Supplement

to the

Application for Certification

for the

Russell City Energy Center

Hayward, California

01-AFC-7

Submitted to the

California Energy Commission

Submitted by

Calpine/Bechtel Joint Development

June 2001

CONTENTS

1. INTRODUCTION

This supplement to Calpine/Bechtel's Application for Certification (AFC) for the Russell City Energy Center (01-AFC-7), responds to comments that California Energy Commission (CEC) Staff have made with respect to data adequacy on data adequacy worksheets submitted to Calpine/Bechtel. The format for this supplement follows the order of the AFC, with comments on Electrical Transmission (Chapter 6.0), Air Quality (Chapter 8.1), Cultural Resources (Chapter 8.3), Hazardous Materials Handling (Chapter 8.5), Noise (Chapter 8.7), Socioeconomics (8.10), Visual Resources (Chapter 8.13), and Water Resources (Chapter 8.15). Discussion of the data adequacy worksheet for Soil and Water Resources (6-month) follows the Water Resources section, since comments in this worksheet have to do with water resources and repeat the questions posed in the 12-month Water Resources data adequacy worksheet. Only sections for which CEC Staff posed requests or questions related to data adequacy are addressed in this supplement. If the request asked for additional appended material, it is included at the end of each section.

6.0 ELECTRICAL TRANSMISSION

*1. **Power Flow Diagram (6-month expedited process [§2022(b)(3)(A)]):***

An interconnection study identifying the electrical system impacts and a discussion of the mitigation measures considered and those proposed to maintain conformance with NERC, WSCC, Cal-ISO or other applicable reliability or planning criteria based on load flow, post transient, transient, and fault current studies performed by or for the transmission owner in accordance with all applicable Cal-ISO or other interconnection authority's tariffs, operating agreements, and scheduling protocols.

Information required to make AFC conform with regulations:

Provide power flow diagram for normal conditions, with and without the project, and for contingencies, which caused a criteria violation.

Provide a discussion of the mitigating measures considered and those proposed for criteria violations.

Response—Power flow diagrams for normal conditions, with and without the project, are provided at the end of this section. We used the 996/1129 A ratings originally provided for the San Mateo-Eastshore line in the model rather than the ratings that may materialize from PG&E's ongoing assessment. These will be updated as information becomes available.

On Monday, June 11, 2001, Dan Wood of Utility System Efficiencies, Inc. confirmed with Al McCuen of the CEC via telephone that submission of these power flow diagrams provides sufficient information for the Transmission System Engineering component of the AFC to be declared data adequate. Per this telephone conversation, no discussion of mitigating measures will be required for data adequacy.

*2. **Power Flow Diagrams (12-month process [Appendix B(b)(2)(C)]):***

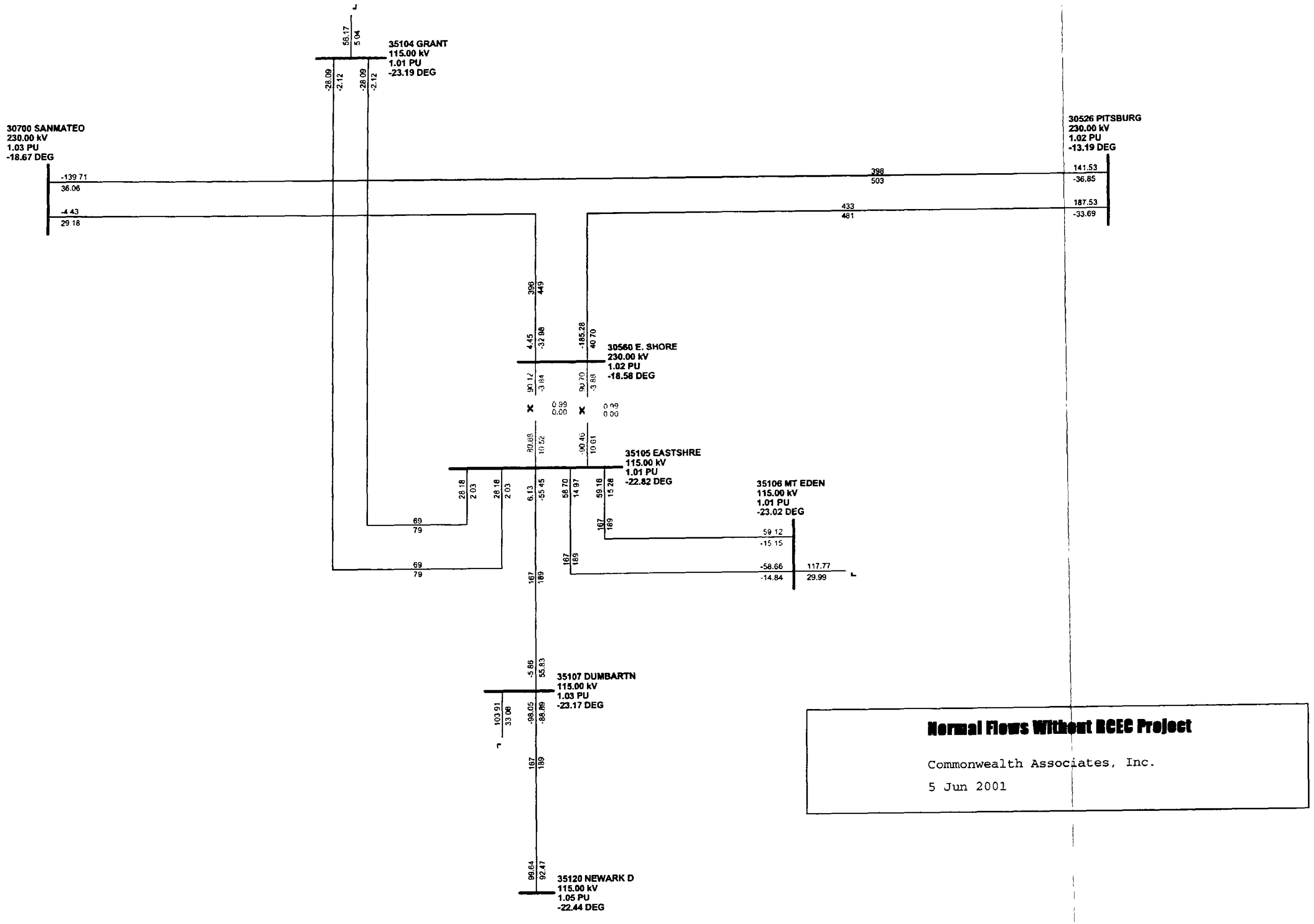
A detailed description of the design, construction, and operation of any electric transmission facilities, such as power lines, substations, switchyards, or other transmission equipment, which will be constructed or modified to transmit electrical power from the proposed power plant to the load centers to be served by the facility. Such description shall include the width of rights of way and the physical and electrical characteristics of electrical transmission facilities such as towers, conductors, and insulators. This description shall include power load flow diagrams which demonstrate conformance or nonconformance with utility reliability and planning criteria at the time the facility is expected to be placed in operation and five years thereafter;

Information required to make AFC conform with regulations:

Provide power flow diagrams for normal conditions, with and without the project, and for contingencies, which caused a criteria violation.

Response—See 6-month data adequacy response above.

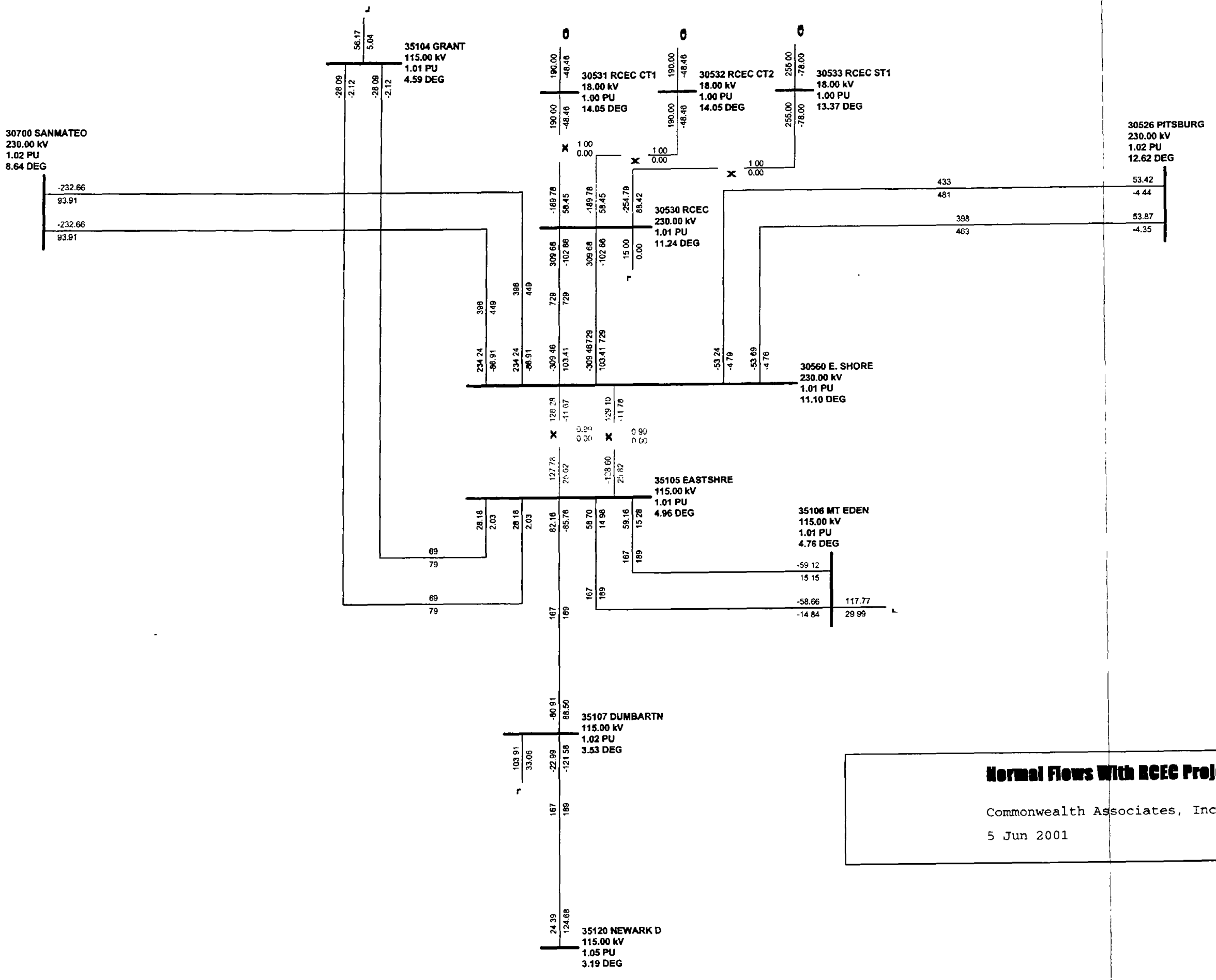
POWER FLOW DIAGRAMS



Normal Flows Without RCEC Project

Commonwealth Associates, Inc.

5 Jun 2001



Normal Flows With RCEC Project

Commonwealth Associates, Inc.

5 Jun 2001

8.1 AIR QUALITY

1. Cumulative Impact Analysis (6-month expedited process [§2022(b)(2)(A)])

A detailed modeling analysis assessing whether the cumulative impacts of all inert criteria pollutants (NOx, SO2, CO, and PM10) from the project's typical operating mode in combination with all stationary emissions sources within a six-mile radius of the proposed site that have received construction permits, but are not yet operational, and all stationary emissions sources that are currently undergoing air district permit application review will cause or contribute to a violation of any ambient air quality standard.

Information required to make AFC conform with regulations:

Appendix 8.1H is a cumulative impact analysis protocol. Please provide the completed cumulative impact analysis.

Response—A source emissions inventory was obtained from BAAQMD for the area surrounding the Russell City Energy Center (RCEC). BAAQMD identified a total of 17 facilities within 8 miles, or 12.9 kilometers, of the RCEC location at UTM coordinates 576,900 meters east and 4,165,400 meters north, that hold Authority to Construct permits but which have not yet commenced operation. Out of the 17 facilities identified, six were included in the multi-source modeling analysis. The remaining facilities are permitted only VOC emissions and were not included in the analysis. This six modeled facilities with PM, SO_2, NO_X, or CO emissions as shown below. The BAAQMD inventory printout is attached.

Plant ID	Facility Name	UTM Coord. (km)		Emissions (tons/year)			
		East	North	PM	NO_X	SO_X	CO
1209	Union Sanitary District	580,423	4,160,817	0.6	7.2	2.2	19.2
2815	Tuscarora Inc	577,279	4,165,336	0.0	0.8	0.0	1.2
3255	Bay Equip & Repair	577,633	4,165,381	1.8	0.0	0.0	0.0
7688	Emerald Packaging	585,470	4,161,765	0.2	3.1	0.0	12.3
12574	Cal Hi Tec Finishing	577,287	4,167,692	0.0	0.3	0.0	0.1
12687	Container Recycling	585,371	4,161,557	26.0	0.4	0.0	4.5

Each multi-source facility was conservatively modeled with ISCST3 as a low single stack (10 meters high) with negligible plume rise (ambient temperature, 0.01 m/s exit velocity, and a 0.1 meter stack diameter) at the facility location provided. Modeled emissions were based on 8760 hours/year of operation (i.e., 0.126 g/s per lb/hour x tons/year x 2000 lbs/ton / 8760 hours/year). NO_X emissions were modeled with ISC3OLM to determine 1-hour NO_2 concentrations based on the Ozone Limiting Method and annual ISCST3 NO_2 concentrations were assumed to be 75% of the annual NO_X concentrations modeled with ISCST3 based on the Ambient Ratio Method.

