileuterus culicivorus, Golden-crowned Warbler
Basileuterus rufifrons, Rufous-capped Warbler
Icteria virens, Yellow-breasted Chat
Pseudacramus leucotis, Olive Warbler

SUBFAMILY THIRUPINAE

Spindalis zeno, Stripe-headed Tanager
Nesospingus speculiferus, Puerto Rican Tanager
Piranga flava, Hepatic Tanager
Piranga rubra, Summer Tanager
Piranga olivacea, Scarlet Tanager
Piranga ludoviciana, Western Tanager
Euphonia musica, Antillean Euphonia

SUBFAMILY CARDINALINAE

Rhodospiza celsa, Crimson-collared Grosbeak
Cardinalis cardinalis, Northern Cardinal
Cardinalis stricklandi, Pyrrhuloxia
Pheucticus carpeophyllus, Yellow Grosbeak
Pheucticus ludovicianus, Rose-breasted Grosbeak
Pheucticus melanocephalus, Black-headed Grosbeak
Guiraca caerulea, Blue Grosbeak
Passerina amoena, Lazuli Bunting
Passerina cyanea, Indigo Bunting
Passerina verticalis, Varied Bunting
Passerina ciris, Painted Bunting
Spiza americana, Dickcissel

SUBFAMILY EMBERIZINAE

Arremonops rufivirgatus, Olive Sparrow
Pipilo chlorurus, Green-tailed Towhee
Pipilo erythrophthalmus, Rufous-sided Towhee
Pipilo fuscus, Brown Towhee
Pipilo aberti, Abert's Towhee
Sporophila torquata, White-collared Seedeater
Tiaris albicollis, Yellow-faced Grassquit
Tiaris bicolor, Black-faced Grassquit
Loxilla portoricensis, Puerto Rican Bullfinch
Amphispiza aestivalis, Bachman's Sparrow

Almophila botleri, Botteri's Sparrow
Almophila cassini, Cassin's Sparrow
Almophila carpalis, Rufous-winged Sparrow
Almophila ruficeps, Rufous-crowned Sparrow
Spizella arborea, American Tree Sparrow
Spizella passerina, Chipping Sparrow
Spizella pallida, Clay-colored Sparrow
Spizella breweri, Brewer's Sparrow
Spizella pusilla, Field Sparrow
Spizella wortheni, Worthen's Sparrow
Spizella atrogularis, Black-chinned Sparrow
Poocetes gramineus, Vesper Sparrow
Chondestes grammacus, Lark Sparrow
Amphispiza bilineata, Black-throated Sparrow
Amphispiza belli, Sage Sparrow
Amphispiza quinquestrata, Five-striped Sparrow
Calamospiza melanocorys, Lark Bunting
Passerculus sandwichensis, Savannah Sparrow
Ammodramus bairdi, Baird's Sparrow
Ammodramus savannarum, Grasshopper Sparrow
Ammodramus henslowii, Henslow's Sparrow
Ammodramus lecontei, Le Conte's Sparrow
Ammodramus caudacutus, Sharp-tailed Sparrow
Ammodramus maritimus, Seaside Sparrow
Passerella iliaca, Fox Sparrow
Melospiza melodia, Song Sparrow
Melospiza lincolni, Lincoln's Sparrow
Melospiza georgiana, Swamp Sparrow
Zonotrichia albicollis, White-throated Sparrow
Zonotrichia atricapilla, Golden-crowned Sparrow
Zonotrichia leucophrys, White-crowned Sparrow
Zonotrichia querula, Harris' Sparrow
Junco hyemalis, Dark-eyed Junco
Junco phaeonotus, Yellow-eyed Junco
Emberiza rufica, Rustic Bunting
Emberiza pallasi, Pallas' Reed-Bunting
Emberiza schoeniclus, Common Reed-Bunting
Calcarius macrourus, McCown's Longspur
Calcarius lapponicus, Lapland Longspur
Calcarius pictus, Smith's Longspur
Calcarius ornatus, Chestnut-collared Longspur
Plectrophenax nivalis, Snow Bunting
Plectrophenax hyperboreus, McKay's Bunting

SUBFAMILY ICTERINAE

Dolichonyx oryzivorus, Bobolink
Agelaius phoeniceus, Red-winged Blackbird
Agelaius tricolor, Tricolored Blackbird
Agelaius humeratus, Tawny-shouldered Blackbird
Agelaius rufinotus, Yellow-shouldered Blackbird
Sturnella magna, Eastern Meadowlark
Sturnella neglecta, Western Meadowlark
Xanthocephalus xanthocephalus, Yellow-headed Blackbird

U.S. Fish and Wildlife Serv., Interior

Euphagus carolinus, Rusty Blackbird
Euphagus cyanocephalus, Brewer's Blackbird
Quiscalus major, Great-tailed Grackle
Quiscalus mexicanus, Boat-tailed Grackle
Quiscalus quiscula, Common Grackle
Quiscalus niger, Greater Antillean Grackle
Melothrus bonariensis, Shiny Cowbird
Melothrus aeneus, Bronzed Cowbird
Melothrus ater, Brown-headed Cowbird
Icterus dominicensis, Black-cowbird Oriole
Icterus wagleri, Orchard Oriole
Icterus cucullatus, Hooded Oriole
Icterus pusillus, Streak-backed Oriole
Icterus gularis, Altamira Oriole
Icterus griseicauda, Audubon's Oriole
Icterus galbula, Northern Oriole
Icterus parisorum, Scott's Oriole

FAMILY FRINGILLIDAE

Fringilla montifringilla, Brambling
SUBFAMILY CARDUELINAE

Leucosticte arctica, Rosy Finch
Pinkia enucator, Pine Grosbeak
Carduelis erythrurus, Common Rosefinch
Carduelis parvirostris, Purple Finch
Carduelis purpurea, Cassin's Finch
Carduelis mexicana, House Finch
Loxia curvirostris, Red Crossbill
Loxia leucophaea, White-winged Crossbill
Carduelis flamma, Common Redpoll
Carduelis hornemanni, Hoary Redpoll
Carduelis pinus, Pine Siskin
Carduelis pacifica, Lesser Goldfinch
Carduelis lawrencei, Lawrence's Goldfinch
Carduelis tristis, American Goldfinch
Carduelis sinica, Oriental Greenfinch
Pyrrhula pyrrhula, Eurasian Bullfinch
Coccothraustes vespertina, Evening Grosbeak
Coccothraustes coccyzina, Hairyfinch

Subpart C—Addresses

§ 10.21 Director.
 (a) Mail forwarded to the Director for law enforcement purposes should be addressed: Chief, Division of Law Enforcement, U.S. Fish and Wildlife Service, P.O. Box 3247, Arlington, VA 22203-3247.
 (b) Mail forwarded to the Director with reference to permits should be addressed: Chief, Office of Management Authority, U.S. Fish and Wildlife Service, 4401 North Fairfax Drive, Room 432, Arlington, VA 22203.
 [55 FR 48851, Nov. 23, 1990]

§ 10.22 Law enforcement offices.
 Service law enforcement offices at their areas of responsibility folk Mail should be addressed: "Asst. Regional Director, Division of Law Enforcement, U.S. Fish and Wildlife Service, (appropriate address below)".

