CEER-A-067

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CEER - A67

CENTER FOR ENERGY AND ENVIRONMENT RESEARCH

NORTH WEST COAST POWER PLANT

QUALITY ASSURANCE MANUAL

Fepruary 1980

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[NORTH WEST COAST POWER PLANT

?QUALITY ASSURANCE MANUAL,

February 1980

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?CENTER FOR ENERGY AND ENVIRONMENT RESEARCH

NORTH WEST COAST POWER PLANT

QUALITY ASSURANCE MANUAL

Sciences Section?

Hl. Ty Be Rosso

REVISION APPROVAL

Toad, Environmental Date quality Assurance Date

Sciences Section

ead, Environmental vate ??wraliey Rewaranee Date

Setences Section

Wead, Environmental Date quality Aeaurance Date

Sciences Section

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I. Organization

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Quality Aseurance Guide ~ Task Procedures

Thermal/Chenical Tolerance

Benthic Studies

ater Quality / ?ydrotogy

ankton / Fish Studies

Terrestrial Ecology - Vegetation & Fauna

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GEER Audit Program Plan

I. Specific Activities to be Audited:

IZ. Abdie Program Plan Documents.

Audit Check List

T. Sample Check List:

quality Assurance Menoranda-

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NORTH WEST COAST PROJECT QUALITY ASSURANCE PROGRAM

Organization

?The organization of the CEER / North West Coast (SCO) Project group consists of the project office, including the project leader and a snail administrative staff, a snail logistics action group which handless field operations on shore and at sea, and a nusber of scientific functional units, each led by a qualified scientist vho 4s specifically trained and experienced in the portion of the

setentific investigation which he directs. Within the scientific

units are sore junior scientists and assistants, all of whom have

sone training and/or experience in scientific work. Each leader of

fan individual scientific unit has responsibility for detailed plan-
ning of the investigations that fall within his area of expertise,

for scheduling the appropriate field and laboratory activities and

directing the efforts of his people tovard accomplishing the research.
ALL CEER scientific unit leaders are field experienced and routinely
Participate in field work ay well as in laboratory work.

?The organigran of Figure I depicts the project organization
and identifies certain key people, including the leader of scientific
units.

The Quality Assurance Program will be directed by a Q. A.
Supervisor reporting to the Head, Environmental Sciences Section.

?The Q. A. Supervisor will audit che various research activities of

---Page Break---

Center for Energy ond Environment Research

Puerto Rico Electric Power Authority North West Coast

(NWCO? Project

Wend, tavivonmental

Sciences Section

Lt. Tiny

Mead, Marine Booloay

2 pes tg

Project Project Manager ?quality

cnier Selentise Rody Zimmerman Assurance

RJ. Zamerman (acting) Ri Rosso,

T

Marine Terrestrial

Ecology Ecoloay

Thermal / Chenieal

1 Quaticy/iydrology

2.3. Zimmerman et) 3M. Uspex (PD) Fauna

pf Sanders Sharboe D. Reagan (1

Py) ese 5! deta Rosa

i 5. eapelia

1 [/ seoente stecies laniton/Fish Studies

i

¥. Vicente (1) i

|. Yoshioka (PL)

Buceanse Oven

Garela Garcia

Direction ond Coordination

avait

(PI) Prineipol tnvesti

Quality Assuronce Program Implementation

Orgenigram For NWCO Project

Fed 20, 1900

siomirea Lhasa Lorem sorte aot en

---Page Break---

the MWCO Project and submit monthly reports to the Director, CHER and

to the Hea, Fnvironmental Sciences Section as outlined in "CEER

Audit Program Plan."

TL. Quality Assurance Program

?The primary function of the CEER Quality Assurance Program will

be to ensure management attention to key elements of the PREPA

Progra for environsental investigations for Power Plant siting at

MWCO, The "CER Audit Program Plan? serves as a "Q. A. Manual? for

arch contract. This function will be carried out by means

of a CEER audit program according to an audit progran plan which will:

1, Identify the individual responsible for the audits

2. Provide for a monthly audit

3. List all activities oubject to audit and identify specific

ies to be audited in any one month

4, Describe methods to obtain corrective actions on findings

5. Specify documentation and reporting requirenents

III. Design control

?The CEER Quality Assurance Program is designed to insure that

scientific research york, the schedule for performing the various

sections of the work and preparation of reports shall accomplish the

objectives of the PREPA Program for environmental investigations.

?The specific research tasks and the methods to accomplish then are

---Page Break---

outlined in the Specifications for General Performance Requirements

(4) provided by the PREPA.

TV. Gontrot of Documents, Records and Reports

The leader of each scientific unit in the project is reponsible for the proper use of the necessary forms, data sheets, log books and other records to fulfill the needs for scheduling and for recording of eld trips, samples collected and processed, data taken in the field and taken from field material when processed in the laboratory. The records shall include date, time and location for each sample or measurenent. where appropriate, depth will be record~

ed. Field notes, adequately identified to permit keying to data and

wmples, vill contain other relevant information such as description

of the site, current conditions such as weather, etc.

The watues of the eecorés shall de tailored to the kind of material treated, the type of measurements and methods of sampling and Inboratory handling of materials and data. In all cases they shall be such chat the leader of the scientific unit can determine pon what raw data all final results are based, i.e. what the raw data values were, and when, where and how they were taken. The rav data values shall be preserved for the Life of the contract, and final disposition shall be determined in conjunction with PREPA, ?The leader of such scientific unit is also responsible for

controlling the labelling, storage, and handling of his sample

---Page Break---

naterial from original collection until all data have been extracted

from it and recorced. ?The system used shall be consistent with the rest of his record system and shall permit accomplishnent of the stated objectives of identification,

The project leader, assisted by the project office staff, is

Fesponsible for assenbling data and total scientific contributions

from all the functional units into the necessary reports to meet the

project schedule.

vy

Project instruction

All Leaders of scientific units receive the basic documents

which provide guidelines for objectives and methods of the investi-

gation and formats for obtaining and presenting results, e.g.1

1. Specification for General Performance Requireaents for

Aquatic Baseline Studies for Puerto Kico Electric Pover

Auchoriey, (PREPAY.

2. Specification for General Performance Requirenents for

Terrestrial Ecological Investigation and Analysis for

PREPA.

3+ Specification for General Performance Requirenents for

?Thermal and Chesical Tolerance Studies for PREPA.

4. Specification for General Performance Requirenents for

Tides and Currents fydrological Data Collection for

PREPA.

---Page Break---

5. North West Coast (SCO) Project Quality Assurance Manual

Utem (1), (2), (3) and (4) constitute che prime standard for

the research progr:

Copies of repores genet

Led by the project office are distei?

buted to all interested unit leaders.

Contracts

ipecified schedule dates for reporting are the accept-

wndard for preparation and submission of dat

by scientific

units, with allowance for final preparation time in the project

office. In addition, the project office keeps unit leaders abreast

of dates relevant to their individual functions. Earlier reporting

fs done wher data in available.

General operating procedures regarding logistics, communication,

safety, etc. are distributed as the need arises by meno from the

prosjct office to ali unit leaders. Information and discussion

eet ings for sli project scientiats are held at appropriate points in

the progress of the work.

Prog:

VI. Control of Equipment

?The functional unit leader is reponsible for keeping up with the whereabouts and condition of his eqvipaent, giving ie proper care and having repairs, servicing and calibration done when necessary.