The facilities were modeled with the coarse, downwash, and facility fenceline receptor grids modeled earlier for the facility. In addition, fine 30-meter receptor grids were placed around all of the multisource facilities, which extended at least 200 meters in all directions. The methodology calls for maximum concentrations modeling to be refined with 30-meter receptor grids if the maximum concentrations are

located in the coarse receptor grid. For this analysis, this step was unnecessary since all maximum modeled concentrations occurred in the 30-meter multisource fine grid, the 30-meter facility downwash grid, or along the RCEC fenceline. Maximum modeled locations were verified to occur well within the edges of the 30 meter spaced receptor grids when appropriate. Results of the multisource analysis were added to maximum background concentrations and compared to state and federal ambient air quality standards.

Maximum modeled 1-hour CO and NO_2 concentrations are due to RCEC emissions and occur on the RCEC fenceline and 30-meter downwash grids, respectively. Maximum modeled concentrations for other pollutants and averaging times are caused by other facilities and occur in the 30-meter fine grids placed around each multisource facility. Maximum modeled 8-hour CO, annual NO_2, and SO_2 concentrations are due to Union Sanitary District emissions and occur near this facility. Maximum modeled PM_{10} concentrations are due to Container Recycling Alliance emissions and occur near this facility. As described earlier, 1-hour and annual NO_2 modeled concentrations are based on the Ozone Limiting Method (using ISC3OLM) and Ambient Ratio Method (using 75%), respectively.

These maximum modeled concentrations are added to maximum background concentrations and then compared to the state and federal ambient air quality standards. The maximum ambient (modeled plus background) concentrations are less than the applicable standards for all pollutants except PM_{10}. For PM_{10}, 24-hour and annual modeled concentrations exceeded the state and federal ambient air quality standards. The modeling indicates that Container Recycling Alliance emissions are responsible for over 99% of the maximum modeled PM_{10} concentrations. RCEC's contributions to the modeled PM_{10} exceedances are less than the significant impact levels for all modeled receptors. Therefore, RCEC is not considered to cause or contribute to the modeled PM_{10} exceedances.

Pollutant	Averaging Time	Maximum Multi-source Concentration ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Ambient Concentration ($\mu g/m^3$)	RCEC Contribution ($\mu g/m^3$)	State Standard ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)
NO_2	1-hour	169.0	206.8	376	169.0	470	-
	Annual	10.4	41.5	52	0.018	-	100
SO_2	1-hour	116.6	104.8	221	0	650	-
	3-hour	74.49	52	126	0	-	1300
	24-hour	18.8	18.4	37	0	109	365
	Annual	4.22	5.3	9.5	0.002	-	80
CO	1-hour	1230.6	6440	7671	1230.6	23,000	40,000
	8-hour	415.9	3617	4033	0	10,000	10,000
PM_{10}	24-hour	292.2	88	380	0.071	50	150
	Ann.Geo.	60.1	21.9	82.0	0.060	30	-
	Ann.Arith.	60.1	24.3	84.4	0.060	-	50

2. Initial Commissioning Phase (6-month expedited process [§2022(b)(2)(B)]):

A description of the project's planned initial commissioning phase, which is the phase between the first firing of emissions sources and the consistent production of electricity for sale to the market, including the types and durations of equipment tests, criteria pollutant emissions, and monitoring techniques to be used during such tests, and air dispersion modeling analyses of the impacts of those emissions on state and federal ambient air quality standards for NO2, SO2, CO, and PM10.

Information required to make AFC conform with regulations:

Please provide a description of the projects planned initial commissioning phase including the type and duration of equipment tests, proposed monitoring to be used during such tests. estimates of all criteria pollutant emissions, and air dispersion modeling analyses of the impacts of those emissions on state and federal ambient air quality standards for NO2, SO2, CO, and PM10.

Response—Turbine commissioning emissions data and air quality modeling results are presented in the application. No violations of ambient air quality standards were predicted. The types and lengths of the source tests that Calpine/Bechtel will perform during the commissioning process for the selected Siemens-Westinghouse combustion turbines are not available at this time. However, the total time duration between first fire of the first CT and Source Testing will not exceed 300 hours. The CEC provided data with regards to commissioning, but this was for a GE-type turbine, and may not be precisely applicable to the Westinghouse engine.

The BAAQMD has established permit conditions for turbine commissioning for both the Calpine/Bechtel Delta Energy Center (DEC) and Metcalf Energy Center (MEC) projects. The same conditions are proposed for the Russell City Energy Center project. The following data was specifically developed for the Siemens-Westinghouse turbines to be used in all three projects.

Proposed Conditions for the Commissioning Period:

1. The owner/operator of the Russell City Energy Center (RCEC) shall minimize emissions of carbon monoxide and nitrogen oxides from the Gas Turbines and Heat Recovery Steam Generators (HRSGs), to the maximum extent possible during the commissioning period. The commissioning period is comprised of several equipment tests. The commissioning period shall not extend beyond 300 hours.

2. At the earliest feasible opportunity in accordance with the recommendations of the equipment manufacturers and the construction contractor, the combustors of the Gas Turbines and the Heat Recovery Steam Generators, shall be turned to minimize the emissions of carbon monoxide and nitrogen oxides.

3. At the earliest feasible opportunity in accordance with the recommendations of the equipment manufacturers and the construction contractor, the SCR Systems shall be installed, adjusted, and operated to minimize the emissions of carbon monoxide and nitrogen oxides from the Gas Turbines and the Heat Recovery Steam Generators.

4. The owner/operator of RCEC shall submit a plan to the District Permit Services Division and the CEC CPM at least four weeks prior to first firing of the Gas Turbines describing the procedures to be

followed during the commissioning of the turbines, HRSGs, and steam turbine. The plan shall include a description of each commissioning activity, the anticipated duration of each activity in hours, and the purpose of the activity. The activities described shall include, but not be limited to, the tuning of the Dry-Low-NOx combustors, the installation and operation of the SCR systems and oxidation catalysts, the installation, calibration, and testing of the CO and NOx continuous emission monitors, and any activities requiring the firing of the Gas Turbines and HRSGs, without abatement by their respective SCR Systems.

5. During the commissioning, the owner/operator of RCEC shall demonstrate compliance with conditions 7 through 9 and 11 through the use of properly operated and maintained continuous emission monitors and data recorders for the following parameters:

   firing hours
   fuel flow rates
   stack gas nitrogen oxide emission concentrations
   stack gas carbon monoxide emission concentrations
   stack gas oxygen concentrations

   The monitored parameters shall be recorded at least once every 15 minutes (excluding normal calibration periods or when the monitored source is not in operation) for the Gas Turbines and HRSGs. The owner/operator shall use District-approved methods to calculate heat input rates, nitrogen dioxide mass emission rates, carbon monoxide mass emission rates, and NO_x and CO emission concentrations, summarized for each clock hour and each calendar day. All records shall be retained on site for at least 5 years from the date of entry and made available to District personnel upon request.

6. The District-approved continuous monitors specified in condition 5 shall be installed, calibrated, and operated prior to first firing of the Gas Turbines and Heat Recovery Steam Generators. After first firing of the turbines, the detection range of these continuous emission monitors shall be adjusted as necessary to accurately measure the resulting range of CO and NOx emission concentrations. The type, specifications, and location of these monitors shall be subject to District review and approval.

7. The total number of firing hours of a Gas Turbine and Heat Recovery Steam Generator without abatement of nitrogen oxide emissions by the SCR System shall not exceed 300 hours during the commissioning period. Such operation of a Gas Turbine and HRSG without abatement shall be limited to discrete commissioning activities that can only be properly executed without the SCR system in place. Upon completion of these activities, the owner/operator shall provide written notice to the District Permit Services and Enforcement Divisions and the unused balance of the 300 firing hours without abatement shall expire.

8. The total mass emissions of nitrogen oxides, carbon monoxide, precursor organic compounds, PM_{10} and sulfur dioxide that are emitted by the Gas Turbines and Heat Recovery Steam Generators during the commissioning period shall accrue towards the consecutive twelve-month emission limitations specified in the permit application.

9. Prior to the end of the Commissioning Period, the Owner/Operator shall conduct a District- and CEC-approved source test using external continuous emission monitors to determine compliance the emission limits specified during commissioning. The source test shall determine NO_x, CO, and POC emissions during start-up and shutdown of the gas turbines. The POC emissions shall be analyzed for methane and ethane to account for the presence of unburned natural gas. The source test shall include a minimum of three start-up and three shutdown periods. Twenty calendar days before the execution of the source tests, the Owner/Operator shall submit to the District and the CEC Compliance Program Manager (CPM) a detailed source test plan designed to satisfy the requirements of this condition. The district and the CEC CPM will notify the Owner/Operator of any necessary modifications to the plan within 20 working days of receipt of the plan; otherwise, the plan shall be deemed approved. The Owner/Operator shall incorporate the District and CEC CPM comments into the test plan. The Owner/Operator shall notify the District and the CEC CPM within the seven (7) working days prior to the planned source testing date. Source test results shall be submitted to the District and the CEC CPM within 30 days of the source testing date.

3. BAAQMD Determination of Compliance (12-month process [Appendix B(g)(8)(A)]):

The information necessary for the air pollution control district where the project is located to complete a Determination of Compliance.

Information required to make AFC conform with regulations:

On June 1st Mike Ringer (CEC) spoke to Ken Lim (BAAQMD) who indicated that BAAQMD had yet to receive a permit application. Please provide a letter from the BAAQMD indicating that they have all information necessary to complete a DOC.

Response—BAAQMD received Calpine/Bechtel's Authority to Construction ATC) application for the Russell City Energy Center on May 30th. The BAAQMD ruled the application data adequate on June 11th, 2001. A copy of the BAAQMD letter documenting receipt of the ATC application and its data adequacy is attached.

BAAQMD NEW FACILITY INVENTORY

BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

April 26, 2001

RTP Enviromental Associates Inc.
7752 Fay Avenue, Suite C
La Jolla, California 92037

Attention: Mr. Gregory Darvin

Subject: Calpine Russel City Project Request for Source Emission Inventory

Dear Mr. Darvin:

Enclosed are two printouts of criteria emission from stationary sources located within an eight mile radius of the site specified (UTM km 576.900E, 4165.400N). The first list contains the criteria emissions of seventeen facilities that have an Authority to Construct, but have not commenced operation. These emissions are potential to emit and may not reflect the future actual operating emissions. Individual stack parameters are not available for these facilities.

The second printout contains the criteria emission for 374 existing facilities. This list shows the emissions by individual sources and where available, the typical stack parameters and UTM coordinates. The individual source data units are as follows: Emissions in pounds per day, Stack height in feet, Stack cross section area in square feet, Gas temperature in degree Fahrenheit, Gas flow in actual cubic feet per minute, and UTM in kilometers. The -8888 character should be interpreted as "no data available".