AREAS OF RESPONSIBILITY AND OFFICE ADDRESSES

California, Hawaii, Idaho, Nevada, Oregon, Washington, American Samoa, Guiana, the Marshall Islands, Northern Mariana Islands, and the Trust Territory of Pacific Islands (District 1):
 Eastside Federal Complex, 911 N.E. 1st Avenue, Portland, OR 97232-181, Telephone: 503-231-5125.
 Arizona, New Mexico, Oklahoma, and Texas (District 2):
 P.O. Box 329, Albuquerque, NM 87103, Telephone: 505-766-2691
 Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin (District 3):
 P.O. Box 45—Federal Building, Snelling, Twin Cities, MN 55111, Telephone: 612-725-3530.
 Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Puerto Rico, and the Virgin Islands (District 4):
 P.O. Box 4889, Atlanta, GA 30302, Telephone: 404-531-5872
 Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia (District 5):
 P.O. Box 128, New Town Branch, Box MA 02258, Telephone: 617-865-2298
 Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming (District 6):
 P.O. Box 25488, Denver Federal Center (District 7):
 Denver, CO 80225, Telephone: 303-235-7575
 Alaska (District 7):
 P.O. Box 92597, Anchorage, AK 99509-1 Telephone: 907-766-3311
 Any foreign country (Washington Office):
 P.O. Box 3247, Arlington, VA 22203-3247, Telephone: 703-358-1948.
 (Pub. L. 97-79, 95 Stat. 1072; 16 U.S.C. 3378)
 [48 FR 1319, Jan. 12, 1983; 48 FR 37040, Aug. 1983, as amended at 49 FR 31291, Aug. 6, 1984; 51 FR 23551, June 30, 1986; 53 FR 6649, Mar. 1988; 55 FR 48851, Nov. 23, 1990]

~~PALO VERDE NUCLEAR GENERATING STATION~~
EVAPORATION PONDS CONTAINMENT AND MONITORING PROGRAM OUTLINE

A. Regulatory Oversight

1. Arizona Department of Environmental Quality (Water Quality)
 - a. Groundwater Quality Protection Permit No. G-0077-07 - effective 08/21/88
 - 1) Alert level notification.
 - 2) Unintentional discharge notification.
 - 3) Facility modification notification.
 - 4) Permit violation notification.
 - 5) Quarterly report submittal.
 - 6) Annual interpretive report submittal.
 - b. Aquifer Protection Permit - application submitted 05/12/95
 - 1) Same as above.
 - 2) Additional alert levels proposed.
 - 3) Aquifer water quality standards as discharge limits.
 - 4) Establish point of compliance.
2. Arizona Department of Water Resources (Dam Safety)
 - a. Annual Evaporation Pond Dam Safety Report submittal.
 - b. Triennial agency dam inspection.

B. Containment

1. Evaporation Pond No. 1
Double lined - top liner 80-mil HDPE.
2. Evaporation Pond No. 2
Single lined - 80-mil HDPE.

C. Leak Detection

1. Evaporation Pond No. 1
 - a. Drainage net between liners.
 - b. Toe drains and underdrains.
 - c. Two collection sumps.
2. Evaporation Pond No. 2
 - a. Toe drains.
 - b. Three collection sumps.

3. Evaporation Ponds No. 1 and No. 2

- a. Weekly inspections of pond dikes and liners.
- b. Weekly inspection of evaporation pond sumps.
- c. Weekly monitoring of pond water levels.
- d. Monthly monitoring of water levels in 24 dike piezometers.
- e. Monthly monitoring of water levels in 24 wells.
- f. Quarterly monitoring of water levels in 64 additional wells.
- g. Quarterly monitoring of 25 inorganic chemical parameters in ponds.
- h. Quarterly monitoring of 25 inorganic chemical parameters in 8 wells.
- i. Annual monitoring of 25 inorganic chemical parameters in 39 additional wells.
- j. Quarterly monitoring of tritium and gamma isotopes in ponds.
- k. Annual monitoring of tritium and gamma isotopes in 10 wells.
- l. Annual reads on 8 neutron soil moisture detectors around ponds.
- m. Annual Dam Safety Report walk down.
- n. Annual survey of 16 pond settlement markers.
- o. Triennial ADWR dam safety inspection..

D. Leak Response

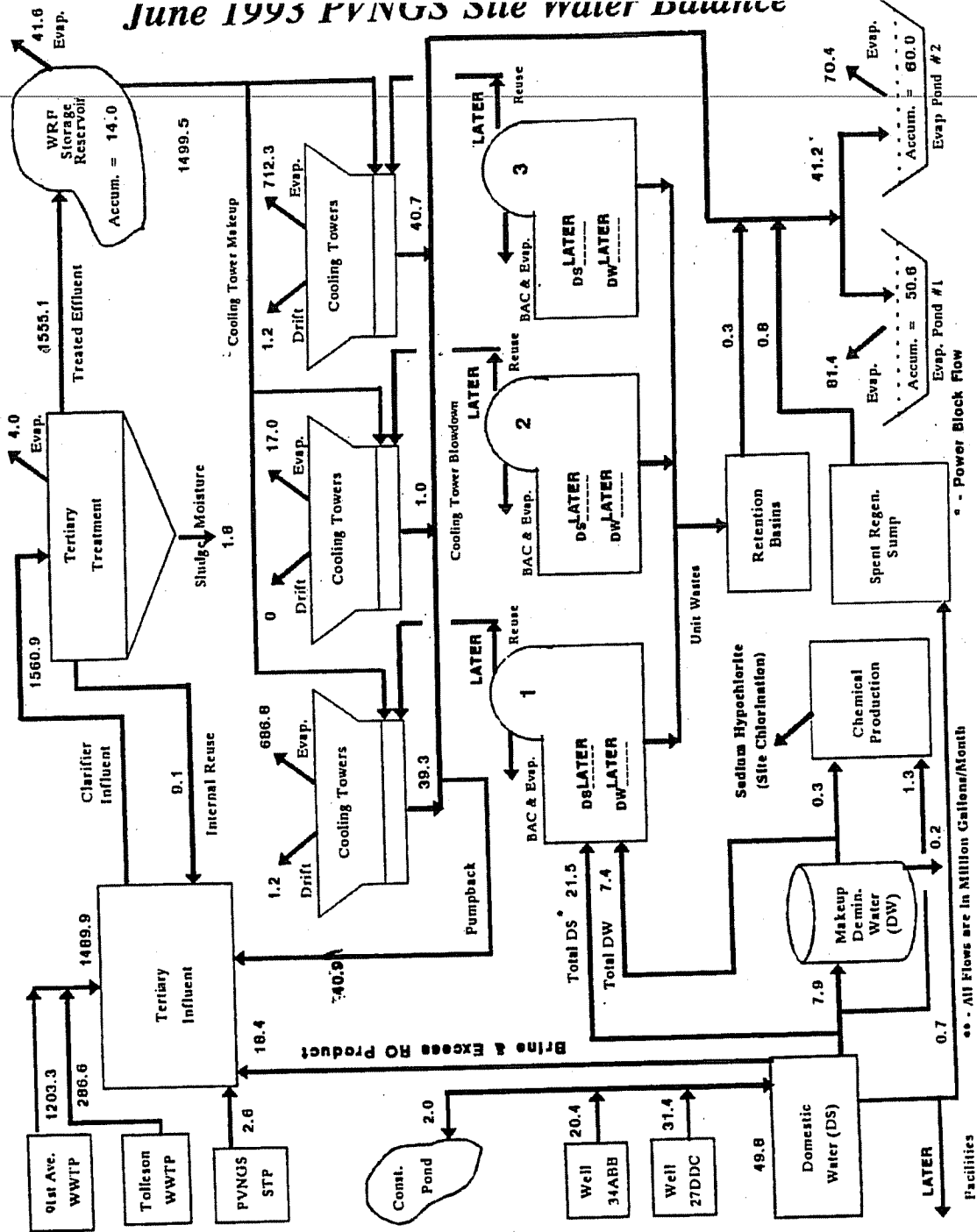
1. Notify Arizona Department of Environmental Quality (ADEQ) within 72 hours of becoming aware of exceeding an alert level.
2. Submit plan for corrective and remedial action to ADEQ within 30 days.
3. Submit contingency plan to ADEQ within 180 days.
4. Water Reclamation Facility maintains fairly equal levels in ponds to allow for emergency transfer of water from one pond to the other.