Where calibration or standardization of measuring equipment scan be done satisfactorily by unit personnel, the unit leader

insures that such check procedures are accomplished at the proper

---Page Break---

fines and provides the necessary instructions to the people who per~ form the checks. shiere the calibration or standardization procedures is beyond the capabilities of unit personel and facilities, the unit leader establishes an appropriate schedule based on manufacturer Literature, operating experience, etc. The unit leader is responsible for making the necessary arrangements and insuring that the checks

are made on this schedule or at any other tine when a discrepancy

in operation is suspected.

VI, Measuring and Test Equipment Reco

A record of all equipment supplying quantitative data inputs

te the BVCO Program will be set-up, These records will include the

serial number of each piece of equipment, field and offasite

calibration methods, records of calibration, and other pertinent

data on the equipment. The unit Leader will keep these records

up-to-date to insure that data

e produced by calibrated equipment.

VIII. Audits

?The individual responsible for the audit program will assure

that an auditor will review a specified part of the list of activities

to be audited, together with additional itens such as suspected

weaknesses or follow-up on previous findings. Where possible, the

auditor will not be responsible for work in the area being audited.

The auditor will prepare an audit check list for his own use during

---Page Break---

the audit. In all cases, the auditor will arrange the audit to

minimize discruption of work in progress. An audit will be conduct

ed once each month.

Conducting the Audit - the auditor vill use the check list as

4 guide during the audie, bur will not Limit his review to the

specific points Listed. For example, in reviewing sample data, the

auditor may find data that is inconsistent; this may lead to questions

on instrumentation. the auditor may obtain information by review

Of documents, by discussions with personnel, and by direct observation

Of activities, Again, the audit will be conducted to minimize

interfernece with work in progress. Imediately following the audit,

the auditor will review vith cognizant CEER individuals the findings

land recommendations resulting from the audit.

Documentation - each audit by CEER will be reported in a brief,

concise audit report. This report will:

1, Identify areas covered by the audit

2. Repore findings in each area

3. Recommend action, if any, to be taken on findings, and

4, Report understandings reached during the audit and

subsequent review regarding any intended corrective action.

Schedule - while the primary function of the audit program is

to ensure proper technical control, audits may identify schedular

problems. Also, constructive audits will define areas where progress

can be inproved. Review of audits by senior CER scientists should

include consideration of progress and schedules.

---Page Break---

Scientific peer review - The scientific data generated by the

environmental study are subjected to critical review by other

seientists in the appropriate disciplines.

Tre Q. A. Supervisor will maintain 4 record of actions agreed ?won, the individual responsible for carrying out the changes and the states of corrective action. It is enphasized that the docunen-tation involved in this effort should not be cumbersome, but should enable senior CEER scientists to assess the effectiveness of the program.

TX. Program Records

The following records vill be maintained by the CER Quality Assurance Program:

1. Moreh West a

? Project Quality Assurance Mansal and any anendnents to it,

2. CEER Audit Program Plan and amendnents to it,

3, Schedule of audits of various activities and records of dates when audits wore actually accomplished.

4, Completed Audit Check List pertaining to each audit

5. Monthly Audie Reports

6. Internal Correspondence with scientists and supervisors

Yelating to audit program and follow-ups on recoanended

7. Correspondence betwsen PREPA and CEER related to the

Quality Assurance Program

---Page Break---

8. Administrative correspondence related to operation of CEER

QA. Program.

X. Corrective Action

Corrective action will be carried out as stated in the "CEER

Audit Program

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QUALITY ASSURANCE CUIDE-TASK PROCEDURES

SARI ASSURANCE CULDE-TASK PROCEDURES

?The procedures or methods to be used are those presented in

the specifications provided by PREPA, Details for performing various

tasks are included in the following pages.

ae

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?Thermal and Chenical Tolerance

1. Checklist of Equipment and Materials

La

Le

Equipment

111 LAUDA Yodel K-2/R circulating bath units, or

suitable equivalents.

1.1.2 ASTM certified mercury thermometers.

78°C to 432°C, total immersions

b. 425°C to 455°C, total immersion

1.1.3, PEARBODY RYAN Model

equivalent recorders,

thermographs, or

1.1.4 YELLOW SPRINGS INSTRLMENTS Model 57 dissolved

oxygen eter, or equivalent, equipped vith
YS1'5739 probe, or suitable equivalent.

1.1.5 YELLOW SPRINGS INSTRUMENTS Model 33 salinity
conductivities-tenperature eter or equivalent
with YSI 3310 or YSI 3311 prove, or suitable
equivalent.

1.1.6 MASTER FLEX variable speed pump drives, Model
W2IROLS7, or 7364-10, or suitable equivalents,
with pump Models 7013, or 7014, or J015, oF
7016, or 7017, or 7018, oF suitable equivalents.

METTLER Type KS or K7 top Loading balance, or
suitable equivalent.

2-1,8 MARKSON ditital stopwatch - No. 11065, oF
suitable equivalent.

Materials

1.2.1 Non-metatic (polyethylene, oF

ing and transport containers.

jar) collect~

1.2.2 Aquaria in an assortment of sizes ranging from,

but not Limited to, 3.8 liters to 37.8 Liters

in volume.

1.2.3 Metric rules and calipers or equivalent length

neasuring devices.

---Page Break---

1.2.4 Flowing seayater, in a climate controlled labora~

tory. Open or closed circulation provided from

not less than 4,000 liter seawater reservior, as

needed.

1.2.5 Laboratory work tables with drains, designed

for flow-through scavater experinents.

4.2.6 Artificial areation pumps for aquaria, as needed.

1.2.7 Field and Laboratory notebooks and data entry

forms.

2. Inportant Procedural steps

2.1 Field collection and laboratory holding.

Field collection and laboratory holding.

?Organisms will be collected live in the field using

appropriate entrapment gear, species by species (a

determined by the project scientist).

?Organisms will be transported to the Laboratory within

fhe sane day as collected in special containers cleare

Ly marked, + Use Seawater Only, No

Small species such as copepods acd

be placed in Zip-lock bags (new, double

Einsed in seawater) in turn placed into Larger insulat-

ed containers (not less than 15 liters) with seauster,

~Puring transport organisns will not be excessively crowded or handled, nor will tenperature be allowed fe rise beyond 1°C above anbient, nor oxygen allowed to deplete to Less than 60% of saturation?

?Transfer of organisms to laboratory tanks will take Place after replacing 252, 502 and 1002 ef field collected scavate: with laboratory seawater. Ta no case, during transfer will organisms be subject te pore than 3°C temperature change or 3ppt salinity change in any 12 hour period (EPA specification See EPA~600/4-78-012, July 1978).

~All organisas wit be collected during the week prior fo testing. ?During holding and acclimation seek species vill be fed, with food type and quantity determined by a specialist.

---Page Break---

2.2 AccLination

?The pretest acclimation period will not be less than 48 hours, and typically will be 72 hours. If more than 5% of the ?organisns die within that period, or Af they appear to be diseased or otherwise stressed (as determined by the researcher), the entire group will be discarded ané a new group obtained (EPA standards; op.cit.).

2.2.1 During acclimation and testing:

2.2.1.1 ?Live weight loading within each aquarium

will not exceed 2.5 grans per liter.