If you have any questions on this matter please call me at **(415) 749-4683.**

Very truly yours,

Gene Willner
Air Quality Engineer II

:cswEnclosures (2)

	PART	ORG	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	.0	.7	.0	.0	.0

****

Plant No.: 7688 [5.78 miles from the point spec] 585.470E 4161.765N

Emerald Packaging Inc
33050 Western Avenue
Union City, CA 94587

	PART	ORG	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	.2	.0	3.1	.0	12.3

****

Plant No.: 11677 [6.26 miles from the point spec] 571.878E 4174.140N

Treasure Chest Advertising Co, Inc
1345E Doolittle Drive
San Leandro, CA 94577

	PART	ORG	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	.0	.0	.0	.0	.0

****

Plant No.: 11816 [.26 miles from the point spec] 576.950E 4165.810N

Xtra Lease Inc
3600 Depot Road
Hayward, CA 94545

	PART	ORG	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	.0	4.1	.0	.0	.0

****

Plant No.: 11984 [1.54 miles from the point spec] 578.224E 4167.503N

Jack's Cleaners & Shirt Laundry
1214 W Winton Street
Hayward, CA 94544

	PART	ORG	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	.0	.7	.0	.0	.0

****

Plant No.: 12068 [4.61 miles from the point spec] 580.386E 4171.952N

Francis Refinishing
2620 Norbridge Avenue
Castro Valley, CA 94546

	PART	ORG	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	.0	.8	.0	.0	.0

****

Plant No.: 12115 [4.30 miles from the point spec] 583.649E 4163.863N

Spectrum Label Corporation
30803 San Clemente
Hayward, CA 94544

	PART	O	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	.0	.7	.0	.0	.0

****

Plant No.: 7688 [5.78 miles from the point spec] 585.470E 4161.765N

Emerald Packaging Inc
33050 Western Avenue
Union City, CA 94587

	PART	ORG	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	.2	.0	3.1	.0	12.3

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Plant No.: 11677 [6.26 miles from the point spec] 571.878E 4174.140N

Treasure Chest Advertising Co, Inc
1345E Doolittle Drive
San Leandro, CA 94577

	PART	ORG	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	.0	.0	.0	.0	.0

****

Plant No.: 11816 [.26 miles from the point spec] 576.950E 4165.810N

Xtra Lease Inc
3600 Depot Road
Hayward, CA 94545

	PART	ORG	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	.0	4.1	.0	.0	.0

****

Plant No.: 11984 [1.54 miles from the point spec] 578.224E 4167.503N

Jack's Cleaners & Shirt Laundry
1214 W Winton Street
Hayward, CA 94544

	PART	ORG	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	.0	.7	.0	.0	.0

****

Plant No.: 12068 [4.61 miles from the point spec] 580.386E 4171.952N

Francis Refinishing
2620 Norbridge Avenue
Castro Valley, CA 94546

	PART	ORG	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	.0	.8	.0	.0	.0

****

Plant No.: 12115 [4.30 miles from the point spec] 583.649E 4163.863N

Spectrum Label Corporation
30803 San Clemente
Hayward, CA 94544

	PART	ORG	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	.0	16.5	.0	.0	.0

****

Plant No.: 12520 [.70 miles from the point spec] 577.405E 4164.398N

Zyomyx Inc
3911 Trust Way
Hayward, CA 94545

	PART	ORG	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	.0	1.3	.0	.0	.0

****

Plant No.: 12574 [1.44 miles from the point spec] 577.287E 4167.692N

Cal Hi Tec Finishing LLC
1680 W Winton Ave, Unit #1
Hayward, CA 94545

	PART	ORG	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	.0	1.9	.3	.0	.1

****

Plant No.: 12687 [5.78 miles from the point spec] 585.371E 4161.557N

Container Recycling Alliance
33333 Western
Union City, CA 94587

	PART	ORG	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	26.0	.2	.4	.0	4.5

****

Plant No.: 12838 [2.25 miles from the point spec] 577.783E 4168.916N

A & H Gas c/o Portico, Inc
20450 Hesperian Blvd
Hayward, CA 94540

	PART	ORG	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	.0	.1	.0	.0	.0

****

Plant No.: 12980 [.48 miles from the point spec] 576.971E 4166.175N

Vuteq Corporation
3624 Munster Avenue
Hayward, CA 94545

	PART	ORG	NOX	SOX	CO
EMISSION TOTALS TONS/YEAR	.0	2.7	.0	.0	.0

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Total Number of Facilties Found 17

BAAQMD LETTER DOCUMENTING
RECEIPT OF INFORMATION FOR PERMIT APPLICATION REVIEW

BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

June 11, 2001

Mr. Steve Larson
Executive Director
California Energy Commission
1516 Ninth Street
Sacramento CA 95814

Dear Mr. Larson:

This is to inform you that we have completed our initial review of the Application for Certification (AFC) that was submitted by Calpine/Bechtel Joint Development for the Russell City Energy Center. In accordance with the requirements of Bay Area Air Quality Management District Regulation 2-3-402, we have determined that the AFC contains sufficient information for the District to undertake a Determination of Compliance review.

If you have any questions, please contact me at Tel: (415) 749-4708, Fax: (415) 749-5030, or E-mail: wlee@baaqmd.gov.

Very truly yours,

Wayman Lee, PE
Air Quality Engineer
Permit Services Division

cc: James R. Leaky, Development Manager, Calpine/Bechtel Joint Development
RTP Environmental Associates, Inc.

8.3 CULTURAL RESOURCES

1. Changes in LORS (6-month expedited process [§2022(b)(1)(C)]):

Where a standard, ordinance, or law is expected to change between the time of filing an application and certification, information from the responsible jurisdiction documenting the impending change, the schedule for enactment of the change, and whether the proposed project will comply with the changed standard, ordinance, or law.

Information required to make AFC conform with regulations:

Please identify any ordinance or law that is expected to change and whether the project will comply with the changes. If no standards, ordinances or laws apply, please make that statement.

Response—Foster Wheeler Environmental staff contacted the Advisory Council on Historic Preservation (ACHP) to determine if there would be any changes in applicable federal laws, ordinances, regulations, and standards pertaining to historic properties that may have an effect on the Russell City Energy Project. Ron Anzelone, of the Washington, D.C. ACHP office, was contacted on June 15, 2001. He said he did not foresee any upcoming changes in the laws. He did mention President's Executive Order 13212 would establish an interagency task force chaired by Council on Environmental Quality. This task force will look at any necessary streamlining of all environmental review requirements that would be required for power projects. Foster Wheeler staff also contacted Mr. Clarence Caesar of the California Office of Historic Preservation on June 18, 2001 to determine whether or not there might be laws, ordinances, regulations, or standards at the state level that would change in the near future. Mr. Caesar, similarly, did not foresee any such changes.

2. Personnel Qualifications (12-month process [Appendix B(g)(2)(B)]):

A description of all literature searches and field surveys used to provide information about known cultural resources in the project vicinity. If survey records of the area potentially physically affected by the project are not available, and the area has the potential for containing significant cultural resources, the applicant shall submit a new or revised survey for any portion of the area lacking comprehensive survey data. A discussion of the dates of the surveys, methods used in completing the surveys, and the identification and qualification of the individuals conducting the surveys shall be included.

Information required to make AFC conform with regulations:

Please identify and provide the qualifications (resumes) for the members of the project team who conducted the drive-by architectural reconnaissance.

Response—Andrew Gorman and Douglas Davy, Ph.D., of Foster Wheeler Environmental Corporation conducted architectural reconnaissance for the RCEC project. Andrew Gorman's resume has been provided in Appendix 8.3-A of the AFC. Douglas Davy's resume is included at the end of this section.

3. Historically Significant Structures (12-month process [Appendix B(g)(2)(C)]):

A discussion of the sensitivity of the project area described in subsection (g)(2)(A) and the presence and significance of any known archeological sites and other cultural resources that may be affected by the project. Information on the specific location of archeological resources shall be included in a separate

appendix to the application and submitted to the Commission under a request for confidentiality pursuant to Title 20, California Code of Regulations, § 2501 et seq.

Information required to make AFC conform with regulations:

Please identify the location of any buildings, features or objects that may be older than 45 years that are adjacent to the project or the linears (one property deep).

Response—The project team conducted a drive-by-architectural reconnaissance to determine whether any potentially significant historic architecture is located within the project APE. In addition, USGS 1994 digital orthophoto aerial photographs and historical aerial photographs dated 1946, 1958, and 1969 were compared and examined against historic USGS topographic maps for buildings or structures adjacent to the Russell City Energy Center and linear alignments that might have survived redevelopment in the Hayward Industrial Corridor, which took place largely during in the 1960s, 1970s, and 1980s. The USGS topographic maps examined were the San Leandro 1947 and 1959 (revised 1968) quadrangle maps for the RCEC project site and the 1942 and 1946 Hayward quadrangles for the natural gas pipeline and electrical transmission line.

The drive-by and map examination showed that showed that the City of Hayward Water Pollution Control Facility (WPCF) was constructed in 1954, making it 47 years old. Most of the plant's treatment works, however, were constructed during the 1980s (Alex Ameri, Deputy Director of Public Works for Utilities, City of Hayward, personal communication, June 14, 2001). There are no other buildings or structures older than 45 years old in lots adjacent to the project or project facilities.

The 1942 and 1946 USGS Hayward 7.5-minute maps and the 1946 aerial photograph show a dirt road in the same location as today's Enterprise Avenue extending west from what is now the intersection of Enterprise Avenue and Clawiter Road. In 1946, there were farmsteads on the northwest and southwest corners of this intersection. In the 1950 edition of the Hayward quadrangle, only the two structures on the south side of the dirt road still remain. The 1959 USGS Hayward map shows only one structure remaining. Enterprise Avenue is shown as an improved street, rather than dirt road. By the time of the 1969 aerial photograph, industrial infilling has begun. The 1994 aerial photographs show that recent industrial developments have replaced any earlier structures.

The 1946 USGS Hayward topographic quadrangle and the 1946, 1958, and 1969 aerial photographs were reviewed to examine the area along the project electrical transmission line between the RCEC and the Eastshore Substation. The photographs show a farmstead located off of Eden Landing Road south of State Route 92 in 1946 and 1958. By 1969 (aerial photograph) the widening of State Route 92 and construction of the Clawiter Road/Eden Landing Road overpass had encroached on the farmstead, though some structures remained. The 1994 aerial photograph shows that these structures have been replaced by industrial buildings along Investment Drive.

CULTURAL RESOURCES RESUME

D.M. Davy, Ph.D.

Douglas M. Davy, Ph.D.

Supervising Cultural Resources Scientist

EXPERIENCE SUMMARY

Twenty years of experience in cultural resources management, including prehistoric and historic archaeology, traditional cultural properties, and historic architecture and engineering. Fifteen years experience as a manager of archaeological field projects in support of regulatory compliance programs for energy, transportation, mineral and water resources development, and hazardous materials management projects.

EDUCATION

Ph.D., Archaeology, Southern Illinois University, Carbondale, 1982
M.A., Ethnology, Southern Illinois University, Carbondale, 1978
B.A., Anthropology, University of California, Santa Cruz, 1970

TRAINING

General Services Administration, Federal Projects and Historic Preservation Law
Project Management Training, Series 100 and 200, Foster Wheeler Environmental Corporation
Hazardous Waste Operations and Emergency Response, OSHA 29-CFR 1910.120

CERTIFICATION

Register of Professional Archaeologists, 1999 (SOPA since 1985)

REPRESENTATIVE PROJECT EXPERIENCE

Statewide Historic Buildings and Structures Inventory, DoD Installations, State of California; U.S. Army Corps of Engineers, Sacramento District. Project Manager for inventory and overview of buildings and structures surveys for 93 military bases in California. Project involved literature search and historic context development for California as a region and for the Cold War and Korean War periods and a compilation of all historic buildings and structures at California military bases.. The resulting report will be used as a guide for all future historic buildings and structures inventories in California. Project review committee included representatives of the four military service branches, State Historic Preservation Office, Advisory Council on Historic Preservation, and National Park Service. This project was awarded the Governor's Preservation Award in 2001.

Benicia Army Cemetery Historic Resources Management Plan; U.S. Army Corps of Engineers - Project Manager for Historic Resources Management Plan and public interpretation plan for Benicia Army Cemetery, the oldest U.S. military post cemetery in the Pacific States. Directed archival research program at National Archives. Prepared a public interpretive program for the cemetery.

Douglas M. Davy, Ph.D.

Deseret Chemical Depot Integrated Cultural Resources Management Plan; US Army Corps of Engineers – Project Manager to prepare Integrated Cultural Resources Management Plan for Deseret Chemical Depot, Utah. Reviewed historic and archaeological resources including historic buildings and structures and prehistoric and historic archaeological sites. Prepared a cultural resources management planning guide for the installation.

Historic Buildings and Structures Inventories, California Marine Corps Installations; US Army Corps of Engineers – Project Manager for historic buildings and structures inventory of all remaining uninventoried historic buildings and structures at US Marine Corps installations in California. Installations included Camp Pendleton and Marine Corps Air Ground Combat Center, Twentynine Palms.

Historic and Archaeological Resources Protection Plan, Naval Weapons Station, Seal Beach and Fallbrook Detachment; US Army Corps of Engineers – Project Manager for a revised Historic and Archaeological Resources Protection (HARP) Plan for Naval Weapons Station, Seal Beach and Fallbrook Detachment. Plan includes consideration of all historic buildings and structures and historic and prehistoric archaeological sites on the installations.

Eastern Transportation Corridor; Transportation Corridor Agencies - Project Archaeologist for 24-mile-long multi-lane toll road in Orange County, California. Directed construction monitors, consulted with 5 Native American Tribes, prepared Archaeological Resources Management Plan, and managed test excavation and laboratory analysis program to determine National Register eligibility of 22 archaeological sites discovered during construction. Directed scientific data recovery excavations to mitigate potential impacts to prehistoric rockshelter site and three deeply buried archaeological deposits discovered during construction.

Northend Landfill Capping and Shoreline Protection Project; Naval Ordnance Center Pacific Division, U.S. Navy Engineering Field Activity Northwest - Project Archaeologist for landfill capping and shoreline protection project. Conducted test investigations to determine National Register eligibility of prehistoric shell midden site, consulted with 5 Native American tribes, prepared Archaeological Resources Treatment Plan and Memorandum of Agreement for data recovery to mitigate adverse effects on a prehistoric archaeological site. Directed scientific data recovery excavation as a mitigation measure at buried site in tidal zone.