E. Regulatory Penalties

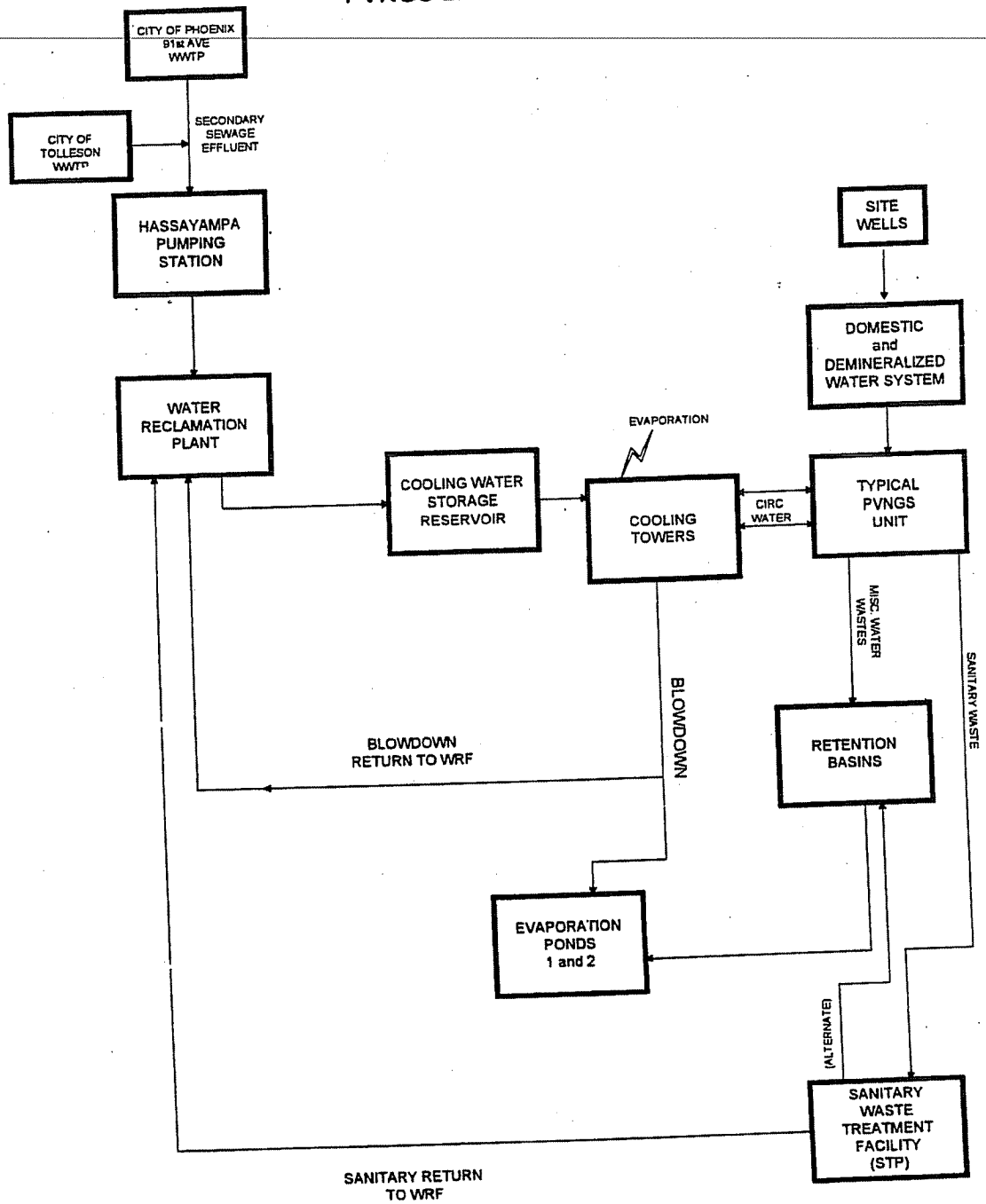
1. Civil penalty of \$25,000.00/day/violation for violating permit conditions or exceeding permit discharge limitations at point of compliance.
2. Alert level not a discharge limitation - current permit has no discharge limit or point of compliance.
3. Aquifer Protection Permit will have discharge limitations and point of compliance.