2.2.1.2 seawater flow rates into aquaria vill not be less than one volune exchange each two hour period,

2.2.1.3 dissolved oxygen will not be allowed to become lower than 402 of saturation.
(each of above are EPA standards)

2.2.2 During thermal tolerance testing, three acclimation temperatures are to be used for each speci

2.2.2.1 2a°¢

2.2.2.2 31% (28°C + 3°¢)

2.2.2.3 25°¢ (28% = 3°c)

Deaviation from these acclimation tem Peratures can be instituted if the extremes are found to be too low or too low or too high for a particular species

During chemical tolerance testing,

all acclimations will be at 28°C.

2.3 Tests

2.3.1 Thermal Tolerances

vAfter an acclimation period of 72 hours at

31°C, 28°C or 25°C, organisns are to be placed

abruptly into test temperatures. a

a

---Page Break---

a. 32%

b. 35%

ce. ere

@ are

?+ acclimation control

Desviation from these test tenperatures may be allowed
Af the scientist in charge deems then inapprostiaee
for the species being tested

Tenperature will be maintained by
Precision heating-cooling, both units equipped sith
Vatiably adjustable thersal regulars positional in
fest aquaria, Im addition, the laboratory will be
Fenperature controtied to Increase precisvon,

?Fest duration witt be for 96 hours or until all tests

jortality (excluding the control).
the control organisms die within
the period, the entire test will be abandonad?

?Data will be entered onto prescribed forms similar
fo or she sane as those appended to this documents
designted:

a, mortality data

b. physical test parancters

© equipment check

?These tests are to be considered acute thermal shock

Guperinents for the upper incipient thermal Limes

ge distinguished from lover incipient limit and eritical

sreimal mexina (CTH) experiments. (See: V. #. Hutchison.

Thermal Ecology 1. ERDA Series 40, pages 12 and Ia,

1976).

2.3.2 Chemical Tolerance

?Aser an acclimation period of 72 hours at 28°C, orga

isms are to be placed abruptly into 4 test of a Sena]

{eggbe desienated) diftering by one order of magnituae

(x10) ?each. A separate test without setal ion er

detectable levels will serve as acontrol.

?Wertality will be recorded on data foras (similar to

those of thermal tolerance teste) over a 96 hoors

ais

---Page Break---

period. The test vill terminate when, or if, 50
mortality is attained in all teat concentration.
The test run will be abandoned if control mortality
is beyond 52 during the 96 hours period,

?Tests with three different metals will be run for each
species.

?Each metal will be batch mixed week by week at a
concentration higher than that of the highest test
concentration in @ 4,000 Liter tank. This reservoir
will serve as a bioassay test effluent to be minea

in know quantities , using peristaltic pumps inte
Seawater flowing at?a given rate into test aquaria.
The metalic ion concentration in the effluent reoes=
voir vill be predetermined by mixing a given quanticy

of metal salt, assuming a know dissociation constant, into seawater. Periodically, sanples will be taken of the seawater in each test concentration and erect checked with a Atomic Absorption specttophotometer,

wIn general, all procedures for chemical tolerance testing will adhere, when applicable, to EPA standards a8 set forth in Methods for Measuring the Acute

Toxicity of EEfluents to Aquatic Organise (EPA-600/ t-78-012, July, 1978)

Report Fors

vLatoratory data will be entered onto prescribed da

forms sinilar to, or the sane as those appended to this document, The researcher entering data in each case will be clearly identified by his or her signature in a colunn designated eignature or researcher.

and Noe:

?Held notes witl be entered onto water resistant paper in a standard Engineers Lavel Book (No. S410V) ove suitable equivalent. Each page will be initiated by the researcher taking notes.

wALL original data will be replicated on a good quality copy machine filed in at least two different places, Pages nunbers on each data form will be consecutive and no original data forms regardless of quality will be discarded. If pages are inadvertently lost or destroyed, a full written and signed explanation by the researcher(s) will be inserted in place off,

---Page Break---

4

4.1 Samples

~Organisns collected from the field will be used only once during experiments. Those reaaining alive at the end of the 9 hour test will be released into a nearly

habitat similar to that frou which they were originally

faken, Dead organisms will be renoved from the test aquaria measured as to size and/or weight and disposed of through regular sanitary disposal pickup or into « ?ink equipped with an ordinary garbage disposal,

?ALL effluent seawater from the flow-through system Will be directed through an activated charcoal bed

before returning to the environment.

~ALL original data sheets and note books will be deposited with the Environnental licensing Engineer for filling, with copies of data sheets attacked to Progress reports to the Ucility (PREPA). Copies of ail data and reports as well as comsunications will be kept on file at ckEa.

5. Task Responsibilities of Individuals

3.1 Principal Investigator or Scientist - in charg (60% effort). Duties included

?design of experiments and decisions regarding modi-fication, if necessary.

?service as specialist on tropical invertebrat:
select organiona for study.

?supervision of Research Associates perforning experi~ments,

?Official communication by direct or indirect means

with all other individuals or organizations:

wservice as the individuals ultimated responsible for

?lL data collected and research performed,

5.2 Research Associates (tuo researchers at 100% effort).

Duties included:

IL field collection

?7

---Page Break---

wall loboratory culturing and monitoring of organisms,

vaaintenance and organization of Laboratory according

to accepted scientific standard

?monitoring and data entry for all thermal tolerance

and chemical tolerance experimeatss

?monitoring and maintenance of equipment calibration

?Preparation statistical analyses of data and Literate:

"Provide consultation and assistance to principal

?investigator in writing the final report.

Service techaician

?clean laboratory daily

~saintain ground imediately outside of laboratory

assist in maintaining all non scientific equipment

in the laboratory.

wessist research associates in physical duties,

Maintenance or Calibration of Equipment

6a

Thermal circulation bath units will be checked daily against ASTM Certified Mercury thersoneters with desviations noted.

Themographs will be calibrated initially ducing a fest run with ASTM Certified Mercury thermometers: and checked periodically against the same therasecters £0 assure repeatable performance.

XSI onygen eters and probes will be calibrated by the Banufacturer intially. A periodic check on perfoommce ill be run using Winkler oxygen titrations (set feces in Strickland and Parsons, Standard Methods, 1965).

3S? Model 33 Salinity-conductivity-tesperature peter Pull be calibrated against @ standard using TeAvp.$.0, Standard seawater and ehe manufacturers specification?, and checked weekly.

---Page Break---

6.5

6.6

MASTERFLEX variable speed drives and peristaltic pumps
Will be checked datly, and flow rates determined using
PYREX graduated cylinders calibrated by the manufactur
rer in milliliters, and a ditigal stopuatch (nanufacturer
calibrated) measuring in not less than 0.1 second
intervals.

METTLER top loading balance to be calibrated prior to
use by a certified.manufacturers technician.

Unless otherwise specified, maintenance and calibration
of equipsent will feliow manufacturers specifications,

Hi

---Page Break---

APPENDI: BIOASSAY DATA FORM

?Thenaa/Chemical Studies Marine Ecology Division

FORMAT T ceeR, UR

Mayeguer, #8

TEST ORGANISH

INITIAL NUMBER OF TWOIVIDUALS

LIFE stage

SIZES (3, #50, range)

I

DATES: INITIAL

ACCLIMATION TEMP,

TEST TEMP,

EFFLUENT,

___. comeere

+ ONC,

i

TEST 10,

_ = REPLICATE No. .

oo ooo

oe | TIME | ALIVE | worraLtry ?OBSERVATION RESEARCHER

tt a ???-

oF i

pi | {

7 / oT |

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| 20.