Devil's Nose/Cross County WaterPower Project FERC License Application; Amador County Water Resources Agency - Project Manager for cultural resources field inventory, National Register criteria evaluation, and Native American consultation, for a 121-MW water supply reservoir and hydroelectric project involving a 1,000-acre reservoir in central California. Recorded archaeological sites and conducted scientific field program to determine their eligibility for listing on the National Register of Historic Places. Coordinated cultural resources management activities with U.S. Forest Service, Office of Historic Preservation, Native American tribes, and other agencies.

Douglas M. Davy, Ph.D.

Vancouver to Sacramento Fiber Optic Conduit Installation Project; Worldwide Fiber Networks, Incorporated. Project archaeologist for fiber optic conduit installation project from Vancouver, British Columbia, to Sacramento, California. Managed literature search, field inventory, and site evaluation program for project permitting. Managed team of archaeological and Native American monitors for construction.

Historic Properties Survey of Selected Areas at Fort Peck Lake; U.S. Army Corps of Engineers, Missouri River Division - Project Manager for archaeological survey of 4,000 acres at Fort Peck Lake, eastern Montana as a technical study in support of the EIS for the Missouri River Master Water Control Manual. Recorded 49 archaeological sites and analyzed reservoir shoreline erosion effects on historic properties.

Stanford Oaks Golf and Residential Development; Landmark Land Company. Project Archaeologist and Project Manager for 1,100-acre golf course and residential community development. Recorded archaeological sites, and conducted archaeological excavations to evaluate the significance of 12 prehistoric and historic archaeological sites.

Thomes-Newville Reservoir Archaeological Survey; California Department of Water Resources - Archaeological Field Director for 20,000-acre archaeological survey for water supply reservoir in northwestern California. Directed field operations and recorded more than 200 archaeological and historic sites.

Regulatory Support Program; Federal Energy Regulatory Commission - Prepared Environmental Impact Statements and Environmental Assessments and conducted agency consultation to ensure compliance with Section 106 of the National Historic Preservation Act for hydroelectric projects in western United States in support of FERC staff. Prepared four major EISs and four EAs for hydroelectric projects in California, Oregon, Washington, Idaho, Nebraska, and Wisconsin. Prepared cultural resources portions of FERC's Licensing Handbook and Relicensing Handbook.

SOFAR Upper Mountain Project; SOFAR Management Authority - Project Archaeologist for 110-MW hydroelectric project involving two large and two small reservoirs in central California. Conducted archaeological survey, prepared cultural resources management and monitoring plans, directed Native American consultation study to identify traditional cultural properties. Consulted with U.S. Forest Service, State Historic Preservation Office, and Native American tribes.

Sly Park Flashboards EA; El Dorado Irrigation District - Project Archaeologist for National Register criteria evaluations of two prehistoric sites located on the shorelines of a reservoir in east-central California for reservoir expansion project. Planned and directed archaeological excavations to evaluate the sites, and prepared site evaluation report. Consulted with the Bureau of Reclamation, State Historic Preservation Office, and Native American tribes.

Douglas M. Davy, Ph.D.

Piñon Pine Power Project; Sierra Pacific Power Company - Project Archaeologist for historic properties survey and site evaluation program for a coal gasification project in west-central Nevada. Conducted field survey to identify sites, and directed test excavations to evaluate the National Register eligibility of a prehistoric archaeological site. Consulted with Native American tribe and State Historic Preservation Officer.

Power Plant Site Certification Program; California Energy Commission - Assessed impacts of 10 proposed power plants in southern, central and northern California on archaeological, historical, Native American heritage, and paleontological resources. Proposed licensing conditions for power plant site certification. Presented expert testimony at site certification hearings. Prepared handbook for applicants for preparing applications for licensing. Projects located in Kern, San Mateo, Contra Costa, Monterey, and Los Angeles (3), counties.

Columbia River System Operation Review EIS; Bonneville Power Administration - Prepared an EIS evaluating 21 alternatives for the reoperation of the 14 federal dams on the Columbia and Snake river systems. Analyzed potential effects of project operational alternatives on archaeological sites and Native American traditional cultural properties. Wrote computer program to analyze reservoir fluctuation effects on archaeological sites and authored data analysis chapters of technical appendix to EIS.

PUBLICATIONS AND PRESENTATIONS

Davy, D.M. 1999. Early Holocene buried sites in the Tustin Plain. Society for California Archaeology, Sacramento, California.

Davy, D.M., R. Herbert, and J. Carrier. 1998. A Regional and Interservice Approach to Historic Buildings and Structures Evaluation. *Proceedings of the National Defense Industrial Association.*

Davy, D.M. in press. Lt. Colonel James Louis Mason, Corps of Engineers, 1817-1853. *Periodical: The Journal of America's Military Past.*

Davy, D.M. 1995. Simulating reservoir effects on archaeological sites for the Columbia River System Operation Review. Annual Meeting of the Northwest Anthropological Conference.

Davy, D.M. and B.A. Ramos. 1994. A statistical analysis of Gunther Barbed projectile points from two Northern California sites. *Proceedings of the Society for California Archaeology* 7.

Davy, D.M. 1994. River flow regulation as a measure to mitigate the effects of a hydroelectric project on a cultural landscape. Annual meeting of the National Council on Public History.

Davy, D.M. 1980. Borrowed concepts: a comment on Rhoades. *American Antiquity* 45:346-349.

8.5 HAZARDOUS MATERIALS HANDLING

1. Hydrogen Storage (6-month expedited process [§2022(b)(2)(I)]):

A demonstration that the proposed facility will not require storage of gaseous flammable or explosive materials in quantities greater than 25,000 standard cubic feet;

Information required to make AFC conform with regulations:

While the application is data adequate it also indicates that the project does not comply with the requirements of the 6-month process. As proposed the project will involve storage of 95,000 scf of hydrogen.

Response—Calpine-Bechtel will comply with this requirement by purchasing and storing make-up hydrogen in cylinders rather than a tube trailer. The total hydrogen quantity stored at the site will remain below 25,000 standard cubic feet. The estimated maximum storage quantity is 10,000 scf. This quantity will be sufficient to supply make-up hydrogen for three weeks, based on a leakage rate equal to the manufacturer's guaranteed maximum leakage rate of 475 scf per day.

8.7 NOISE

1. Switchyard and Transmission Line Noise (12-month process [Appendix B(g)(4)(F)]):

The audible noise from existing switchyards and overhead transmission lines that would be affected by the project and estimates of the future audible noise levels that would result from existing and proposed switchyards and transmission lines. Noise levels shall be calculated at the property boundary for switchyards and at the edge of the rights-of-way for transmission lines.

Information required to make AFC conform with regulations:

Description of noise levels at right-of-way of new 1.1-mile length 230 kV transmission line. Description of whether project will result in changes in existing noise levels at PG&E Eastshore Substation.

Response—The 1.1-mile transmission line spanning from the RCEC to the Eastshore Substation is represented in Section 6.0 of the AFC as Cross Sections A1 and A2 for existing and post-RCEC construction transmission line configurations. An audible noise study was performed to assess existing (A1) and future (A2) noise levels generated by the transmission lines under worst-case conditions. Noise-level calculations were performed assuming line voltages of 121 kV (115kV plus five percent) for the existing conditions and 121 kV and 242 kV (230 kV plus five percent) for the future conditions after RCEC goes on-line. The highest levels of corona and, hence, audible noise will occur during rain events when the conductors are wet. Therefore, both scenarios assumed rainy conditions during the analysis.

Noise levels were modeled using ENVIRO, a program developed by the Electric Power Research Institute. Noise levels were calculated at a five-foot microphone height above flat terrain. Results from the study are depicted graphically in Figure 6.4-10 (existing conditions) and Figure 6.4-11 (conditions with RCEC on-line) in the AFC; the tabulated results are included in Appendix 6-L.

The transmission line right-of-way is 145 feet wide throughout the 1.1-mile corridor. The present alignment of the existing 115 kV transmission line is off-centered within the right-of-way, with the northeast edge of the right-of-way 40 feet from the centerline of the existing line. The proposed transmission line alignment will be centered in 145-foot wide corridor. These distances were used for the noise calculations. Results from the noise study indicate current and projected maximum audible noise levels of 46.2 dB (A) and 46.7 dB (A), respectively, at a distance of 70 feet from centerline, or the approximately the edge of the right-of-way.

The principle source of audible noise from electric transmission apparatuses is corona-associated noise from transmission lines, rather than substations. However, there is some noise associated with transformers in substations. Corona noise is a function of line voltage and conductor size. Because high-voltage transmission lines already exist within and near Eastshore substation and the voltage and conductors will not be changed, the audible noise from them will not increase as a result of RCEC going on-line. With the proposed radial connection of the RCEC, the Eastshore Substation will be expanded by adding additional breakers and bus work. No transformers will be added. There is little noise associated with a breaker unless it is operating (which occurs infrequently). The noise associated with the bus works is similar to that associated with a line. While the substation will expand as the result of additional equipment, the equipment will be similar to what already exists. This additional equipment will not be subject to increase in voltage or, where applicable, a change in conductor size and therefore,

will not generate additional noise. While noise quantification by analytical methods is beyond normal engineering practice, we expect any additional noise generated by new equipment to be masked by the existing sources.

8.10 SOCIOECONOMICS

1. Local Taxes (12-month process [Appendix B(g)(7)(A)(i)]):

The economic characteristics, including the economic base, fiscal resources, and a list of the applicable local agencies with taxing powers and their most recent and projected revenues.

Information required to make AFC conform with regulations:

Please provide a list of the applicable local agencies with taxing powers and their most recent and projected revenues.

Response— Table 8.10(s)-1 presents a summary of various tax revenues for the City of Hayward for the past fiscal year and projected revenue for the 2001-2002 fiscal year.

Table 8.10(s)-1. City of Hayward tax revenue summary

Revenue Source	1999-2000 Actual Revenue ($1,000)	2000-2001 Projected Revenue ($,1000)
Property Taxes	14,739	15,630
Sales Tax	29,484	32,900
Business Tax	1,812	1,800
Real Property Tax	3,815	4,900
Transient Occupancy Tax	1,367	1,400
Supplemental Improvement	1,798	1,700
Emergency Facilities Tax	1,727	1,700

Source: City of Hayward Finance Dept.

Following the deregulation of the California energy market in 1996 via AB 1890, there has been a shift between State and local control of property tax assessment for new power plants. Prior to passage of electricity deregulation legislation, electric generation, distribution, and transmission facilities were owned and operated by public utilities, and these facilities were subject to the State Board of Equalization (Board) assessment pursuant to Article XIII, Section 19 of the California Constitution. Following deregulation, however, the Board adopted Rule 905, under which the Board self-restricted its assessment jurisdiction to public utilities. County assessors were given assessment jurisdiction over any power plant built by a private company and any plant sold by a public utility to a private company after adoption of the rule in November 1999. Thus, under current practice, only public utilities are state-assessed.

There are differences in state-assessed (unitary) and county-assessed (local) property in the valuation method, revenue allocation, and value setting. Under State-assessed laws the valuation of a property is reassessed annually to determine a fair market value. For county-assessed properties, valuation is subject to the provisions of Article XIIIA of the California State Constitution, and fair market value is determined at acquisition, with no more than a 2% increase in valuation for each year. Revenues are allocated to all jurisdictions in the county for a State-assessed property, whereas for a County-assessed property, revenues are allocated to only jurisdictions in the tax rate area where the property is located.

The Board members set the value of a property for a State-assessed property, whereas the County Assessor has the responsibility of determining the value of a property if assessed by the County.

Assembly Bill 81 (AB 81) authored by assemblyman Migden titled, "Property Taxation: Assessment of Electric Generation Facilities" was passed by the California State Assembly, and is currently in the State Senate. With the successful passing of AB 81, a shift in responsibility for assessing electric generation facilities with a generation capacity of 50 megawatts or more from local County assessors to the State Board of Equalization will occur. This law will become effective on January 1, 2002 if chaptered during 2001.

Local property tax revenue distribution for both the State (Unitary) and County (local) systems was compiled. Detailed tables are included at the end of this section showing the tax revenue distribution under each system.

Table 8.10(s)-2 presents a summary of distribution through the local tax system, which is currently in effect for new power plants. These revenue data are for Tax Rate Area 25028 (not the whole county), which will contain the RCEC. The total property tax revenues in Tax Rate Area 25028 in 2000 were $7.8 million. The projected annual revenue contribution from the RCEC will range from $3.0 to $4.0 million, based on an estimated valuation range of $300 to $400 million and tax rate of 1.0065 percent. This contribution will significantly increase allocation amount to local agencies.

Table 8.10(s)-3 presents the property tax distribution for all of Alameda County based on the Unitary system. If AB 81 becomes effective, RCEC will likely be assessed and taxed by this system. As shown in the table, property taxes from the RCEC would be distributed to a much larger group of agencies throughout the entire county; therefore, the positive impact within the immediate community of the RCEC would be less significant. The total revenue generated by RCEC under this system would range from $3.9 to $5.1 million, based on a tax rate of 1.2841 percent.