ATTACHMENT G

EVAPORATION POND DESIGN & GENERAL INFORMATION



PVNGS BASIC FLOW DIAGRAM



VERTICAL SETTLEMENT - EVAPORATION PONDS - 1994

	E-1	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	E-10	E-11	E-12	E-13
JAN	942.0984	942.2179	942.2204	942.4828	942.4238	942.1619	942.3420	941.6378	940.7990	941.2200	940.5056	940.4572	940.5048
FEB	942.0668	942.2123	942.2131	942.4720	942.4299	942.1610	942.3410	941.6000	940.7663	941.2078	940.4881	940.4375	940.4900
MAR	942.0948	942.2175	942.2205	942.4754	942.4322	942.1484	942.3390	941.5638	940.7630	941.2200	940.5044	940.4628	940.4972
APR	942.0781	942.2008	942.2239	942.4754	942.4281	942.1448	942.3355	941.5627	940.7810	941.2029	940.4877	940.4434	940.4874
MAY	942.0990	942.2143	942.2285	942.4884	942.4381	942.1485	942.3376	941.5633	940.7940	941.2255	940.5104	940.4654	940.5028
JUN	942.0915	942.2125	942.2256	942.4854	942.4392	942.1441	942.3335	941.5614	940.7900	941.2182	940.5015	940.4529	940.5048
JUL	942.0880	942.2050	942.2274	942.4787	942.4231	942.1420	942.3325	941.5611	940.7824	941.2140	940.4998	940.4487	940.5048
AUG	942.0995	942.2242	942.2327	942.4818	942.4353	942.1468	942.3381	941.5681	940.7972	941.2229	940.5070	940.4575	940.5119
SEP	942.0978	942.2201	942.2249	942.4790	942.4280	942.1478	942.3349	941.5635	940.7922	941.2211	940.5049	940.4548	940.5072
OCT	942.1021	942.2220	942.2299	942.4778	942.4256	942.1437	942.3371	941.5670	940.7986	941.2284	940.5077	940.4625	940.5028
NOV	NO SETTLEMENT DATA REQUIRED												
DEC	NO SETTLEMENT DATA REQUIRED												

HORIZONTAL MOVEMENT - EVAPORATION PONDS - 1994

	E-1	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	E-10	E-11	E-12	E-13
JAN	N864229.0701	N862639.0408	N861082.5043	N861049.2844	N861184.3842	N862639.1404	N864214.9759	N864228.4764	N864231.2209	N864231.2698	N864231.6698	N863175.0640	N862119.5389
FEB	E211344.8198	E211374.2818	E211362.2868	E209542.1920	E207843.7747	E207709.0588	E207728.8080	E209542.0933	E212551.1292	E213851.1445	E214951.0808	E214774.7208	E214440.8187
MAR	N864229.0709	N862639.0316	N861082.4936	N861049.2879	N861184.4314	N862639.1735	N864214.9779	N864228.4627	N864231.2382	N864231.3176	N864231.7450	N863175.0638	N862119.5424
APR	E211344.8458	E211374.2900	E211362.2843	E209542.1946	E207843.7837	E207709.0905	E207728.8249	E209542.0203	E212551.1073	E213851.0915	E214951.0278	E214774.7211	E214440.8159
MAY	N864229.0709	N862639.0316	N861082.4935	N861049.2878	N861184.4314	N862639.1735	N864214.9779	N864228.4437	N864231.2295	N864231.3175	N864231.7450	N863175.0670	N862119.5385
JUN	E211344.8268	E211374.2873	E211362.2878	E209542.2046	E207843.7837	E207709.0806	E207728.8240	E209542.0246	E212551.1047	E213851.0915	E214951.0278	E214774.7137	E214440.8317
JUL	N864229.0737	N862639.0305	N861082.4839	N861049.2902	N861184.3818	N862639.0872	N864214.9759	N864228.4814	N864231.2048	N864231.2633	N864231.6207	N863175.8138	N862119.4616
AUG	E211344.8301	E211374.2736	E211362.2873	E209542.2011	E207843.7787	E207709.0108	E207728.8226	E209542.0818	E212551.1073	E213851.2017	E214951.1735	E214774.7720	E214440.8623
SEP	N864229.0634	N862639.0403	N861082.5093	N861049.2858	N861184.3848	N862639.0172	N864214.9870	N864228.4688	N864231.2046	N864231.2942	N864231.6213	N863175.8120	N862119.4479
OCT	E211344.8268	E211374.2873	E211362.2878	E209542.1980	E207843.7781	E207709.0914	E207728.8131	E209542.0522	E212551.1073	E213851.1071	E214951.1676	N863175.8120	N862119.4633
NOV	N864229.0680	N862639.0333	N861082.5093	N861049.2813	N861184.4009	N862639.1210	N864214.8852	N864228.4485	N864231.2162	N864231.2930	N864231.6649	E214774.7736	N862119.4633
DEC	E211344.8710	E211374.2703	E211362.2710	E209542.2040	E207843.7796	E207709.0303	E207728.8160	E209542.0872	E212551.1407	E213851.1401	E214951.0900	N863175.8120	N862119.4633
JAN	N864229.0688	N862639.0310	N861082.4925	N861049.2883	N861184.3852	N862639.1102	N864214.9821	N864228.4482	N864231.2124	N864231.2763	N864231.6430	E214774.7508	N862119.4479
FEB	E211344.8811	E211374.2689	E211362.2851	E209542.1972	E207843.7810	E207709.0101	E207728.8100	E209542.0418	E212551.1614	E213851.1554	E214951.1252	N863175.8120	N862119.4479
MAR	N864229.0534	N862639.0303	N861082.4926	N861049.2858	N861184.3820	N862639.0857	N864214.8597	N864228.4478	N864231.2073	N864231.2889	N864231.6213	E214774.7736	N862119.4633
APR	E211344.8711	E211374.2678	E211362.2852	E209542.1990	E207843.7798	E207709.0907	E207728.8199	E209542.0565	E212551.1777	E213851.1921	E214951.1676	N863175.8120	N862119.4633
MAY	N864229.0624	N862639.0300	N861082.4925	N861049.2862	N861184.3842	N862639.1276	N864214.9904	N864228.4680	N864231.2224	N864231.2936	N864231.6787	E214774.7736	N862119.4633
JUN	E211344.8803	E211374.2684	E211362.2848	E209542.2011	E207843.7747	E207709.0594	E207728.8530	E209542.0779	E212551.1293	E213851.1293	E214951.0901	N863175.8120	N862119.4633
JUL	N864229.0624	N862639.0300	N861082.4925	N861049.2823	N861184.3828	N862639.1248	N864214.8941	N864228.4625	N864231.2224	N864231.3001	N864231.6828	E214774.7736	N862119.4633
AUG	E211344.8800	E211374.2684	E211362.2848	E209542.1986	E207843.7796	E207709.0428	E207728.8496	E209542.0757	E212551.1293	E213851.1312	E214951.0933	N863175.8120	N862119.4633
SEP	NO SETTLEMENT DATA REQUIRED												
OCT	NO SETTLEMENT DATA REQUIRED												
NOV	NO SETTLEMENT DATA REQUIRED												
DEC	NO SETTLEMENT DATA REQUIRED												

WATER LEVEL - EVAPORATION PONDS - 1994

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN 31 '95
POND #1	929.07	928.41	928.6	929.62	929.83	929.38	929.56	929.97	930.64	930.26	929.88	931.14	931.63
POND #2	921.73	921	921.41	920.64	920.37	919.84	919.55	918.61	918.22	918.83	919.71	920.29	921.13