---Page Break---

TEST W0..

TEST PARAMETERS;

HOUR

HECK

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tive |ro. |g

i

APPENDIX

THERMAL CHEMICAL STUDIES

FORMAT TT

saLinrry | eFFLUENT conc.

i

+ REP. HO.

SIGNATURE RESEARCHER

con.)

2

8

2

20

36

48

?

|

|

|

:

|

one

---Page Break---

IT, Benthic Studies

1. Checklist of Equipment and Materials

11 Equipment

haa

tae

Ls

inet

Ls

SCUBA gear: tanks, regulators, accessories

Underwater communication systea: Wet phone

Sound wave System, Inc.

Underwater camera: Nikonos Model 111

Undervater strobe: Model Sunpack marine

Microscopes

1.1.5.1 Compound: Americal Optical: Series

H1O Microstar Model X¥10 TM = JW.

with Caner:

Attachment 1053, 35 am with magnifi

tion factors of 2.8 x and 5.0 x. With

exposure meter series 1056, Expostar

Control units (115-120v, 6 Okg, series

1190,

1.1.5.2 Dissecting: Saush and Lomb: Sterozoom

7, from Baush and Loab Tne.

12 Maceriats

had

1.2.2

123

Cement blocks

Asbestos panels

Chains

Buoys

Chesicals

Containers,

2, Important Procedural seeps

?The specifications established by the engineer for

the study of the benthic flora and fauan at the Rincdn and

2.

---Page Break---

Carrigal sites are stated in pages 23-28 of 85. There are three major specifications for both sites: A. benthic Mapp~ings B. Sampling Stations and C. artificial Substrates. ?The methods to meet these requirenents are given below.

2.1 BENTHIC HAP: The methods to create a benthic map for both sites are given below.

21.1 Aerial Photography: Aerial photographs will be used for (a) genoral reco-naiseance of each site; (0) determining general shoreline features (©) determining the approximate Location of submerged reef structures; submerged rock plat~forms and rock outcrops in relation to clear (ue. sandy) bottoms, Both black and white fim? (Plus X, ASA 125) and color film (Kodachrowe, ASA 64) willbe used for this purpose. PREPA's helicopter or an airplane (preferably from West Wing Flying School, since it is close to soth sites) is required,

2.1.2 Botton Profiles: sotton profiles will be determined aboard the R/V SULTANA. The instrument, already installed on board ig a Ross Fisherman Depth Finder ang Recorder, The advantage of this instrunent is that, in addition, #¢ will Provide information or substrate type since it ?can distinguish betueen soft and hard botton:

4 soft or silty Sotton vill appear on the chart, asa relatively narrow bottom Line due to absorption of the acoustic signal, a hard of rocky bottom will have @ much wider Line at the sane sensitivity setting due to higher bottom reflectivity of the acoustic signal.

2.1.3 Underwater Transects: Underwater transects are required by the engineer at both sites (pages 23-25 of 85) "to evaluate substrate type biotic associations, and zonation? (page 25 of 85). These transects will be useful for crating. benthic maps at both sites. The consultant

proposes the following setiodology to comply with these specifications. The location and diccetion of each transect ic given in Fig. 2-1-1 (Rinedn) and in Fig. 2.1.2 (Carraizal). ?Transect Lines Will be 300 m'long marked at 20m intervals. They ill run from shore to offshore.? A forsat (FORT 1, Appended) has been prepared to meet

---Page Break---

FORMAT 1

Dates

Bearings end of Te: Station:

Depth Rang. ?Type of Sample:

Signature:

Conspicuous

Distance(s) Depeh(fe) _ Substrate Species

om

0-2

20 - 40

40 - 60

60 - 80

80 - 100

100 = 120

120 - 140

140 ~ 160

160 - 180

180 - 200

200 ~ 220

220 - 240

240 - 260

260 ~ 280

280 ~ 300

300m

---Page Break---

FORMAT 11

Bearings of Station: Date:

Depth Range:

Distance from Shore:

Signature:

Conspicuous

Depth Substrate DoM-coves Species

25

---Page Break---

2.2

the specifications mentioned above. U/W photo

graphy Will also be used to characterize the

bottom. Samples of conspicuous, unrecognizable

organisns will be collected.

2.1.4 Spot Dives: As many spot dives (hereby defined as dives at preselected spots) as seen Necessary to fulfill the information required to construct a benthic map vill be made. A format (FORMAT II) has been prepared to docunent,, underwater, the specified information. Underwater photography as vell as samples of conspicuous, unrecognizable species, will be taken.

Sampling Stations: Sapling stations on predetermined locations have been selected by the engineer to provide information or more specific aspects of benthic comunity eructure and dynamics: a) species present (invertebrate, algae, fish; b) species interaction of major species

Present; c) ?seasonal changes in biotic components;

4) changes in the biotic components and 3) population

densities of conspicuous species (pages 26-27 of 85),

In order to meet these requirenents, the engineer

Proposes a 10 mx 2m transect as the major sampling

?area, The consultant proposes the following methodology to meet the requirenents of the engineer? utilizing the 10 mx 2m transect proposed.

Three 10m long chains spaced 1 m apart from the central chain, each running parallel to each other, will be Permanently secured to the substrate 90 a5 to provide the 10 = x 2m area specified by the engineer fn page 26 of 85. At every meter a transverse line will be placed, and secured, so as to provide twenty. 1m? plots in two ?rows: ROW T and ROW II, each consisting of 10,

1m? plots. Each pilot is eninerated as illusteated

in Figure 1 (appended). At each sampling stations ROW I will be photographed twice yearly; at the beginaing of the study and 12 months after the beginning of the study, and the area described in detail so as to note any changes in biotic components as specified in page 26 of 85. Random collections during the year will be obtained. Ten, 1/16 m2, quadrats will be taken at

the beginning of the study and 12 months after the deginning of the study. Counts (population density)

of conspicuous plants and aninals will be determined within the 10m x 2m transect, at the beginning of the study, and 12 months after the beginning of the study,

---Page Break---

FIcURE 1

19

20)

2

---Page Break---

2.3. ARTIFICIAL SUBSTRATES: In section 2.2.1.4 pages 27-28 of 85 the engineer specifies the requirenent of an artificial substrate study in order to give an idea Of the potential for recolonization at predetermined Stations. The Duratex panels will be tied towe surface of the cenent blocks and will cover the sane surface area as the surface of each block. The blocks will be aligned in two rows: one of 7 blocks and another Yow of 6 blocks. A chain will rum through the holes of the blocks through the whole Length of the row and secured to the substrate. The sampling procedure has already been established by the engineer (pages 27-28 of 85), The Rine6n site is a high wave energy environ ment, and modifications of securing the blocks to the substrate may be necessary.