PROPERTY TAX SUMMARY TABLES

Tabl 8.10(s)-2. Local property tax summary for Tax Rat Area 25028 ($)

Government Agency	Percent Allocation	2000 Property Tax Revenues	2001/2002 Projected Property Tax	RCEC Revenue Based on $300M Assessed Value	RCEC Revenue Based on $400M Assessed Value	RCEC Rev. Shifted to ERAF[1] based on $300M	RCEC Rev. Shifted to ERAF based on $400M	RCEC Rev. After ERAF Shift based on $300M	RCEC Rev. After ERAF Shift based on $400M
County of Alameda	35 08%	2,742,742	2,962,162	1,059,179	1,412,238	371,538	691,008	687,641	721,230
Chabot - Las Postitas Community College General	2.54%	198,497	214,377	76,655	102,206	1,946	2,595	74,709	99,611
Hayward Unified School District General	20.32%	1,588,835	1,715,942	613,569	818,092	124,678	166,238	488,890	651,854
School Institute of Pupils	0.17%	13,033	14,075	5,033	6,710	8	11	5,024	6,699
Juvenile Hall Education	0.03%	2,698	2,914	1,042	1,389	0	0	1,041	1,389
County Support School Service	0.10%	8,101	8,749	3,128	4,171	3	4	3,125	4,167
County Support School Capital	0.08%	6,242	6,741	2,410	3,214	2	3	2,409	3,211
School Development Center	0.10%	7,578	8,184	2,926	3,902	3	4	2,924	3,898
School Audio Visual Capital	0 02%	1,625	1,754	627	836	0	0	627	836
County Flood Control	0 21%	16,440	17,755	6,349	8,465	13	18	6,335	8,447
Flood Zone 4	1.29%	100,545	108,588	38,828	51,771	499	666	38,329	51,105
Bay Area Air Quality Management Dist.	0 21%	16 452	17,768	6,353	8,471	13	18	6,340	8,453
Mosquito Abatement	0.14%	10 968	11,845	4,236	5,647	6	8	4,230	5,639
AC Transit SV 1	5.26%	411 449	444,365	158,891	211,855	8,361	11,148	150,530	200,707
Bay Area Rapid Transit	0.62%	48,313	52,178	18,657	24,877	115	154	18,542	24,723
Hayward Area Rec & Park	10.11%	790,336	853,563	305,208	406,944	9,018	41,133	296,190	365,810
East Bay Regional Park 1	2.95%	231,023	249,505	89,215	118,954	18,531	3,515	70,684	115,439
City of Hayward	20.77%	1,624,115	1,754,044	627,193	836,257	130,277	173,702	496,916	662,555
TOTALS	**100%**	**7,818,991**	**8,444,510**	**3,019,500**	**4,026,000**	**665,014**	**1,090,225**	**2,354,486**	**2,935,775**

[1] ERAF - Educational Revenue Augmentation Fund

Source: Alameda County Tax Collector's Office

Table 8.10(s)-3. Unitary property tax summary f r Alameda County ($)

Government Agency	Percent Allocation	2000 Unitary Tax Revenues	2001/2002 Projected Tax Revenues	RCEC Revenue Based on $300M Assessed Value	RCEC Revenue Based on $400M Assessed Value	RCEC Rev. Shifted to ERAF based on $300M	RCEC Rev. Shifted to ERAF based on $400M	RCEC Rev. After ERAF Shift based on $300M	RCEC Rev. After ERAF Shift based on $400M
County of Alameda	28.23%	7,974 045	8,611 969	1,087,671	1,450,228	532,197	709,597	555,474	740,631
SPECIAL DISTRICTS:									
Alameda County Fire Department	0.75%	212,769	229,791	29,022	38,696			29,022	38,696
Alaco Fire Zone #1 (C.V.)	0.01%	2,144	2,315	292	390	25	33	267	356
Fairview	0.07%	18,403	19,875	2,510	3,347	549	733	1,961	2,614
Alaco Fire Zone #2, Remon	0.00%	118	128	16	22	4	6	12	16
Alaco Fire Zone #3, Castlewood	0.00%	892	964	122	162	33	44	88	118
Alaco Fire Zone #4, Happy Vly	0 00%	557		76	101			76	101
FLOOD CONTROL/SOIL & WATER CONSERVATION									
Alameda Co. Resource Cons	0.01%	2,043	2,207	279	372	44	59	235	313
Alameda Co. F.C. & W. C.	0.11%	30,078	32,485	4,103	5,470	1,632	2,176	2,471	3,295
Flood Zone 2	0 17%	48,199	52,055	6,574	8,766	3,058	4,078	3,516	4,688
Flood Zone 2A	0.01%	2,976	3,214	406	541	140	187	266	355
Flood Zone 3A	0.12%	32,760	35,380	4,468	5,958	1,476	1,968	2,993	3,990
Flood Zone 4	0.02%	5,421	5,854	739	986	255	340	484	646
Flood Zone 5	0.19%	52,587	56,794	7,173	9,564	3,914	5,218	3,259	4,346
Flood Zone 6	0.15%	41,522	44,844	5,664	7,552	1,953	2,605	3,710	4,947
Flood Zone 7	0.23%	65,245	70,465	8,900	11,866	3,544	4,725	5,356	7,141
Flood Zone 9	0.01%	1,857	2,005	253	338	125	167	128	171
Flood Zone 12	0.40%	112,141	121,112	15,296	20,395	4,534	6,045	10,762	14,350
Flood Zone 13	0 04%	12,132	13,102	1,655	2,206	179	239	1,476	1,968
Byron Bethany Irrigation	0.02%	5,250	5,670	716	955			716	955
HEALTH									
Alameda Co Mosquito Abute	0.11%	31,566	34 091	4,307	5,742	1,634	2,179	2,673	3,564
Bay Area Air Quality Management Dist.	0 18%	52,211	56,388	7,122	9,496			7,122	9,496
SANITARY									
E.B.M.U.D. Special Dist. #1	0 18%	49,836	53,823	6,798	9,064			6,798	9,064
Castro Valley	0.03%	7,434	8,028	1,014	1,352	406	541	608	811
ROAD									
County Service Area R-1967	0 00%	254	275	35	46	14	18	21	28
RECREATION & PARK									
Hayward Area	1 34%	377,853	408,081	51,540	68,719	23,713	31,618	27,826	37,102
Livermore Area	0.56%	158,893	171,604	21,673	28,898	10,446	13,929	11,227	14,969
East Bay Regional	2.37%	670,623	724,272	91,474	121,965			91,474	121,965
LIBRARY SERVICES									
County Library	0 78%	219,857	237,445	29,989	39,985	15,153	20 204	14,835	19,781
County Library Sp. Tax Zone	0.02%	6,225	6,722	849	1,132	245	326	604	806

Government Agency	Percent Allocation	2000 Unitary Tax Revenues	2001/2002 Projected Tax Revenues	RCEC Revenue Based on $300M Assessed Value	RCEC Revenue Based on $400M Assessed Value	RCEC Rev. Shifted to ERAF[1] based on $300M	RCEC Rev. Shifted to ERAF based on $400M	RCEC Rev. After ERAF Shift based on $300M	RCEC Rev. After ERAF Shift based on $400M
TRANSIT									
AC Transit Special Svc #1	2.71%	764,890	826,081	104,332	139,109			104,332	139,109
AC Transit Special Svc. #2	0.48%	134,728	145 506	18,377	24,503			18,377	24,503
SF-BART	0.54%	153,376	165,646	20,921	27,894			20,921	27,894
WATER									
Alameda County	0.26%	73,742	79,642	10,059	13,411	3,725	4,966	6,334	8,445
E.B.M.U.D.	0.64%	181,095	195,583	24,702	32,936			24,702	32,936
LIGHTING									
County Service Area SL-1970	0.00%	5	5	1	1			1	1
County Service Area SL-1972	0 00%	98	106	13	18	5	7	8	11
POLICE									
County Serv Area PP1991-1	0 08%	22,974	24,812	3,134	4,178			3,134	4,178
TOTAL SPECIAL DISTRICTS	12.58%	3,552,754	3,836,373	484,602	646,136	76,808	102,410	407,794	543,725
CITIES									
Alameda	0.77%	216,863	234,212	29,580	39,441	6,043	8,058	23,537	31,383
Albany	0.26%	73,235	79,094	9,989	13,319	2,556	3,408	7,433	9,911
Berkeley	1.98%	560,353	605,181	76,433	101,911	14,667	19,557	61,765	82,354
Dublin	0.27%	75,084	81,090	10,242	13,655	975	1,300	9,267	12,355
Emeryville	0.17%	46,978	50,736	6,408	8,544	424	565	5,984	7,979
Fremont	2.19%	617,510	666,911	84,229	112,306	18,623	24,831	65,606	87,475
Hayward	2.23%	629,135	679,466	85,815	114,420	20,767	27,690	65,048	86,730
Livermore	0.78%	219,845	237,432	29,987	39,983	7,143	9,524	22,844	30,459
Newark	0.32%	90,433	97,667	12,335	16,447	2,990	3,987	9,345	12,460
Oakland	8.15%	2,300,810	2,484,874	313,834	418,445	67,129	89,505	246,705	328,940
Piedmont	0.19%	54,815	59,200	7,477	9,969	1,103	1,470	6,374	8,499
Pleasanton	1.68%	474,861	512,850	64,772	86,362	11,057	14,742	53,715	71,620
San Leandro	0.76%	214,175	231,309	29,214	38,952	6,228	8,305	22,985	30,647
Union City	0.61%	171,318	185,024	23,368	31,157	5 763	7,683	17,605	23,474
TOTAL CITIES	20.34%	5,745,415	6,205,048	783,683	1,044,910	165,468	220,624	618,214	824,286
SCHOOLS									
County Supt. Schools Sp. Funds									
Audio-Visuals Capital	0 01%	3,686	3,981	503	670			503	670
County Supt. Service	0.09%	25,711	27,768	3,507	4,676			3,507	4,676
County Supt Capital	0.07%	19,809	21,394	2,702	3,603			2,702	3,603
Develop. Center HDCP Pupil	0.07%	18,373	19,843	2,506	3,342			2,506	3,342
Education Instit Pupils	0.15%	41,383	44,694	5,645	7,526			5,645	7,526
Education Phys. HDCP Pupil	0.09%	26,827	28,973	3,659	4,879			3,659	4,879
Education T.M.R., EC 1887	0.04%	7,199	7,774	1,367	1,823			1,367	1,823
Juvenile Hall Education	0.03%	8,558	9,243	1,167	1,556			1,167	1,556
T.M R. & P.H. Capital	0 00%	597	645	81	109			81	109

Government Agency	Percent Allocation	2000 Unitary Tax Revenues	2001/2002 Projected Tax Revenues	RCEC Revenue Based on $300M Assessed Value	RCEC Revenue Based on $400M Assessed Value	RCEC Rev. Shifted to ERAF[1] based on $300M	RCEC Rev. Shifted to ERAF based on $400M	RCEC Rev. After ERAF Shift based on $300M	RCEC Rev. After ERAF Shift based on $400M
T.M.R. & P.H Tuition	0.01%	3,622	3,912	494	659			494	659
ELEMENTARY									
Mountain House	0.15%	41,504	44,824	5,661	7,548			5,661	7,548
UNIFIED									
Alameda	0.48%	136,398	147,310	18,605	24,807			18,605	24,807
Albany	0.22%	62,626	67,636	8,542	11,390			8,542	11,390
Berkeley	0.93%	262,197	283,172	35,764	47,685			35,764	47,685
Castro Valley	0.33%	93,313	100,778	12,728	16,971			12,728	16,971
Dublin	0.50%	141,818	153,163	19,344	25,792			19,344	25,792
Emery	0.09%	25,438	27,473	3,470	4,626			3,470	4,626
Fremont	2.31%	652,969	705,207	89,066	118,755			89,066	118,755
Hayward	2.07%	584,054	630,778	79,666	106,221			79,666	106,221
Livermore Valley JT	1.14%	322,453	348,249	43,983	58,644			43,983	58,644
New Haven	0.60%	170,158	183,770	23,210	30,946			23,210	30,946
Newark	0.32%	91,274	98,576	12,450	16,600			12,450	16,600
Oakland	4.40%	1,242,965	1,342,403	169,542	226,056			169,542	226,056
Piedmont	0.12%	34,493	37,252	4,705	6,273			4,705	6,273
Pleasanton	1.55%	438,144	473,195	59,763	79,685			59,763	79,685
San Leandro	0.74%	207,838	224,465	28,349	37,799			28,349	37,799
San Lorenzo	0.52%	148,128	159,978	20,205	26,940			20,205	26,940
Sunol	0.12%	33,382	36,052	4,553	6,071			4,553	6,071
COMMUNITY COLLEGE									
Fremont-Newark	0.49%	138,735	149,834	18,924	25,232			18,924	25,232
Peralta	0.89%	252,202	272,378	34,401	45,868			34,401	45,868
Chabot-Los Positas	1.03%	291,427	314,742	39,751	53,001			39,751	53,001
SAN JOAQUIN COUNTY DISTRICTS									
Tracy High	0.15%	42,707	46,124	5,825	7,767			5,825	7,767
San Joaquin Delta Community	0.06%	15,713	16,970	2,143	2,858			2,143	2,858
TOTAL SCHOOLS	**19.78%**	**5,585,702**	**6,032,558**	**762,283**	**1,016,377**			**762,283**	**1,016,377**
Education Rev. Augmentation Fund:	3.39%	956,297	1,032,800	130,440	173,920			130,440	173,920
Spec. Dist. Augmentation Fund	1.94%	548,608	592,497	74,831	99,775			74,831	99,775
REDEVELOPMENT AGENCIES									
Alameda Co & San Leandro J	0.01%	4,214	4,551	575	766			575	766
Alameda: West End IMP	0.10%	29,337	31,684	4,002	5,335			4,002	5,335
Alameda Point IMP				0	0			0	0
Business and Wtrfrnt	0.01%	2,119	2,288	289	385			289	385
TOTAL ALAMEDA	0.11%	31,455	33,972	4,291	5,721			4,291	5,721
ALBANY: Cleveland Ave				0	0			0	0
Berkeley: Savo Island	0.01%	1,604	1,732	219	292			219	292
West Berkeley	0.04%	10,499	11,338	1,432	1,909			1,432	1,909