Retention Basin Discharge Log

Date	Basin No.	Gallons Discharged	Date	Basin No.	Gallons Discharged
9-28-94	2	322,982	12-6-94	1	333,669
9-29-94	1	332,634	12-9-94	2	361,326
5,746,985	10-1-94	251,400	12-13-94	1	319,729
10-2-94	1	258,300	12-14-94	2	300,163
10-4-94	2	305,915	12-17-94	1	347,511
10-5-94	1	249,533	12-20-94	2	347,511
10-7-94	2	344,509	12-22-94	1	305,900
10-9-94	1	361,359	12-24-94	2	361,359
10-11-94	2	302,874	12-26-94	1	323,615
10-13-94	1	361,359	12-28-94	2	263,172
10-16-94	2	367,544	12-31-94	1	331,669
10-18-94	1	316,794	1-2-95	2	319,696
10-20-94	2	355,312	1-4-95	1	319,700
10-22-94	1	331,669	1-6-95	2	361,359
10-25-94	2	346,600	1-8-95	1	319,733
4,552,466	10-27-94	399,303	1-11-95	2	365,326
11-5-94	1	249,353	1-13-95	1	319,729
11-6-94	2	361,359	1-16-95	2	319,700
11-11-94	1	331,639	1-18-95	1	319,696
11-13-94	2	347,544	1-20-95	2	319,696
11-18-94	1	319,729	1-23-95	1	344,509
11-21-94	2	316,814	1-25-95	2	315,314
11-25-94	1	360,829	1-27-95	1	331,733
2703425	11-29-94	416,158	1-29-95	2	319,729
12-2-94	1	319,733	2-1-95	1	361,326
12-11-94	2	277,400	2-3-95	2	319,700

Note: - Notify WCR of Basin #, and total gallons discharged so they can contact Unit 2 Chem Lab.

- Calculate total gallons discharged at the end of each month and forward to Jim Cutler.

Retention Basin Discharge Log

Date	Basin No.	Gallons Discharged	Date	Basin No.	Gallons Discharged
2/6/95	1	389,805			
2-7-95	2	319,729			

- Note:** - Notify WCR of Basin #, and total gallons discharged so they can contact Unit 2 Chem Lab.
- Calculate total gallons discharged at the end of each month and forward to Jim Cutler.

CR7

1689

SWBAL.XLS

J. Cutler 2/8/95 10:30 AM

1,000 gphm EC pump.
 3-4 gpm brine
 Run every 3 day

	BO	BP	BQ
77	RETENTION	SRS	
78	BASIN	Total	
79			
80		6,379,018	August 31
81		6,097,485	August 1
82	5,020,708	2,815,330	August 1994
83			
84			
85			September 30
86			September 1
87	5,746,985	3,000,000	September 1994
88			
89			
90			October 31
91			October 1
92	4,552,466	1,122,340	October 1994
93			
94			
95		6,508,205	November 30
96		6,491,252	November 1
97	5,000,000	169,530	November 1994
98	ASSUMED		
99			
100		6,602,733	December 31
101		6,508,205	December 1
102	4,192,757	945,280	December 1994
103			

Evap Pond
Influent
✓(gals)

SWBAL.XLS

J. Cutler 2/18/95 8:20 AM

	BQ	BR	BS	BT	BU	BV	BW
58							
59	May 31		929.63	920.37	10,939,486	9,263,674	3,417.84
60	May 1		929.62	920.84			3,415.33
61	May 1994	39,017,924	0.01	-0.27			2.51
62							
63							
64		Evap Pond Influent	Water Level E.P. # 1	Water Level E.P. # 2	Surface Area E.P. No. 1	Surface Area E.P. No. 2	Stored Vol E.P. No. 1
65							
66			929.39	919.84	10,931,512	9,283,129	3,357.59
67	June 30		929.63	920.37			3,417.84
68	June 1		-0.24	-0.53			-60.25
69	June 1994	38,297,334					
70							
71							
72	July 31		929.56	919.55	10,937,161	9,293,776	3,400.27
73	July 1		929.39	919.84			3,357.59
74	July 1994	77,279,402	0.17	-0.29			42.68
75							
76		36					
77		Evap Pond Influent	Water Level E.P. # 1	Water Level E.P. # 2	Surface Area E.P. No. 1	Surface Area E.P. No. 2	Stored Vol E.P. No. 1
78							
79		(Gallons)					
80	August 31		929.97	918.61	10,950,783	9,328,280	3,503.19
81	August 1		929.56	919.55			3,400.27
82	August 1994	99,860,048	0.41	-0.94			102.92
83							
84							
85	September 30		930.64	918.22	10,973,045	9,211,916	3,671.38
86	September 1		929.97	918.61			3,503.19
87	September 1994	84,778,223	0.67	-0.39			168.19
88							
89							
90	October 31		930.29	918.83	10,961,416	9,234,308	3,583.52
91	October 1		930.64	918.22			3,671.38