Report Forms and totes

Report forms and notes have already been specified in

"specification for General Performance Requirements for Aquatic Ecology and Water Quality: Aquatic Baseline Studies? Section 6, pages 61-85 of 85, Revision 2. The report forms are given in Fig. 6.1.1 and 6.3.1 and the species code assignnents in Table 6.3.2

Disposition of Samples and Results

As specified in Section 2.2.24: Benthic Flora and Fauna (Contractor's Specification), ali apecinens collected in the field will be caken to the laboratory and identified to Species. A list of all reference used and systenatists consulted will be reported to the ower and the engineer by the consultant. All species data shall be recorded on the Biological Anaiyeis Report forms provided by the environnent= al Licensing engineer (Appended).. Specimens collected vill bbe kept in the laboratory, preserved in the proper agents (Zormalin, ethanol) and labeled for station number and date, A reference collection for each group will be set up.

?Task Responsibility of Individuals

5.1 Principal Investigator. In charge of designing field studies, supervision of all aspects concerning the benthic studies; laboratory responsibilities also include taxonomy of the Porifera; submission of monthly

reports.

---Page Break---

5.2

5.3

Maintes

Scientific Research Associate III. 19 charge of all
invertebrate taxonoay and coordinator of laboratory
duties (proper labeling of specimens, proper allocation
of samples).

Lab. Tech IL.

actophytes|

In charge of the taxonomy of all

Field assistant when necessary.

Lab. Tech. T. In charge of obtaining and preparing

all field materials. Principal field assistant in all

Phases of SCUBA diving activities.

\ce and Cali

Maintenance and calibration of equipment will follow

manufacturers specifications

---Page Break---

[APPENDIX: BENTHIC STUDIES

inited e:

BIOLCSICAL FIELD COLLECTION REPORT FOP

ve pero SSeS Mee erm

souneres Specification No, 6212-000.2-8-5-F

Tape 62 of 85

Revision 2

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xX: eNTATE sTUDIES

hited engineers

Higure 6.41 BIOLOGICAL ANALYSIS REPORT FORM

eee

oe kevicion ?2

---Page Break---

APPENDIX: BENTUIC STUDTES

TABLE 6.3.2

SPECIES CODE ASStoMMENTS

Loses yp

Tae

() The first space will tell the computer what general group the

species belongs to:

ot used

+ Rot used (signifies water quality)

Phytoplankton,

Zooplankton

1

2

3.

4

5. Tehthyeplankton

6. Benthic Fauna

7. Fish

8. Benthic Flora

(2,3,4) Spaces 2, 3 and 4 are used to designate the genus order for

each particular group

(5, 6) Spaces 5 and 6 are used to di

genus.

ignate species within each

Revision 2

32

---Page Break---

MIT. Water quality / Hydrology

1, CheckList of Equipment and Materials

Lal Equipment

Maa

1120

hin

Let

hrs

add

Laas

Laae

Lay

Secchi Disk, standard 20 cm dianeter oceanogra~

phic type

YSE Model 57 Dissolved oxygen meter or equivalent

DRT-200 Turbidineter or equivalent

Corning pl meter or equivalent

YSI Model 33 Salinity-conductivity-Temperature

eter or equivalent

Millipore Bacteriological Analysis kit or

equivalent

Precision Scientific Freas 815 Tacubator or

equivatent

Mettler H 542 Analytical balance or equivalent

Kontes MicroKjeldahl digestion system or

equivalent

?Technicon Auto Analyzer IT or equivalent

Perkin Elmer Model 303 Atomic absorption

Spectrophotometer and accessories or equivelent

Coleman/Perkin Elmer MAS 50 Mercury Analyzer

or equivalent

Niskin Water Bottles 51 capacity - non metallic

or equivalent.

Millipore vacuum filtration pump or equivalent

Soxhet Extraction Syste for COD or equivalent

Becknan Model 3600 U/VIS Spectrophotometer or

equivalent

Millipore Milli RO4 water purification or

equivalent

---Page Break---

12 Materials

1.2.1 Polyethylene sample storage bottles, cubitainers

1.2.2 30D bottles numbered (glass)

1.2.3 Glass sanple storage bottles for coD

1.2.4 Millipore filter holders and 0.45 um pore size meabrane filters or equivalent

1.2.5 Burettes, beakers, volumetric flasks and other slassware

1.2.6 AA Standard Solutions for Trace Metals (Fisher certified or equivalent)

1.2.7, Analytical Grade reagents as required in Standard Methods for all analyses.

2. Important Procedural steps

2.1 Field Collections-Rincon: Water Samples

Water samples for analysis of water quality Parameters, will be collected sonthly at Station 0230 as described in the Licensing engineer's speciticat ions surface (nominal depth of 0.5 a) and near the bottom (8.0 m) depth at Station 0230 as in specification Replicate samples will be collected in sequential

ts. A nonmetallic water sampler such as a

Poly vinyl chloride Miskin type sampler will be urilized.

The capacity of the sampler vill be of sufficient voluse

to collect all necessary sample aliquots in a single

cast. The capacity of the sampler will be large enough

to allow collection of a 500 ml sample aliquot for

Phytoplankton enumeration and plant pigment samples

at Station 0230 @s in specifications) surface.

Water samples vill be collected after three

Finses of the sample bottles previously acid rinsed

and distilled vater rinsed. All water samples will be

stored in a freezer on hoard the sampling vessel. and

frozen until analysis as a means of preservation

ALL sample containers will be clearly labeled
with location, code, station number, depth of
collection, tine, date and collector's initials.

a3

---Page Break---

2.2

2.3

Profiles and Field Measurements - The researcher
Will measure tenperature and dissolved oxygen with a
YSI Model 57 Dissolved Oxygen Meter, or an equivalent,
at the surface (nominal depth 1.0 feet) and at 1-0
eter intervals to the bottom at Station 0230 (as in
specifications) on a monthly basis. The researcher
Will measure Secchi Disk Transparency, Turbidity and
pul at Station 0230 on a moathly basis. Profiles and
Field measurements will be made concurrently with
water sample collections.

Field Collection ~ carrizal

Water samples - ater sanples for analysis of water quality parameters, shall be collected monthly at Stations 0130 and 0230 (as in specifications). In addition, at Least, one collection for all physical and chenical paranctere (described in specifications) will be made during a period in vhich Rio Culebrinas is in a flood condition. Collection will be made at the surface (nominal depth of 0.5 m) ané near the bottom (8.0 m depeh) at both Stations 0130 and 0230 (as in specifications). Methods and type of sampler will be the same for Rincon, however the capacity of the sampler will be Large enough to collect water quality and phytoplankton samples ar Station 0230 surface and bottom.

Profiles and Field Measurements - Measurenents|
Will be made at both Stations 0130 and 0230 (as describ= ed in specifications).

Analytical Methods

State of the art analytical techniques will be used. Water Quality parameters will be determined by methods prescribed int

APHA, AUWA, WPCF ?Standard Methods for the Examination of Water and Wastewater? ashington, D.c, 1976,

Strickland, J.D.H. and T.R. Parsons. "A Practical Handbook of Seawater Analysis" Bulletin 167 Fisheries Research Board of Canada, Ottawa (1968).

US EPA "Manual of Methods for Chemical Analysis of Water and Wastes? Office of Technology Trans~ fer, Washington, 1972,

---Page Break---

3. Report Forms and Wot

3:1 Field Notes - Field notes will be taken in conjunction With the water quality sampling. Water bottle sampling notes and Secci Disk Transparency Turbidity and pit will bbe recorded in No. 2 pencil on water proof field. sheet the following information at each water quality sampling Station: date, tine of day (local 24-hour time) tidal

ge from USCOS tables, wind speed and direction, wave

ight and direction and weather observations. Notes

WAIL be made of any unusual occurrences which might

affect the quality of the samples collected, Tenperature

and dissolved oxygen profile data will be recorded ina water proof field notebook. Each log sheet and field notebook page will be signed or initiated by the individual responsible for the collection and handling of samples in the field.