Government Agency	Percent Allocation	2000 Unitary Tax Revenues	2001/2002 Projected Tax Revenues	RCEC Revenue Based on $300M Assessed Value	RCEC Revenue Based on $400M Assessed Value	RCEC Rev. Shifted to ERAF[1] based on $300M	RCEC Rev. Shifted to ERAF based on $400M	RCEC Rev. After ERAF Shift based on $300M	RCEC Rev. After ERAF Shift based on $400M
TOTAL BERKELEY	0.04%	12,102	13,070	1,651	2,201			1,651	2,201
Emeryville	0 25%	69,643	75,214	9,499	12,666			9,499	12,666
Shellmound	0.02%	4,518	4,879	616	822			616	822
TOTAL EMERYVILLE	0.26%	74,161	80,093	10,116	13,487			10,116	13,487
Fremont: Niles	0.01%	2,684	2,899	366	488			366	488
Industrial	1.17%	330,415	356,848	45,069	60,092			45,069	60,092
Irvington	0 06%	17,600	19,008	2,401	3,201			2,401	3,201
Centerville	0.00%	26	29	4	5			4	5
TOTAL FREMONT	1.24%	350,726	378,784	47,840	63,786			47,840	63,786
Hayward: Downtown	1.61%	455,289	491,713	62,102	82,803			62,102	82,803
Livermore	0.03%	9,692	10,468	1,322	1,763			1,322	1,763
Oakland: Acorn	0.12%	33,281	35,943	4,540	6,053			4,540	6,053
Central Dist	10.08%	2,847,835	3,075,662	388,449	517,932			388,449	517,932
Coliseum (Elmhurst)	0.06%	16,728	18,066	2,282	3,042			2,282	3,042
Oak Center	0.06%	16,346	17,653	2,230	2,973			2,230	2,973
Standford/Adeline	0 01%	3,573	3,858	487	650			487	650
TOTAL OAKLAND	10.33%	2,917,762	3,151,183	397,987	530,649			397,987	530,649
San Leandro: Plaza 1	0.01%	3,199	3,455	436	582			436	582
Plaza 2	0.04%	11,139	12,030	1,519	2,026			1,519	2,026
TOTAL SAN LEANDRO	0 05%	14,338	15,485	1,956	2,608			1,956	2,608
Union City Community	0 03%	9,815	10,600	1,339	1,785			1,339	1 785
TOTAL REDEVELOPMENT	**13.74%**	**3,879,555**	**4,189,920**	**529,177**	**705,569**			**529,177**	**705,569**
GRAND TOTAL	100%	28,242,376	30,501,165	3,852,686	5,136,915	774,473	1,032,631	3,078,213	4,104,284

[1] ERAF - Educational Revenue Augmentation Fund

Source: Alameda County Auditor-Controller Office

8.13 VISUAL RESOURCES

1. General Plan Update (6-month expedited process [§2022(b)(1)(C)]):

Where a standard, ordinance, or law is expected to change between the time of filing an application and certification, information from the responsible jurisdiction documenting the impending change, the schedule for enactment of the change, and whether the proposed project will comply with the changed standard, ordinance, or law.

Information required to make AFC conform with regulations:

Page 8.6-9 of the AFC states that the City of Hayward is conducting an update of the -General Plan to be completed during 2001. The visual section of the AFC does not indicate whether the proposed project will comply with the goals, policies, guidelines and standards of the updated General Plan. Please provide information from the City of Hayward documenting the impending change, the schedule for enactment of the change, and whether the proposed project will comply with the goals, policies, guidelines, and standards related to visual resources of the updated General Plan.

Response—The City of Hayward is in the process of comprehensively revising the General Plan for the first time since 1985. The City's intention is to adopt a new Plan that will provide appropriate guidance for future growth and development for the next twenty years. The City identified major issues to be addressed in late 2000 and has been evaluating these issues along with alternatives for dealing with them on an ongoing basis throughout late 2000 and 2001. Draft goals, policies, and implementation strategies are currently being reviewed. The City's completion date goal for the draft General Plan document and Draft Environmental Impact Report is July or August, 2001. Public review is scheduled for October 2001. Planning Commission and City Council public hearings are planned for November and December 2001, respectively. This information is provided by the City of Hayward on their website at www.ci.hayward.ca.us/generalplan/index.html.

Specific issues of concern pertaining to the Industrial Corridor are identified in an agenda report prepared by the City titled *The New Economy and the Transformation of the Industrial Corridor*. This report is available at www.ci.hayward.ca.us/generalplan/backgroundreports.html. Six primary issues were identified for evaluation by the City Council and Planning Commission:

1. Implementing multiple zoning districts with in the Industrial Corridor to better segregate manufacturing and warehousing uses from high technology uses.

2. Potential segregation of uses, such as heavy industrial, high technology, and biotechnology uses that use hazardous and toxic materials, from residential uses; and segregation of child care facilities to areas not exposed to hazardous materials, yet near the employment centers of the Industrial Corridor.

3. Possible use of overlay zones in the Industrial Corridor to require a higher minimum number of parking spaces for all new construction. This would prevent future parking shortages as low employment intensity uses (such as warehousing uses) are later converted to more intensive uses.

4. Possible permitting of on-street parking in some areas, to relieve parking congestion caused by conversion of warehouses to more intensive development.

5. Institution of higher minimum parcel sizes for some types of industrial development to encourage the siting of manufacturing and research and development operations that require larger parcels for development.

6. Placing a higher priority on public transit to and within the Industrial Corridor.

Based on the proposed key issues identified in the City's guidance documents for the updated General Plan, the RCEC is likely to remain compatible with the General Plan and the planning goals for the City of Hayward after the new plan is published. The RCEC project would be consistent with current City planning trends in relation to the six key revised General Plan issues listed above as follows:

1. **Multiple zoning districts**— If the City subdivides the Industrial Corridor into separate zones for manufacturing and high technology, the RCEC and its surrounding area would very likely fit into a manufacturing zone. The City's WPCF, the Rohm and Haas paint polymers plant, Tuscarora industries, Mags Trucking, and many other manufacturing and warehousing uses surround the RCEC project site.

2. **Segregation of Uses**—The RCEC would use hazardous materials but is located nearly a mile from the nearest residence. Transportation routes between the RCEC and nearest controlled-access highway do not pass adjacent to residential areas.

3. **Overlay zones for parking**— The RCEC does not involve the conversion of warehouses to uses of more intensive employment and hence will not cause a parking concern. All of the parking spaces necessary for RCEC operations staff will be located within the plant boundary.

4. **On-Street Parking**—As with #3, the RCEC does not involve the conversion of warehouses to uses of more intensive employment and hence will not cause a parking concern. On-street parking will not be necessary for the RCEC.

5. **Higher minimum parcel size**—The RCEC project involves consolidating two parcels for a total of 14.7 acres and will thus help preserve parcel size for future manufacturing and industrial uses.

6. **Public Transit**—Increased use of public transit would help to reduce traffic congestion in the Industrial Corridor and would provide more transit options for RCEC employees.

The General Plan revision guidance documents that the City of Hayward has published to date do not address changes in the City's goals for visual resources management or in zoning regulations that have to do with lot setbacks or height limits. The City's policy has in the past been not to impose height limits to structures, possibly to permit large structures that may be necessary for some kinds of industrial concerns (such as the Rohm and Haas paint polymers plant stack, the RCEC, etc.). There is no indication in the guidance documents that the City would impose height limits or additional lot setback requirements for the sake of visual resources management in the Industrial Corridor. Though it is possible that changes in the zoning regulations could accompany the segregation of uses (sub-zones in the Industrial Corridor), it is most likely that requirements would not change in the area in which the RCEC is located (assuming that the RCEC and its surroundings would become a manufacturing and warehousing zone).

2. KFAX Tower Relocation (12-month process [Appendix B(g)(1)]):

...provide a discussion of the existing site conditions, the expected direct, indirect and cumulative impacts due to the construction, operation and maintenance of the project, the measures proposed to mitigate adverse environmental impacts of the project, the effectiveness of the proposed measures, and any monitoring plans proposed to verify the effectiveness of the mitigation.

Information required to make AFC conform with regulations:

Four, 228-foot tall KFAX Radio towers currently occupy the project site. These towers would be relocated as a result of the project. The AFC indicates that the City of Hayward is currently preparing an environmental document in compliance with CEQA that addresses the removal and relocation of the towers and that the City expects to complete their review by mid summer 2001. However, the AFC should discuss the visual impacts of the relocated radio towers as an indirect impact of the proposed power plant project. If a draft environmental document is available, it should be provided to staff as part of this data adequacy determination.

Response—The CEC has determined that the radio tower relocation would be a separate project from the RCEC, outside of the CEC's jurisdiction, partly because of the Federal Communications Commission'a action of licensing the new transmitter. The visual resources effects of the new transmitter site are addressed in the City's Initial Study. Copies of the City of Hayward's Initial Study and CEQA Mitigated Negative Declaration addressing KFAX radio tower relocation are included at the end of this section.

CITY OF HAYWARD INITIAL STUDY

Environmental Checklist Form

1. Project title: **Use Permit 01-160-11 to Raze existing KFAX Radio Station Transmitter Facilities from Enterprise Avenue and Relocate them to near the western terminus of West Winton Avenue.**

2. Lead agency name and address: **City of Hayward**

3. Contact person and phone number: **Dyana Anderly, AICP, Planning Manager, 510.583.4214**

4. Project location:
   The project location is on the eastern panhandle area of the closed Old West Winton landfill, located near the western terminus of West Winton Avenue. The City of Hayward owns the property.

5. Project sponsor's name and address: **Golden Gate Broadcasting Co., Inc.**

6. General plan designation: **"Industrial" and "Baylands"**

7. Zoning: **"Industrial" and "Floodplain"**

8. Description of project:

   The project consists of construction of four, 228-foot-high (above ground) self-supporting AM radio transmitter facilities and associated transmitter facilities on the proposed location near the western terminus of West Winton Avenue, and removal of the existing KFAX transmitter facilities from their current location at 3636 Enterprise Avenue, opposite the City's waste water treatment plant. While the existing towers are supported by "guy" wires, the proposed new towers will be self-supporting monopoles.

9. Surrounding land uses and setting:

   The City's wastewater treatment ponds are located immediately to the south. A large, closed landfill is located to the southwest. The Alameda County flood control channel and the All Cities Landfill, a landfill in the process of being closed and capped, lie to the north. To the east is developed area zoned Industrial that contains industrial and office uses and several automobile salvage yards. Further west, towards San Francisco Bay are the Hayward Regional Shoreline Hiking Trails.

10. Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement.)

    Alameda County Flood Control and Water Conservation District
    Federal Communications Commission
    Federal Aviation Administration
    San Francisco Bay Regional Water Quality Control Board

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☒ Aesthetics	☐ Agriculture Resources	☐ Air Quality
☒ Biological Resources	☐ Cultural Resources	☐ Geology /Soils
☐ Hazards & Hazardous Materials	☐ Hydrology / Water Quality	☒ Land Use / Planning
☐ Mineral Resources	☐ Noise	☐ Population / Housing
☐ Public Services	☐ Recreation	☒ Transportation/Traffic
☐ Utilities / Service Systems	☐ Mandatory Findings of Significance	

DETERMINATION:

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

_____ May 24, 2001
Signature Date

Sylvia Ehrenthal City of Hayward
Printed Name Agency

ENVIRONMENTAL ISSUES:

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
I. AESTHETICS -- Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☒	☐	☐

Comment: The existing KFAX radio transmitter facilities are situated within view of the Hayward shoreline area and State Route 92; therefore, replacing them with new towers at another location that is similarly visible from the shoreline will not have a significant negative visual impact as viewed from strategic viewpoints. In addition, the existing KFAX towers are supported by guy wires, whereas the new towers will be self-supporting monopoles. This design will further reduce their visual impact. As the towers are tall, thin, will be finished in galvanized gray, and are of lattice construction, they will recede into view to some extent. Although the presence of radio towers changes the composition of the view somewhat, the radio towers do not substantially change either the view's character or quality. As viewed from a distance 0.5 miles from the proposed site, the lower third of the towers would be visually absorbed into the backdrop provided by the distant ridgeline of the East Bay hills. Because they are so thin, the upper portions of the towers recede into the sky behind them.