*Evap Pond
INFURTC
(94)*

SWBAL.XLS

J. Cutler 2/18/95 8:20 AM

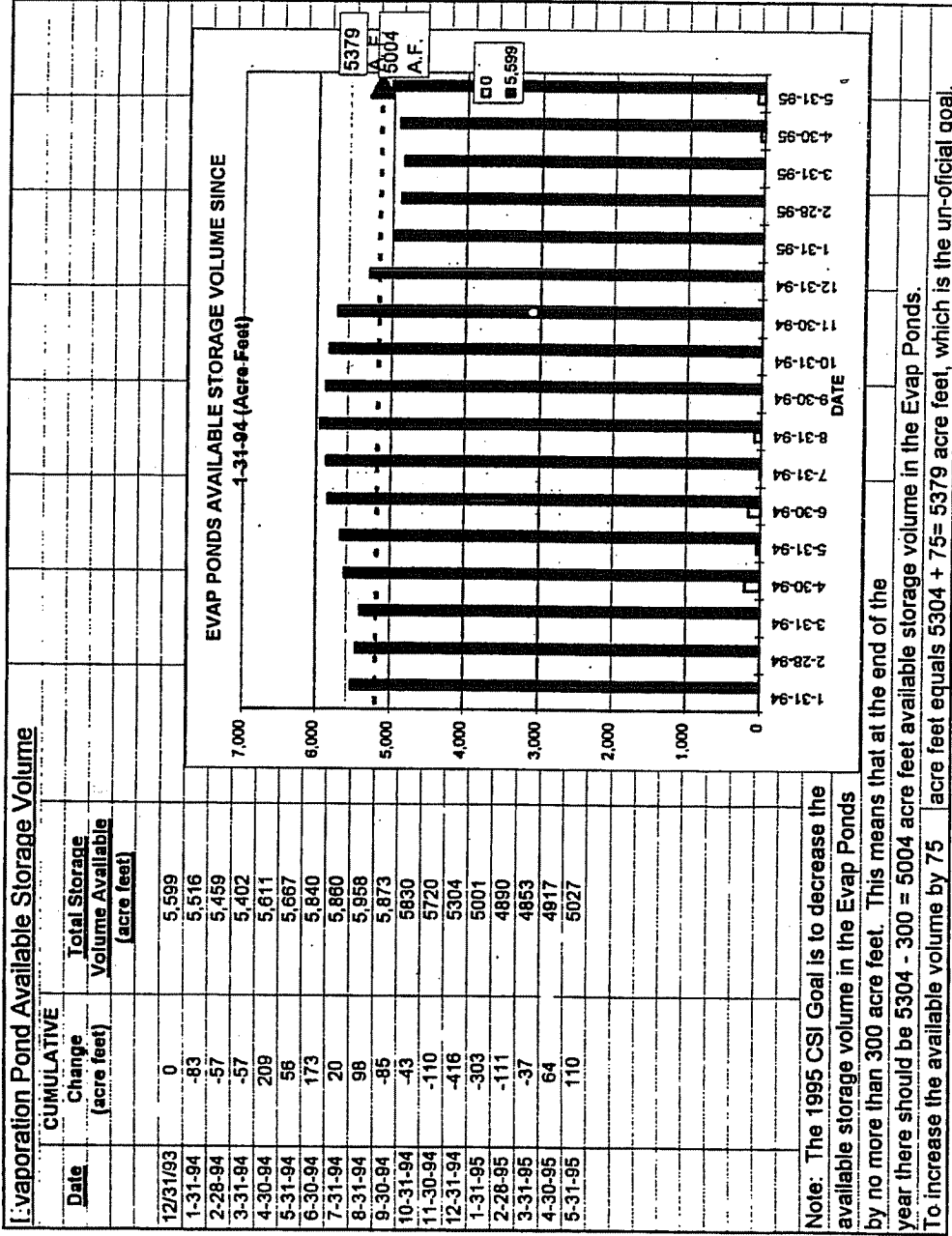
	BQ	BR	BS	BT	BU	BV	BW
92	October 1994	84,541,357	-0.35	0.61			-87.86
93							
94							
95	November 30		929.98	919.71	10,951,115	9,266,611	3,505.70
96	November 1		930.29	918.83			3,583.52
97	November 1994	128,423,500	-0.31	0.88			-77.82
98							
99							
100	December 31		931.14	920.29	10,995,664	9,287,901	3,797.52
101	December 1		929.98	919.71			3,505.70
102	December 1994	120,875,526	1.16	0.58			291.82
103							
104							

PKK
FYI
Jim

SWBAL.XLS

J. Cutler 6/13/95 3:47 PM

	BQ	BR	BS	BT	BU	BV	BW
		Evap Pond Influent	Water Level E.P. # 1	Water Level E.P. # 2	Surface Area E.P. No. 1	Surface Area E.P. No. 2	Stored Vol E.P. No. 1
107							
108							
109							
110							
111	January 31		931.63	921.13	11,014,527	9,318,736	3,921.37
112	January 1		931.14	920.29			3,797.52
113	January 1995	98,601,117	0.49	0.84			123.84
114							
115							
116	February 28		931.16	922.21	10,996,434	9,358,381	3,802.58
117	February 1		931.63	921.13			3,921.37
118	February 1995	65,766,374	-0.47	1.08			-118.79
119							
120							
121	March 31		930.39	923.27	10,966,793	9,397,291	3,608.78
122	March 1		931.16	922.21			3,802.58
123	March 1995	62,975,722	-0.77	1.06			-193.80
124							
125							
126	April 30		929.89	923.56	10,948,125	9,407,936	3,483.07
127	April 1		930.39	923.27			3,608.78
128	April 1995	64,551,399	-0.50	0.29			-125.71
129							
130							
131	May 31		929.27	923.77	10,927,525	9,415,645	3,327.20
132	May 1		929.89	923.56			3,483.07
133	May 1995	70,114,554	-0.62	0.21			-155.87
134							
135							



CHEMISTRY CHANGES THAT MIGHT EFFECT EVAP PONDS

1)The units have switched back to using ammonia in the secondary system form ethanolamine. This change began to take place during the summer of 1995.

2) Unit 1 is testing the use of Ammonia Sulfate to aide in resin separation (deplete resin prior to regeneration). This change if used at all 3 units will introduce another 1 million pounds per year into the secondary system. Some of which will reach the evap ponds.

2.3.2 Perched System

The PVNGS site is located in an area that was historically used for irrigated agriculture between 1950 and 1975. Groundwater recharge, primarily from excess applied irrigation water, formed a perched groundwater mound under the site. The perched groundwater is primarily contained within the Upper Alluvial Unit (LZ-5) and has a lower boundary consisting of an aquitard, the Middle Fine-Grained Unit. Available data suggest the aquitard is continuous under the entire site area. Though the upper portion of the Middle Fine-Grained Unit is saturated by downward flow from the Upper Alluvial Unit, it is not considered part of the perched system because of its very low relative permeability. The estimated vertical hydraulic conductivity for the Middle Fine-Grained Unit based on laboratory tests is on the order of 0.001 gallons per day per square foot (gpd/ft²) (5×10^{-3} centimeters per second (cm/sec)).

Water contained in the perched system is generally under water table conditions and is limited mainly to the site property where it is mounded beneath areas which were formerly cultivated and irrigated fields.

2.4 Monitored Facilities

2.4.1 Water Storage Reservoir

The water storage reservoir is located on the northeast portion of the site (Figure 1). The reservoir, which stores treated wastewater effluent, provides the plant's cooling water supply. The bottom of the reservoir is lined with a rubberized asphalt compound and the sides are lined with Hypalon™. The reservoir has a surface area of 80 acres and stores approximately 2,000 acre-feet of water.

2.4.2 Evaporation Pond No. 1

PVNGS Evaporation Pond No. 1 is located on the southern portion of the site (Figure 1). It was constructed in 1981 and put into service in 1984. The pond is designed to impound blowdown water from the circulating water system and wastewater from the water reclamation plant and other miscellaneous water sources. The pond surface area is approximately 250 acres and the storage capacity is approximately 5,500 acre-feet. The bottom of pond No. 1 varies in elevation from approximately 914 to 921 feet above mean sea level. The elevation of the top of the earth fill embankment is approximately 942 feet.

The pond bottom and side liner were upgraded during the third and fourth quarters of 1991 and first and second quarters of 1992. The liner upgrade activities, completed March 17, 1992, were outlined in correspondence from Mr. Ronald J. Stevens (APS) to Mr. Ed Pond with the ADEQ, dated November 30, 1992. The liner upgrade activities were also described in the 1991 APS Palo Verde Nuclear Generating Station Annual groundwater Report, Volume I (Groundwater Quality Protection Permit No. G-0077-07).