4, Disposition of Samples and Reports

Hater samples are kept frozen until analyses are perform
ed and then are disposed of.

ALL original data sheets and notebooks vill be deposited with the Environmental Licensing Ecgineer for filing, with copies of the data sheets attached to progress reports to the omer. Copies of all data and reports as well as communications will be kept on file at CEER.

5. Task Responsibilicies

5.1 Principal Investigator or Scientist in charge ~ Duties:

= Responsible for supecvision of research associates performing sempling and analysis

= Serve as specialist in analytical, marine and environmental chenistry.

= Design and/or modification of sampling or

analytical methods

= Official communication to all other individuals

oF organizations.

5.2 Research Associate

= Maintenance and organization of the laboratory

---Page Break---

+ Tnstrusental and wet chemical analyses

~ Statistical analysis of data

> Assist principal investigator in report writing

= Field sample collection

5.3 Laboratory Technician

~ Assist research associate and principal investigator

in all aspects of field sampling measurenents and

laboratory analyses.

Maintenance and Calibration of Equipment

All calibrations to be performed on equipment will be

in accordance with the manufacturer's specifications or

using materials and methods that are triceable co the National

Bureau of Standards and state of the art techniques,

---Page Break---

IW. Plankton / Fish studies

A, Zooplankton and Ichthyoplankton

1. Ghecktist of Bquipnent and Materials

1.1 Field collections

haa

hua

1a

hae

has

Net frames, nets, flometers

borties

labels

data sheets

stop watch

formalin

hose for washing nets

wateh

1.2 Laboratory

Lat

122

123

128

1.2.5

1.2.6

2.1 Field

2a

21

nicroscopes

counting tray

subsamples (Folson splitter & Stempel

pipette)

bottles

data sheets

Important Procedural steps

Nets will be rigged according to manufac~

turers specification:

Flowseter will be read prior to launching

oF net.

---Page Break---

2.1.3 time, depth, seastate will be noted on data

sheets,

2.1.4 nets will de lowered until proper depth is

Yeached and will then be opened.

nets will be towed until a minimum of 100m?

of water is filtered.

2.1.6 nets will be closed and raised to surface

2.1.7 flowmeter will be read and time recorded

2.1.8 nets will be rinsed

2.1.9 sample will be placed in sample bottt

containing labels and formalin

2.2 Laboratory

2.2.1 pi of samples will be checked as soon as

possible after their return from the field

Aliquots will be taken with the Stempel

Folsom plankton splitter or pipette,

depending upon the size of subsample requir-

e¢ to count a sufficient number of plankton

(= 300).

2.2.3, Identifications will be Listed on the data

shects and signed by the identifier.

Report forms and notes

3-1 Report forms and notes will be kept following the

Procedure outlined by the engineer.

Disposition of samples and reports

4.1 Zooplankton samples will be kept in a collection

4.2 Reports will be made available to the chief

scientitist eo be relayed to the omer or engineer

Responsiblity

5.1 Principal Investigator - administrative tasks,

budget nanagenent, and overall scieatific super-

vision of program

390

---Page Break---

5.2. Scientist - supervise collection and processing of

samples. Design of specific scientific studi

Analysis of data

5.3 Laboratory techniques - process samples and record

Gata. Cataloguing of samples. May aid in field

collection.

5.4 Field technician ~ ail in field collection, records

sone field notes, naintesance of equipment. ?Aids

is cquipnent calibration.

6. Maintenanee and Calibration

Maintenance and calibration of equipment will

Follow manufacturers specification.

3. ian

2. Ghecktist of Eguipmene aed Materials

La Flee

LiL Goh erape with Lines and floats

1.1.2 diving equipsont ~ tanks, regulators,

Backpacks masks, and fins ~ then trasecte

11.3 data sheets

1st.6 plastic tags and dabets

1.2. Laboratory

Litt atance

1.2.2 moter stick

1.2.3 data sheets

1.2.4 Soteies

1.2.5 tommatin

2. Important Procedural Steps

2.1 Fiead

toe

---Page Break---

2.1.1 Fish traps to be placed at sites designated

by engineer

2.1.2 fish traps will be in place overnight or for

24 hours conditions persitt ing

3. Report Forms and Notes

Report forms and notes will be kept according to

directions of the engineer, and will be available ts

the owner of engineer.

4. Disposition of Samples and Reports

Samples will. be discarded following the foraation

of a feference collection. Reports vill be given to the

chief scientist to be forvarded to the omer or engineers

5. Task Responsibinity

5-1 Principat Investigator - Administration and budget hnanagement Scientific supervision of progr

5.2 Research Associate ~ carries out program under supervision of PL. Carries out sampling program, identifies and weights fish. Fills out data shecta. Supervises field technician.

5.3 Field technician ~ Aids Research Associate, Maintains equipment. Records sone field notes:

Maintenance and Calibration

Maintenance and calibration of equipment will follow manufacturers specifications:

©. Phytoplankton

1 Checklist of equipent and materi

1a Field

11.1 Miskin bottles

1.1.2 containers

1.1.3 formalin

mle

---Page Break---

1.1.4 vacua pumps and filters

11.5 Mgcos

1.1.6 envelopes

L.L.7 freezer, refrigerator, or ice chest

1.1.8 Labels, field data sheets

2.1 Laboratory

2.1.1 Inverted microscope

2.1.2 settling chanbers

2.1.3 fluorometer

2.1.4 acetone

2.1.5 data sheets

2. Important Procedural Steps

2.1 Uternohl procedure will be used to count phyto=

plankton.

2.2 Fluorometer will be used to measure chlorophyll

?and phaeophyta following Stricland and Parsons.

3. Report Form

Report forms and notes will be kept following

Procedures outlined by the engineer.

Disposition of samples

Samples will be discarded due to their degradation

with time, Results will be relayed to the Chief

Notes

Scientist.

5. Task responsibinicy

5.1 Principal Investigator ~ supervise project,

administration and budget management

5.2 Phytoplankton taxononist - sount and enumerate

phytoplankton

mire

---Page Break---

5.3 laboratory technician ~ measure chlorophyll and

Phacopiiyta concentrations on the flucrometes

Maintenance and calibration o!

Maintenance and calibration ¢

Fiuoroneter will be calibrated of against @ spectro=

Photoneter following manufacturers specitications.

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---Page Break---

Terrestrial Ecology ~ Vegetation ond Fauna

1, Checklist of Equipment and Materials

La

Le

Equipment

1.1.1 Tomshauk collapsible Live traps (6 x 6 x 24 inches)

1.1.2 Sherman Live traps (large)

1.1.3. Victor snap traps

Ld Mist nete

1.1.5. binoculars

1.1.6 portable tape recorder

11.7 35 om camera

11.8 headlight

1.1.9 quadrat franes

1.1.10 calipers

L111 insece ight traps

1112 sefcky traps

2.113 Tullgren extraction apparatus

1.1.16 plane press

Materials

1.2.1 date (Peanut butter, eggs, bird seed, etc.)