The new facilities will include a transmitter equipment enclosure and small electronics enclosures at the base of each radio transmission tower. These transmitter equipment enclosures will be constructed of concrete masonry units using a decorative finish such as slumpstone, non-glare roof materials, and will be finished with earth tone paint. They will also be required to be as small as possible. A small pre-fabricated metal equipment cabinet will be installed near the base of each tower. These cabinets will also be finished in earth-tone paint.

Fencing surrounding the structures will be vinyl clad chain-link or better and of a color to blend with the surroundings.

The site will continue to be covered with native grasses.

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☒	☐	☐

Comment: The new radio transmitter facilities would be located on a former landfill, where there are no significant trees, rock outcroppings, or historic buildings. With regard to the views of the bay and shoreline, see I a) above.

c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☒	☐	☐

Comment: See 1 a) above.

d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☒	☐	☐

Comment: Aircraft warning lights will be required to alert aircraft of the location of the radio transmitter facilities. These lights will be white strobes. These strobe lights will be similar to those in the use on the nearby KTCT transmitter towers. The new aircraft warning lights will not have a significant visual impact as viewed from ground level. Project light fixtures necessary for safety, security, and operations and will be shielded from public view, and non-glare fixtures and the use of switches, sensors, and timers will be used to minimize the time that lights not needed for safety and security are on.

II. **AGRICULTURE RESOURCES**: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:

Comment: As a former landfill site with a clay cap, the site does not have significant value for agricultural uses and has not been used for this purpose in the past. Irrigation to the site for agricultural purposes could compromise the integrity of the protective surface of the former landfill.

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒

Comment: See II above.

b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒

Comment: See II above.

c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	☒

Comment: see II above.

III. **AIR QUALITY** -- Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:

a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒

Comment: Access to the site during construction and for maintenance purposes will be required to be surfaced with a material that prevents, to the extent possible, vehicles from tracking mud and dust onto public streets. In addition, wheels may be required to be washed before entering the public street. With the cited mitigation in place, there will be no significant adverse air quality impacts.

b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☐	☒
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☒

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒

Comment: The project is not expected to contribute toward air pollution, and there are no sensitive receptors in the vicinity of the project.

Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

IV. **BIOLOGICAL RESOURCES** -- Would the project:

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☒	☐

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*

Comment:

Special environmental areas in the vicinity of the site include a brackish slough that drains into Hayward Landing, managed by the Hayward Area Park and Recreation District. Biological field surveys for the project were conducted by biologist Brett D. Hartman on February 27 and March 25, 2001. The entire project site was surveyed intensively, and biological reconnaissance of an area within one mile of the project site was also conducted.

Ruderal species such as wild barley (Hordeum leporinm) ripgut grass (Bromus diandrus), and black mustard (Brassica nigra dominate the site. These grasses that are not candidate, sensitive, or special status species.

Listed animal species in the area include the salt marsh harvest mouse *(Reithrodontomys raviventris)* clapper rail *(Rallus longirostris obsoletus)* and salt-marsh wandering shrew *(Sorex vagrans halicoetes);* however, no supporting habitat or other evidence that the site benefits these species was found on the site. Bird species observed on the site included red-winged black birds, barn swallows, and Canada geese.

Relocation of the radio transmitter facilities could result in the loss of individuals of several wildlife species that occupy this site or are dependent upon this site for specific physiological and ecological requirements. However, these species are common to many areas, have no regulatory protective status, and are primarily limited to burrowing rodents (i.e., ground squirrel [*Spermophylus sp.*], pocket gophers [*Thomomys sp.*], and voles [*Microtis sp.*] As a former landfill site with a clay cap, the integrity of the cap is essential in maintaining the integrity of the landfill. In order to insure that burrowing animals do not occupy the site and to reduce weeds, the site is disced each year. Therefore, the likelihood that the site provides habitat for protected species is remote.

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*

Monitoring of construction activities will be carried out by personnel trained to detect any potential and unforeseen impacts on listed, sensitive, or migratory wildlife and their habitats adjacent to the site. If actual or potential effects are detected, the construction foreman will cease the activities that are potentially affecting these species and will consult with a professional biologist qualified to assess the situation and make recommendations to alter or alleviate any activities that are resulting in these effects.

Impacts to wildlife due to the radio transmitter facilities towers will be mitigated through the use of self-supporting supporting broadcast towers. Impacts to wildlife due to collisions with the transmitter facilities are not expected to be significant. Inspections of the current radio transmission tower site over a period of years by maintenance personnel did not reveal evidence that wildlife that had died or had been injured by collisions with the radio transmitter facilities. While literature linked to collisions of migratory birds with radio transmmitter facilities suggests that impacts may occur when the towers are obscured by fog, the Hayward shoreline area is rarely effected by fog.

Biologists will conduct additional field surveys in June for the Hispid's birds beak, Point Reyes bird's beak, and Delta tule pea. In the event that these plants are identified on the site during their blooming phases, additional consultation with regulatory agencies and mitigation planning will be undertaken to ensure that any potential impact to these species is mitigated to a level below significance.

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☐	☒	☐

Comment: See IV a) above.

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒

Comment: There are no identified wetlands on that portion of the project site that will be occupied by radio transmitter facilities or their associated apparatus.

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☒	☐

Comment: See IV a) above.

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan?	☐	☐	☐	☒

Comment: See IV a) above.

V. **CULTURAL RESOURCES** -- Would the project:

a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☒

Comment: The radio transmitter facilities will be located on a portion of a former landfill which is filled with many thousands of yards of household garbage. There is approximately 2 feet of fill overlying the clay cap that covers the landfill. The landfill is not known to contain any significant historical resources, and driving foundation pilings for the towers will not expose any potential historical resources.

b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☐	☒

Comment: Radio transmitter facilities will be located on a portion of a former landfill containing household refuse. There is no reason to suspect that the landfill contains any significant archaeological resources.

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒

Comment: Radio transmitter facilities will be located on a portion of a former landfill containing household refuse. The landfill does not contain any paleontological resources and the driving foundation pilings for the towers will not expose any potential paleontological resources.

d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒

Comment: Radio transmitter facilities will be located on a portion of a former landfill. There is no reason to believe that the landfill contains any human remains.

VI. **GEOLOGY AND SOILS** -- Would the project:

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☒	☐	☐
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒

Comment: The site is not within the Earthquake Hazard Zone. The Hayward Fault passes about 4 miles northeast of the site, while the San Andreas Fault passes about 14 miles southwest of the site.

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
ii) Strong seismic ground shaking?	☐	☒	☐	☐

Comment: Damage to the towers and transmitter buildings from high levels of ground shaking will be substantially reduced by requiring proper seismic design. To reduce structural damage due to continuing consolidation of fill, pile foundations will be required to be designed to include the negative friction (downdrag) imposed by consolidation of the upper 20 feet of material and tower pads and pilings will be designed in accordance with CBC, Seismic Zone 4 requirements.

iii) Seismic-related ground failure, including liquefaction?	☐	☒	☐	☐

Comment: See VI a) i) above. Tower pads will be designed to withstand the strong ground motion and ground failure (liquefaction) of a design earthquake.

iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
b) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒

Comment: See VI a) i) above.

c) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒

Comment: See VI a) i) above.

d) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
VII. **HAZARDS AND HAZARDOUS MATERIALS** – Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☒
Comment: No hazardous materials of a significant threshold are anticipated to be used at the site.				
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☒
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
Comment: The site will not be used for residential or employment purposes. Employees will visit the site only periodically for equipment maintenance purposes.				
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒
VIII. **HYDROLOGY AND WATER QUALITY** -- Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☒
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☒	☐	☐

Comment: A drainage plan is required to be approved by the City Engineer prior to issuance of a building permit for the radio transmitter facilities and accessory structures. The San Francisco Bay Regional Water Quality Control Board also has authority over drainage on the site, and their approval is required before issuance of a building permit for construction of the radio transmitter facilities and accessory structures.

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?	☐	☒	☐	☐
Comment: A drainage plan is required to the approved by the City Engineer prior to issuance of a building permit for the radio transmitter facilities and accessory structures. The San Francisco Bay Regional Quality Control Board also has authority over the drainage system, and their approval of the project will be required prior to issuance of building permits for construction of the radio transmitter facilities and accessory structures.				
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐
Comment: A drainage plan is required to the approved by the City Engineer prior to issuance of a building permit for the radio transmitter facilities and accessory structures.				
f) Otherwise substantially degrade water quality?	☐	☐	☐	☒
Comment: The project requires approval of the San Francisco Bay Regional Water Quality Control Board which is required to be obtained prior to issuance of building permits for construction of the radio transmitter facilities and accessory buildings.				
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
Comment: No housing is proposed.				
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam	☐	☐	☐	☒
i) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒
IX. **LAND USE AND PLANNING** - Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒

Comment: The approximately 14-acre parcel is classified as "Industrial" and "Open Space" by the General Plan Map. This designation does not necessarily preclude the location of uses such as towers. For example, P.G.&E. transmission lines and towers traverse many areas of the City designated as Open space, including the Shoreline and Walpert Ridge. The Zoning Map indicates that eastern portion of the parcel is within the Industrial District and the western portion is in the Flood Plain District. Towers have traditionally been allowed in the Industrial District. The Flood Plain district allows broadcast studios as a permitted use, but does not specifically mention radio towers. To accomplish relocation to this site, by certifying this environmental document, the approving body is determining that the radio transmitter facilities are essentially an element of the broadcasting function and thus similar in character and use to a broadcast studio.

c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☒	☐	☐

Comment: The San Francisco Bay Conservation and Development Commission has "bay" permit jurisdiction over all portions of the Bay that are subject to tidal action, and "shoreline band" permit jurisdiction over the first 100 feet of shoreline inland from the line of highest tidal action. Construction within the Commission's jurisdiction would require a permit from the Commission; however, none of the proposed radio transmitter facilities are within the Commission's shoreline band jurisdiction. As the site is entirely within a landfill, with on-site elevations of over 10 feet, there is no on-site tidal action.

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*

The site lies outside the City of Hayward's "Urban Limit Line." However, relocation of radio transmitter facilities to the project site is not inconsistent with the intent of the Urban Limit Line.

The Hayward Area Shoreline Planning Agency was formed in 1971 as an advisory agency to coordinate planning for the eight miles of shoreline between the Alameda Creek Flood Control Channel to the south and the San Leandro City limits to the north. The agency's advisory status was established under an intergovernmental joint exercise of powers agreement. The agencies participating in this Agreement are East Bay Regional Park District, Hayward Area Recreation and Park District, City of Hayward, Hayward Unified School District, and San Lorenzo Unified School District. On March 15, 2001, during a public meeting, members of the Hayward Area Shoreline Planning Agency did not take exception to reasoning that the Russell City Energy Center and the proposed new KFAX radio transmitter facilities at subject site would be consistent with the City's General Plan and zoning.

X. **MINERAL RESOURCES** -- Would the project:

a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒

Comment: As a former landfill site, there are no known significant mineral resources.

b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

XI. **NOISE** - Would the project result in:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
XII. **POPULATION AND HOUSING** -- Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*

XIII. PUBLIC SERVICES

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

Fire protection?	☐	☒	☐	☐
Comment: Access for fire suppression equipment will be required to be maintained to the site for fire protection purposes.				
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☒	☐
Other public facilities?	☐	☐	☐	☒

XIV. RECREATION --

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

XV. **TRANSPORTATION/TRAFFIC** -- Would the project:

a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☐	☐	☐	☒

Comment: The only traffic associated with the project (outside the construction phase) is infrequent periodic maintenance vehicles.

b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☒	☐	☐

Comment: The project site is approximately 4,900 feet from the nearest point of the nearest runway to the Hayward Executive Airport. Due to the proposed height of the radio transmitter facilities, Federal Aviation Administration (FAA) regulations require an airspace analysis by them. FAA approval is required before issuance of building permits for the radio transmitter facilities. In addition to evaluating the proposal with respect to the Hayward Executive Airport, the FAA analysis will include potential impacts and mitigation measures relative to air traffic approaching the Oakland International Airport.

d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☐	☒
f) Result in inadequate parking capacity?	☐	☐	☐	☒
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒

XVI. **UTILITIES AND SERVICE SYSTEMS** – Would the project:

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

Comment: Other than during the construction phase of the project, there will not be a significant amount of solid waste associated with the radio transmitter facilities.

h) Result in radio interference with other transmitters and in receivers.	☐	☐	☒	☐

Comment: The project requires FCC clearance before issuance of a building permit.