As part of the relining operation for Evaporation Pond No. 1, conducted in 1991-92, a sump and drainage system was installed. The pond bottom and side liner upgrades were outlined in correspondence from Mr. Ronald J. Stevens (APS) to Mr. Ed Pond with the ADEQ, dated November 30, 1992. The sumps (located in the southeast and southwest corners of Evaporation Pond No. 1) collect water from the drainage system installed in the layer between the old liner and the new high-density polyethylene (HDPE) liner. These sumps are monitored for water accumulation weekly. The drainage system consists of six inflow lines into each sump from different areas under the pond, thus allowing the determination of the specific location of a leak. A pumpback system allows any water that accumulates in the sump to be pumped into the pond.

2.4.3 Evaporation Pond No. 2

Evaporation Pond No. 2 was constructed during 1987 and became operational in early 1988 (Figure 1). Pond No. 2 is constructed similarly to pond No. 1 and serves similar functions. The bottom and interior side slopes of pond No. 2 are lined with 80-mil HDPE liner material. The west embankment of pond No. 2 is the east bank of pond No. 1. The other embankments on the east, north and south sides of pond No. 2 form an enclosure of approximately 220 acres. Storage capacity is approximately 5,900 acre-feet. The elevation of the top of the embankment of pond No. 2 is approximately 941 feet. The elevation of the bottom of pond No. 2 varies from approximately 916.5 feet on the north end to approximately 904.5 feet on the south. The bottom of the pond lies approximately 5 to 12 feet below the original ground level.

2.4.4 Sedimentation Basin No. 1

Sedimentation Basin No. 1 is located immediately north of Evaporation Pond No. 1 in the west-central portion of the site. This basin is an unlined, 15-acre surface impoundment which contains runoff from rainfall events. Monitoring of pond water levels on a weekly basis began in 1993, and values will be reported on an annual basis.

2.4.5 Sedimentation Basin No. 2

Sedimentation Basin No. 2 is located immediately north of Evaporation Pond No. 2 in the east-central portion of the site. The basin is an unlined, 60-acre surface impoundment which contains runoff from rainfall events. Weekly pond water level monitoring began in 1993, and values will be reported annually.

2.4.6 Additional Monitored Facilities

Additional monitored facilities include two gunite-lined retention basins, the sludge disposal landfill, the rubbish landfill, and the concrete landfill.

2.3 VISUAL INSPECTION

A visual inspection made on March 9, 1995, revealed no indication that the evaporation pond in its entirety was undergoing any type of distress. The following components of the evaporation pond were inspected and found to be in satisfactory condition:

POND # 1

* Maximum storage during year	3797.5 Acre ft. (Approx.)
* Maximum depth of stored water during year at the deepest part of the pond	21.26 ft. (Approx.)
* Minimum storage during year	3358.0 Acre ft. (Approx.)
* Minimum depth of stored water during year at the shallowest part of the pond	18.81 ft. (Approx.)

There leakage of water detected through the Evaporation Pond liner did not exceed the allowable leak rate. *

SPILLWAY

There is no spillway on this evaporation pond. The water elevation in this pond is maintained by controlling the amount of water that flows into this pond, and the minimum free board is always maintained.

FOUNDATIONS

Foundations

There is no evidence of weathering, disintegration, or other changes in the physical or chemical composition of foundations. The foundation material consisted of moderately to poorly graded silty and gravelly sands with lenses of clay and sandy silts.

Leakage and Seepage

The inside slopes of the pond are lined with an 80 mil thick HDPE primary liner which is underlain with a geonet and a combination of Hypalon and 30 mil HDPE. The geonet terminates at a toe trench which surrounds the entire pond to convey any leakage to one of two sumps located at the southeast and southwest corners of the pond.

3.0 EVAPORATION POND # 2

3.1 GENERAL

Evaporation Pond # 2 is also a reservoir for containing blowdown water from the plant circulating water system, wastewater from the Water Reclamation Facility. The pond was constructed in 1987 and put into service in 1988. The pond is trapezoidal in shape and has a nominal surface area of 220 acres with approximate dimensions between dike center lines of 3200 feet by 3180 feet. The embankment height ranges from 24 to 36 feet, with interior slopes of 3 (horizontal) to 1 (vertical), or 3H:1V, and exterior slopes of 2.5H:1V except for the north dike which is also 3H:1V. The bottom of the pond slopes approximately 12 feet from north to south. The pond is lined with a 80 mil thick High Density Polyethylene (HDPE) liner on the sides and bottom.

3.2 OPERATING CONDITIONS

The evaporation ponds received a maximum 1994 monthly flow of approximately 2700 gallons per minute of blowdown water and waste water from the units. This occurred during the month of December.

Water elevation in the pond is presented in Appendix B. The evaporation pond operated satisfactorily for the storage of blowdown water and waste water from the plant during the year.

3.3 VISUAL INSPECTION

A visual inspection made on March 9, 1995 revealed no indication that the evaporation pond in its entirety was undergoing any type of distress. The following components of the evaporation pond were inspected and found to be in satisfactory condition:

POND # 2

* Maximum storage during year	2302 Acre ft. (Approx.)
* Maximum depth of stored water during year at the deepest part of the pond	19.55 ft. (Approx.)
* Minimum storage during year	1551 Acre ft. (Approx.)
* Minimum depth of stored water during year at the shallowest part of the pond	4.31 ft. (Approx.)

There was no leakage of water detected through the High Density Polyethelene liner.

6-14-95

ID# 422-00308-JAZ

16

Tom, New levels (minimum)

DATE: April 11, 1995

#1 = 925' #2 = 922'

TO: Mark Yarbrough, WRF Section Leader
Sta.#: 6215
Ext.: 82-3095

Wm

FROM: Jihad Zaghloul, Design Basis Project Section Leader
Sta # 7641
Ext 82-5077

Jihad A. Zaghloul

FILE

SUBJECT: Evaporation Pond Administrative Controls

Reference: J. Zaghloul to J. Hesser, "Evaporation Pond Calculation Assumptions". APS Memorandum 422-00281-JAZ/AK dated January 6, 1995

The referenced document listed a number of assumptions which were used in the radiological evaluation of the evaporation pond and should be incorporated into plant procedures. The purpose of this memorandum is to identify the plant procedures and indicate whether the necessary information has been incorporated.