1.2.2 Fite

1.2.3 drafting supplies

1.2.4 tapes

1.2.5, herbarium materiale

1.2.6 preservatives (formalin, alcohol)

1.2.7 drift fence and pit trap materiats

he

---Page Break---

2, Important Procedural steps

Te specifications established by the engineer for the study of terrestrial flora and fauna at the Rincon and Carrizal sites are stated on pages 5, 5A, and 6 of the Specifications (Revision 2) for Terrestrial Ecology Investigation and Analysis. Table 1 presents the sanpling and report shcedule,

?The methods which CEER's Terrestrial Ecology Division will ecaploy to nect these specifications are given below:

2.1 Vegetation Map

21.1 Aerial photography (supplied by the omer) will be used for a general reconnaissance of each site, the ash disposal pile, and proposed rights of-way. Additional photographs will be taken of the sites to docunent and map recent changes, PREPA's helicopter or airplane (preferably from West Wing Flying School) {s required for. 2=4 hours of overflight time. All photographs will be used to construct a map which indicates the distribution of vegetation types (including cropland), major topographic features, and area of disturbance,

Ground-truthing surveys will be conducted to field check a draft map and identity ?problem? features seen on aerial photos. These surveys will be conducted in conjunction with vegetation inventory surveys,

2.2 Biological Inventories

?The major seasonal periods mentioned in the Specifications are hereby defined as Wer season (July-September) and Dry season (January-March). Iavervening seasons are transitional between these and are derines as minor. Unless othervise specified, all sampling locations will bre randonly located using @ grid (Phillips, 1959),

2.2.1 Vascular Plants - Lisited sampling will be conduct-ed during najor and minor seasons (total of four Surveys) to collect specimens and compile a detailed species list for each area of proposed developent.

Vegetation types on each site and the ash disposal Pile will be quantitatively sampled during the two

mis

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major seasons. A species-area curve will be constructed for each vegetation type to ensure that the species composition is adquately represented. The sample size Will be considered adequate uien an increase in 102 of the total area yielde only 10% (or fever) more species (Cain, 1938; Mueller-Donbois and Ellenberg, 1974).

Woody vegetation (trees and shrubs) will be sampled using the point-quarter method (Cottam et al., 1953). A

?minimun of ive 50m transects (10 points each) will be sampled in each major season in each vegetation type dominated by woody species. Woody vegetation in other types will he mapped and total counts will be made.

The species , point-to-plant distance, basal area (for trees), and Crom diameter (For shrubs) will be recorded and used ro calculate relative density, relative dominance,

relative frequency, density, and total basal area (PhilLips, 1959).

Herbaceous vegetation will be sampled using a minigun of twenty 1 m quadrats in each vegetation type. Data on cover, frequency, and density of species will be recorded ?and subsequently calculated according to standard methods (Cox, 1967).

Voucher specimens of plants which cannot be identified in the field will be collected and preserved according

to standard procedures. These specinens will subsequent= Ay be identified br recognized experts.

2.2.2 Faunal Inventories

Field sampling vill be conducted during each of four seasons. Intensive sampling including trapping will be conducted during major seasons only and will be confined to the two proposed Sites and associated ash disposal pile. All major habitats will be surveyed. Faunal habitats include all major vegetation types plus specialized areas

Such a6 wetlands, rocky outerops, and caves. Lees extensive surveys for most groups will be conduct ed quarterly to collect additional information on the presence and seasonal use of habitats by faunal species. Random observations of aninals seen

nib

---Page Break---

within study areas will be recorded and used to augment standard sampling data.

Unless otherwise specified, all sampling locations will be randomly selected within each habitat type. Voucher specinens of selected animal species (except birds) will be collected and preserved according to standard suseum procedures (Hall, 1962; Jacques, 1947). Species identifications will be made in?the field uhenever Possible. Unusual individuals and specinens which

ate difficult to identity will be collected for subsequent verification by recognized experts. Records of threatened and endangered species occurrence will be documented by photographs and verified by experts to the extent practicable.

2.2.2.1 Mammals

One oF more traplines will be establish-ed in each major habitat type. #ach

Line will consist of 10 lives traps placed in a straight line at intervals

2£ approximately 15m. Traplines will

be checked each morning for three or

four consecutive days during each of the two intensive sampling periods, Ceptured individvals vill be marked and released, and the traps will be rebaited at each trap check. The date of capture, species, location and habitat affinity of each

individual will be recorded (Figure 1).

Minor habitats and habitats situated along Tights-of-vay (ROWs) will be sampled using selective Live and snap trapping procedure Live captured individuals will be marked and released.

Bats will be sampled by mist netting at selected locations within study are.

To the extent feasible, some individuals ay be collected by shooting. Potential roosting areas (e.g. caves and abandoned buildings) will be visited to determine species presence and seasonal «

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2.2.2.2

2.2.2.3

Birds

Standard methods (Franzreb, 1977) will bbe used to gather information on the presence, habitat affinities, seasonal Uuse, and'general abundance of bird species. Replicate curveys vill be conducted within each major habitat type during periods of breeding, migrantion and overvintering. Resident breeding species and seasonal migrants will be identified. Important avian habitats (e.g. wetlands) vithin one kiloneter of designated study areas will be also be sampled.

Qualitative surveys will be conducted quarterly within each atudy area so that

@ more complete species list can be compiled. Survey methods may include

walking surveys, the use of recorded calls, and limited mist medting. Sanpling Procedures may be notified to conform to existing conditions in each study a

Amphibians and Reptiles

Diurnal species such as anoles will be surveyed during the dry and rainy seasons along randoaly located transects in each najor habitat type. Intensive searches at selected locations within each study area Will also be conducted to detect the pre sence and habitat affinities of secretive and fossorial forms. Surface debris will be established in selected locations to sample ground dwelling forms. Limited collecting may be required in order eo verify species identifications.

Bach study area will be visited at night during the rainy season to detect calling

anurans (frog and toads). Most species identifications will be made in the field by trained observers. Calls not readily identifiable in che field will be recorded for subsequent expert verification, A few voucher apeciens of amphibians and reptiles may be collected and preserved.

H48-

---Page Break---

2.2.2.4 Invertebrates

The sampling program for terrestrial invertebrates will concentrate on

insects. Field surveys will be conduct-ed quarterly. Light traps and sticky traps will be used to collect represen tative samples from each of the designat-ed study areas. ?These techniques will be supplemented vith netting, vacuum sampling, and surface collecting during the two major Sampling periods.

Soils and leaf Litter arthopod sample:
will be collected during the two intensive
sampling surveys, Arthopods will be
Yenoved from samples using the funnel
extraction techniques (Cox, 1967)
Extracted organisms vill be identified and
counted.

Records vill be kept on the habitat
affinities ané general abundance by major
groups (e.g. families, important generals
ete.) for each season. Insect collections
Will be examined by project staff, and
identifications subsequently verified by
recognized experts.

2.3 Important Species

Lists of candidate important plant and animal
species potentially inhabiting areas of proposed project
development will be submitted within days after the

first field visit. The List will be based on a review of published Literature, discussion with regional authorities, and an observations made during a reconnai Sance survey of the study areas. The List will be updated following each field survey.

A species will be considered important if it ia:

2.3.1 Commercially or recreationally valuable,

2.3.2 officially designated

threatened or endangered,

2.3.3 Likely to affect the vell being of an important species as defined in 1 or 2 above, oF

---Page Break---

2.3.4 sufficiently sensitive to induced environsental
Stress that it could serve as a stress indicator
before significant effects on other important
species occur.

Species which are thus defined will be enphasized during
baseline characterization studies. If initial surveys indicate
that project development may significantly affect the well
Deing of one or more important species CEER would propose
additional quantitative studies beyond the present workscope
in order to determine the magnitude uf the predicted impact,

Report Forms and Notes

ALL field report forms and notes will be dated and signed by
the personnel responsible for collecting the data. Copies

of all field notes will be maintained ina central file and
originals handled in the sanner indicated in the Specifications
docunent. All field notes and data sheets wil! be initialed
by the appropriate principal investigator to indicate that

they have been approved.

Disposition of Samples and Results

ALL specinens will be properly preserved (e.g. plants on herbarium sheets, aninal specimens in alcohol, formalin, oF Prepared as study skins) according to the museum techniques referenced in the appropriate methods sections. All voucher specinens and results will be maintained at CEER facilities in Mayaguez, Rio Piedras, or El Verde and supplied to the owner upon request.

?Task Responsibilitics of Individuals

5-1 The two principal investigator (PTs) will be Douglas Reagan (fauna) and Susan Silander (vegetation). Each PI vill be responsible for conducting and supervising all aspects of their respective tasks.

5.2 Task leaders will be in charge of data collection, Specimen preservation, and data analysis for theit disciplines. Task leaders are: Susan Silander (vegetation studies), Robert Waide (birds), Douglas Reagan (mammals, reptiles, and amphibians), and Miguel Canals (invertebrates).

5.3 Technician level field assistance will be required, but individuals are not specified, Responsibilities will be fo assist the task leaders in the conduct of the various task

---Page Break---

Maintenance and Cal ibr:

ALL equipnent will be vurers's specification:

properly maintained according to manufac

---Page Break---

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TABLET

TERRESTRIAL ECOLOGY SCHEDULE

oo

Task / Report Date

Reconnaissance Survey March 1-31, 1980

Submit Candidate Important Species List within 15 days of

Spring Field Sampling (minor)? april 15 ~ June 15, 1980

Wet Season Field Sampling (major)? July 15 ~ sept. 15, 1980

Fall Field Sanpling (minor)? Oct. 15 = dee. 15, 1980

Submit Site Characterization Report by Novenber 30, 1980

Dry Season Field Sampling (major)? January 15 ~ Feb. 15,1981

Final Data Report by March 31, 1981

Ba

1, Assumes contract issued March 1, 1980; 13 months required to com

plete project tasks

2. A seasonal biological inventory report will be submitted to the

engineer within 30 days? of completion of all field work.

---Page Break---

Ww.

Proviso for Procedural Changes

Frovise for Procedural Changes,

Procedural changes that vill affect results or data procured

can be made vith the approval of the Omer and Engineer.

Minor changes in procedures that will not affect the results

OF data outcome can be made at the discretion of the scientist~

in-charge or of the principal inv

tigator.

She

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CER AUDIT PROGRAM PLAN.

?The Audit Progran Plan is designed to fulfill the requirements

of the PREPA Quality Assurance Program for the Norch West Coast ({WiCO)

Project. The position responsible for the CEER Audit Program will be

the Quality Assurance Supervisor who will report directly to Head,

Environmental Sciences Section,

(One of the activities listed below will be audited each month.

The report of the Audit, with recomendations for further action,

and follow up on previous recommendations will becavailable to the

SWCO Project Manager and to other concern scientists within three

(3) weeks from the date of the audit.

Te The 5

cific activities (scientific units) to be audited are:

Terrestrial Ecology ~ Vegetation and Fauna

Plankton / Fish Studi

3. Mater Quality / Hydrology

?Thermal / Chenical

Benthic Studies

?The activities to be audited each month are as follows: arch-

#L, April - 42, May - 65, June ~ % and July - #5. The schedule will

repeat this sequence unless experience shows the ns

for a change,

---Page Break---

Wnen an Audit shows that corrective action is nect

ry, the

Proposed corrective action will be discussed jointly with the leader of the scientific unit and the MiCO Project Manager hen @ course of corrective action is agreed upon, it will be sumarized in writing vith copies for each person involved. If @ course of corrective action cannot be agreed upon, the Head, Environmental Sciences Section will join the discussion and decide on vhat action Af any is necessary. It is the responsibility of the Quality Assurance Supervisor to follow up in any corrective action to

determine if it is accomplishing its objectiv

Wenever an Audit results in corrective action in relation
fo the work of @ scientific unit of other function of the MHCO
Project, this corrective action will be followed up within two sonths
either as part of a monthly Audit or directly. The extent of
application of the corrective action and its effect will be included
in the next Monthly Audit Report after the follow up action. The

follow up results will be discussed with the individuals involved

?im the original decision for corrective action and any modifications
to this corrective action made as agreed.
TH. The folowing documents will be part of the Audit Progran
Plan:

1. Schedule of audies

2. Completed Audit check Lists

3. Summaries of corrective action agreed upon.

4. Monthly Audie Reports.

56

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The Audit Check List will be used as the basis for each Audit.

The topics covered by chis List are as follows:

n.

w.

vn.

AUDIT CHECK List

Does the Leader of the scientific unit has the required

basic docunents? (Described in Section V of North West Coast

Project Quality Assurance Progr:

Data Confidence

*) Are samples protected from toss, contamination oF change

») Is the calibration of instrunents adequate?

©) Is there statistical treatment of data where applicable?

@) bre data self-consistent; if not why?

©) Are the samples preserved carefully where needed?

1) Ave che data kept carefully; log-books titled, dated and

signed?

Is the Program progressing according to schedule?

Is tine scheduted for writing reports?

Are report deadlines being met?

Review corrective action

---Page Break---

AUDIT cHECK List

(sample)

SCIENTIFIC UNIT

ee

SCIENTIST 1N CHARGE

T+ Boes the leader of the scientific unit has the required basic

?ocuments a5 described in Section V of the North Vest Coast

Project Quality Assurance Progran?

TL. data conti

As Are samples protected from

1. tos

2. Contamination

3. Change

B. Is calibration of instruments adequate?

1. Instruments calibrated at unit, List:

Date Last Calibration

Instrument Calibrated Interval

---Page Break---

2. Instruments requiring outside calibration:

Date Last

Calibration

Instruzent

Interval

?Are calibration dates and intervals on individual

Instruments?

ST there statistical treatment of data vhere applicable?

Re: Section 5.16.3 of PREPA specifications

>.

Are data self-consistent?

If not, why?

=

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Are samples preserved carefully after study where

necesary?

Are data kept carefully?

1, Log books titted and dated?

2. Entries dated?

3. Entries signee?

---Page Break---

111, 19 the program progressing according to schedule?

VIZ, Is time scheduled for writing reports?

VITI. Are report deadlines being met?

mK,

1, Corrective action and date of agreenent.

2. Current status of corrective action.

3 Further recommendat ion:

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QUALITY ASSURANCE MEMORANDA

(Quality Assurance Menoranda will be distributed

5 it develops to all QA Manual holders, for

incorporation in the same).

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