Minimum Evaporation Pond Water Level

Evaporation pond radionuclide concentrations used in radiological analyses are based on a minimum water volume for Evaporation Pond 1 which corresponds to a pond water level of 925'-0". The equivalent volume for Pond 2 corresponds to a minimum pond water level of 922'-0". Minimum pond water levels are presented in Sections 3.10 and 5.9 of PVNGS Procedure WROP-8CM01, "Chemical Waste and Oily Waste Operations Procedure", Revision 0.3. Minimum water levels of 925.0 ft. and 918.0 ft. are specified for Evaporation Ponds 1 and 2 respectively. Evaporation Pond 2 minimum water level is below the value reflective of the radiological evaluation. It is required that Procedure WROP-8CM01 be revised to incorporate the minimum water level of 922.0 ft. for Evaporation Pond 2. Sections of Procedure WROP-8CM01 displaying the proposed changes are included with the attached Instruction Change Request (ICR).

Radionuclide Concentration Limits for Discharge to Evaporation Pond

The PVNGS Offsite Dose Calculation Manual (ODCM) was revised (Revision 9) to incorporate radionuclide concentration limits in discharge to the evaporation pond which were used in the radiological evaluation analyses. Section 3.13 of PVNGS Procedure 74AC-9CY04, "System Chemistry Specification", has been revised to reflect the new ODCM concentration limits.

Evaporation Pond Concentration Limits

The evaporation pond radionuclide concentrations are limited to 1% of 10CFR20 MPC concentration limits for water in an unrestricted area. Action/reporting level radionuclide concentrations in environmental water samples are established in Appendix B of PVNGS Procedure 74RM-0EN09, "Quarterly Radiological Environmental Sample Analysis Verification", Revision 1. The action/reporting level concentrations are less than 1% of 10CFR20 MPC concentration limits. If the concentration of a single nuclide exceeds the action/reporting level value, or if the sum of the fractional concentrations for all nuclides exceeds 1.0, a CRDR is required.

PVNGS procedures have been updated to incorporate radionuclide concentration limits in water discharges to the evaporation pond and evaporation pond radionuclide concentration limits in accordance with those used in the radiological evaluations. The minimum water level of Evaporation Pond 1 in PVNGS Procedure WROP-8CM01 reflects the value used in the radiological analysis; however, this is not the case for Evaporation Pond 2 minimum water level. PVNGS Procedure WROP-8CM01 must be revised to reflect the necessary minimum water level value for Evaporation Pond 2.

In order to track closure of this issue, please provide a memo confirming that procedure WROP-8CM01 has been revised to incorporate the minimum water level of 922.0 ft. for Evaporation Pond 2.

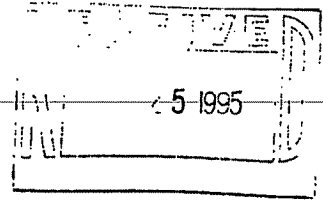
JAZ/AK:lo

cc: J. Hesser 7546
J. Cutler 6215
H. Riley 7641
M. Karbassian 7548
T. Murphy 7936
H. Morazavi 7548
R. Sorensen 7936
A. Klazura 7641

	<u>Minimum Water Levels</u>	
	<u>E1^{#1}</u>	<u>E1^{#2}</u>
Current Criteria	925.00	918.00
This letter	925.00	922.00

APS

Arizona Public Service Company
COMPANY CORRESPONDENCE



ID #: 277-00371-RDS
DATE: 19 April 1995

TO: File
Sta. #:
Ext:

FROM: R. D. Sorensen
Sta. #: 7936
Ext.: 82-6398

FILE: 95-001-419.5
SUBJECT: Evaporation Pond Dike Failure, Calculation 13-NC-ZY-254

Reference: 10CFR50.59 Evaluation Log # 95-00006; Chemistry Level 1 RDS/09

The purpose of calculation 13-NC-ZY-254 was to evaluate the consequences of an evaporation pond dike failure. This calculation concluded that wells in the area flooded by the dike break may be contaminated by intrusion of water through the top of the well, allowing the contamination to enter the regional aquifer directly. Since this calculation did not evaluate the radiological impact of this possible contamination, PVNGS must remain within the original acceptance criteria stated in the PVNGS SER (NUREG 0857, 1981). In the SER, the NRC concluded that "all nuclide concentrations would be smaller than one percent of the 10CFR20 requirements at the site boundary." This criteria was our basis for limiting radioactive material in the evaporation ponds to <1% of 10CFR20.1-20.601, Appendix B concentration limits, since if the evaporation pond dike failed, the contents would reach the site boundary.

The Offsite Dose Calculation Manual (ODCM), Rev. 9, Table 6-2, Reporting Levels, reflects the 1% of 10CFR20, Appendix B, concentration limits. These values were administratively reduced by 40% in 74RM-0EN09, Quarterly Radiological Environmental Sample Analysis Verification, Rev 1, Appendix B. These administrative limits (60% of the 1% of 10CFR20 values) are called Action/Reporting Levels and are based upon quarterly average values. 74RM-0EN09 requires that a CRDR be written if Action/Reporting Levels are exceeded in the evaporation ponds, and it requires that the CRDR shall address the following items:

1. Determine if the reporting levels listed in the ODCM Table 6-2 were exceeded (1% of 10CFR20).
2. If necessary, prescribe corrective actions needed to ensure reporting levels in ODCM Table 6-2 are not exceeded.
3. Determine if radioactivity is due to plant effluents.
4. Determine the origin of the radioactivity.

The reason for the 60% administrative limits was the concern that if radioactivity in the evaporation ponds exceeds 1% of 10CFR20, Appendix B concentrations (ODCM Table 6-2 values), we are in a potentially unreviewed safety question situation since we are outside the accident analysis stated in the UFSAR, Section 15.7.3, "Postulated Radioactive Releases Due To Liquid-Containing Tank Failures." The Action/Reporting Levels ensure that we are alerted and take action long before we would ever approach the 1% of 10CFR20 limits.

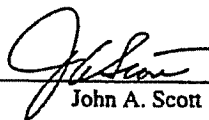
We see two options:

1. Revise 74RM-OEN09 to state that the CRDR required when the Action/Reporting Levels are exceeded shall also acknowledge that we are approaching a potentially unreviewed safety question condition, and a decision is to be made at that time whether or not to perform the calculations in #2 below.
2. Perform calculations now to evaluate the consequences of flooding the wells and revise the UFSAR accident analysis as necessary so that in the unlikely event that the evaporation pond concentration exceeds 1% of 10CFR20, Appendix B concentrations (ODCM Table 6-2 values), we would not have a potentially unreviewed safety question.

The chances of the evaporation ponds ever exceeding 1% of 10CFR20, Appendix B concentrations (ODCM Table 6-2 values) are fairly remote. The decision we need to make is: do we expend resources now to evaluate the consequences of this unlikely occurrence, or do we wait until we exceed 60% of the allowable limits at some possible time in the future (which may not ever happen) before we spend the resources to do the evaluation? (The cost to perform the calculations and analysis by Design Engineering are unknown but could be considerable.)

We recommend the first option based upon cost versus risk, and we will proceed with the procedural changes described above which will establish the additional controls.

Concurrence:


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