XVII. **MANDATORY FINDINGS OF SIGNIFICANCE** --

a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☒	☐

	Potentially Significant Impact	*Potentially Significant Unless Mitigation Incorporation*	*Less Than Significant Impact*	*No Impact*
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☐	☒
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

CITY OF HAYWARD MITIGATED NEGATIVE DECLARATION

DEPARTMENT OF
COMMUNITY AND ECONOMIC DEVELOPMENT
Development Review Services Division

MITIGATED NEGATIVE DECLARATION

Notice is hereby given that the City of Hayward finds that no significant effect on the environment as prescribed by the California Environmental Quality Act of 1970, as amended will occur for the following proposed project:

I. *PROJECT DESCRIPTION*:

USE PERMIT APPLICATION 01-160-11 – GOLDEN GATE BROADCASTING CO., INC. (APPLICANT), CITY OF HAYWARD (OWNER). Request to construct four, 228-foot-high (above ground) self-supporting AM radio transmitter facilities and associated transmitter facilities on the proposed location near the western terminus of West Winton Avenue, and removal of the existing KFAX transmitter facilities from their current location at 3636 Enterprise Avenue, opposite the City's waste water treatment plant. While the existing towers are supported by "guy" wires, the proposed new towers will be self-supporting monopoles.

II. *FINDING PROJECT WILL NOT SIGNIFICANTLY AFFECT ENVIRONMENT*:

The proposed project, as conditioned, will have no significant effect on the area's resources, cumulative or otherwise.

III. *FINDINGS SUPPORTING DECLARATION*:

1. The project application has been reviewed according to the standards and requirements of the California Environmental Quality Act (CEQA) and an Initial Study Environmental Evaluation Checklist has been prepared for the proposed project. The Initial Study has determined that the proposed project, with the recommended mitigation measures, could not result in significant effects on the environment.

2. The project is in conformance with the General Policies Plan Map designations of "Industrial" and "Baylands" as these designations do not necessarily preclude the location of uses such as towers.

3. The project is in conformance with the intent and purpose of the Zoning Ordinance designation of "Industrial" and "Floodplain" in that eastern portion of the parcel is within the Industrial District and the western portion is in the Flood Plain District. Towers have traditionally been allowed in the Industrial District. The Floodplain district allows broadcast studios as a permitted use, but does not specifically mention radio towers. To accomplish relocation to this site, by certifying this environmental document, the approving body is determining that the radio transmitter facilities are essentially an

element of the broadcasting function and thus similar in character and use to a broadcast studio.

4. Impacts to wildlife due to the radio transmitter facilities towers will be mitigated through the use of self-supporting supporting broadcast towers. Impacts to wildlife due to collisions with the transmitter facilities are not expected to be significant. Inspections of the current radio transmission tower site over a period of years by maintenance personnel did not reveal evidence that wildlife that had died or had been injured by collisions with the radio transmitter facilities. While literature linked to collisions of migratory birds with radio transmitter facilities suggests that impacts may occur when the towers are obscured by fog, the Hayward shoreline area is rarely effected by fog.

5. Radio transmitter facilities will be located on a portion of a former landfill containing household refuse. There is no reason to suspect that the landfill contains any significant archaeological, paleontological, or agricultural resources.

6. Requiring proper seismic design will substantially reduce damage to the towers and transmitter buildings from high levels of ground shaking. To reduce structural damage due to continuing consolidation of fill, pile foundations will be required to be designed to include the negative friction (downdrag) imposed by consolidation of the upper 20 feet of material and tower pads and pilings will be designed in accordance with CBC, Seismic Zone 4 requirements.

7. A drainage plan is required to be approved by the City Engineer prior to issuance of a building permit for the radio transmitter facilities and accessory structures. The San Francisco Bay Regional Water Quality Control Board also has authority over drainage on the site, and their approval is required before issuance of a building permit for construction of the radio transmitter facilities and accessory structures.

8. The project site is approximately 4,900 feet from the nearest point of the nearest runway to the Hayward Executive Airport. Due to the proposed height of the radio transmitter facilities, Federal Aviation Administration (FAA) regulations require an airspace analysis by them. FAA approval is required before issuance of building permits for the radio transmitter facilities. In addition to evaluating the proposal with respect to the Hayward Executive Airport, the FAA analysis will include potential impacts and mitigation measures relative to air traffic approaching the Oakland International Airport.

IV. *PERSON WHO PREPARED INITIAL STUDY:*

Sylvia Ehrenthal, Director of Community and Economic Development

Dated: May 24, 2001

V. *COPY OF INITIAL STUDY IS ATTACHED*

For additional information, please contact the City of Hayward Development Review Services Division, 777 B Street, Hayward, CA 94541-5007 or telephone (510) 583-4213

DISTRIBUTION/POSTING

- Provide copies to project applicants and all organizations and individuals requesting it in writing.
- Reference in all public hearing notices to be distributed 30 days in advance of initial public hearing and/or published once in Daily Review prior to hearing.
- Project file.
- Post immediately upon receipt at the City Clerk's Office, the Main City Hall bulletin board, and in all City library branches, and do not remove until the date after the public hearing.

8.15 WATER RESOURCES

1. Report of Waste Discharge (6 and 12-month processes [Appendix B (g)(14)(A)(i), §2022(b)(1)(B)]):

All information required by the Regional Water Quality Control Board in the region where the project will be located to apply for: Waste Discharge Requirements; and

Information required to make AFC conform with regulations:

According to the SFBRWQCB, any effluent discharged beyond the headworks of a waste treatment facility is treated as a separate discharge. Because this will be the case for the RCEC project, the applicant needs to submit a complete Report of Waste Discharge (ROWD) in order for the RWQCB to issue WDRs in the form of an NPDES permit. Please provide a complete ROWD that would enable the RWQCB to initiate the permit review process. Energy Commission staff has requested a letter from the SFBRWQCB regarding the status of an ROWD submission by the Applicant.

Response—The attached letter from Alex Ameri, Deputy Director of Public Works for Utilities, City of Hayward, to the Regional Water Quality Control Board explains that, as a recycled waste stream internal to the City of Hayward's treatment works, the RCEC project would not require a separate NPDES permit. The effluent from the project would, instead, be discharged under the existing East Bay Dischargers Authority (EBDA) permit, as City of Hayward Water Pollution Control Facility effluent.

2. NPDES Permit (6-month and 12-month processes [Appendix B (g)(14)(A)(ii), §2022(b)(2)(E)]):

All information required by the Regional Water Quality Control Board in the region where the project will be located to apply for a National Pollutant Discharge Elimination System Permit.

Information required to make AFC conform with regulations:

As per Appendix B (g) (14) (A) (i), the RCEC would be treated as a separate discharge and will be handled by an NPDES permit for wastewater discharge. Provide a discussion on the aforementioned permit regarding applicability and conformance issues.

Response—See response to #1 above, and the letter from the City of Hayward to the Regional Water Quality Control Board.

3. Hydrostratigraphic Map (12-month process [Appendix B (g)(14)(B)(i)]):

...Ground water bodies and related geologic structures;

Information required to make AFC conform with regulations:

Please provide a hydrostratigraphic map that clearly identifies the aquifers in the area of the proposed project. This data, coupled with project earthmoving data, will allow staff to view aquifer locations and note areas for potential groundwater pumping and dewatering.

Response—A hydrostratigraphic map of the project area is included at the end of this section. As discussed on page 8.15-3 of the AFC, depth to groundwater under the site is only a few feet. Minimal excavation will be required for construction of the RCEC. The elevation for the plant will be increased

from the current level with fill material to approximately 10 feet; therefore, significant dewatering activities are not expected.

4. Map of Watercourses and Wetlands (12-month process [Appendix B (g)(14)(B)(ii)]):

...Surface water bodies;

Information required to make AFC conform with regulations:

Please provide mapping at a legible scale that identifies locations of all natural gas lines, water pipelines, transmission lines (along with tower locations), and laydown/parking areas with respect to all watercourses and wetlands.

Response—The requested map showing the location of project facilities with respect to watercourses and wetlands is provided at the end of this section. Delineated wetlands on the project site are also presented in Figure 8.2-4 of the AFC. No project linears (transmission line, natural gas pipeline, or water pipelines) will cross either watercourses or wetlands. Proposed construction laydown and parking areas do not contain wetlands or watercourses.

5. Backup Water Source (12-month process [Appendix B (g)(14)(C)(i)]):

Source of the water and the rationale for its selection, and if fresh water is to be used for power plant cooling purposes, a discussion of all other potential sources and an explanation why these sources were not feasible.

Information required to make AFC conform with regulations:

The Applicant has indicated that the project will use effluent supply from the Union Sanitary District (USD) wastewater treatment plant in the event of an interruption with the City of Hayward WPCF. Please provide a discussion similar to the one provided for the City of Hayward WPCF/RCEC and all supporting water quantity and quality data related to the USD water source.

Response—Union Sanitary District discharges an annual average of 31 mgd into the EBDA 60" force main which runs north-south, just to the west of the AWT. As a back-up supply to the Hayward WPCF flow, flow from the EBDA pipeline will be used to feed the AWT. Due to the large amount of flow available in the EBDA pipeline, sufficient quantity will be available for both peak and average RCEC operating conditions. Table 7(s)-1 shows the flows currently available through the EBDA pipeline at the proposed connection point to the AWT, as well as projected flows which will become available after build-out.

Figure 7(s)-1a (attached) is a process flow chart that describes the water treatment system operating with USD/EBDA water supply. We have revised the process flow diagram to clarify that the Title 22 process, including the copper treatment and solids clarification process, will be owned and operated by the City of Hayward. The waste stream from the Title 22 process will be internal to the City of Hayward water recycling program, handled by their existing wastewater treatment plant. The only waste streams from the RCEC to be discharged to the City of Hayward wastewater treatment plant will be the blowdown from the cooling tower, plant drainage, and sanitary wastewater, which will all be discharged to the headworks of the plant.

Water quality information on the USD/EBDA effluent has been updated to include a larger data set, and is shown in Table 7(s)-2.

Table 7(s)-1. Union Sanitary District flows in the EBDA pipeline at proposed connection point.

	Units	ADWF	PWWF
Build-out:			
Alvarado	mgd	11.5	38.1
Irvington	mgd	17.9	44.3
Newark	mgd	12.7	34.8
Totals	mgd	**42.1**	**117.2**
Totals	cfs	**65.1**	**181.3**
1999:			
Alvarado	mgd	8.7	32.8
Irvington	mgd	12.2	30.5
Newark	mgd	10.9	29.7
Totals	mgd	**31.8**	**93.0**
Totals	cfs	**49.2**	**143.9**

As shown in Table 7(s)-2, the water quality from the EBDA supply contains equivalent or lower concentrations of the parameters of concern than the Hayward WPCF secondary effluent. Similar to the process described in Section 7.3.2, circulating (or cooling) water system blowdown will consist of AWT plant RO product water (generated from the USD/EBDA effluent) concentrated between 50 and 100 cycles, and residues of the chemicals added to the circulating water. Table 7(s)-3 presents the water quality characterization of this wastewater stream, both at 50 and 100 cycles of concentration. The number of cycles the cooling tower will operate at can be varied to ensure the constituent concentrations in the cooling tower blowdown and cooling tower drift are equivalent regardless of the source of the water supply (Hayward WPCF secondary effluent or USD/EBDA secondary effluent).

Table 7(s)-2. Summary of average water quality characteristics for potential sources of project water.

Water quality parameter †	Hayward secondary effluent (primary source)	Union Sanitary District/EBDA effluent (secondary source)	Hayward Potable Water Supply	Drinking Water Standard
Turbidity	17 (11-33)	6.5	0.3 (0.2-0.6)	1-5 ntu
Color	—	—	2	15 Pt-Co units
Odor Threshold	—	—	1	3 units
pH	7.8	7.8	8.8	6.0 – 9.0 units
Total Alkalinity	255	300	60	no standard (mg/l)
Bicarbonate	—	—	—	no standard (mg/l)
Total Dissolved Solids	564	830	128	1,500 mg/l
Total Suspended Solids	20	14	—	no standard (mg/l)
BOD	17	9	ND	no standard (mg/l)
TOC	32	13	ND	no standard (mg/l)
Phosphate	4	3	ND	no standard (mg/l)
Total Nitrogen	28	—	ND	no standard (mg/l)
Nitrate as NO_3	6.0	<0.2	ND	45 mg/l
Fluoride	2.2	1.1	0.1	2 mg/l
Chloride	153	280	12	500 mg/l
Hardness	160	240	63	200 mg/l
Arsenic	0.0017	0.001	ND	0.05 mg/l
Calcium	33	48	11	no standard (mg/l)
Magnesium	14	29	6	no standard (mg/l)
Manganese	0.06	0.07	ND	0.05 mg/l
Sodium	133	200	13	350 mg/l
Potassium	16	12	0.9	no standard (mg/l)
Silica	13	18	6	no standard (mg/l)
Silver	0.002	0.0003	ND	0.1 mg/l
Sulfate	44	85	13	500 mg/l
Cadmium	0.0006	0.0001	ND	0.005 mg/l
Chromium	0.0051	0.0012	ND	0.05 mg/l
Copper*	0.024	0.013	0.058	1.3 mg/l
Cyanide	< 0.003	<0.003	ND	0.2 mg/l
Iron	1.4	0.15	< 0.1	0.30 mg/l
Lead*	0.0022	0.001	0.004	0.015 mg/l
Mercury	0.00005	0.00001	ND	0.002 mg/l
Nickel	0.012	0.012	ND	0.1 mg/l
Boron	0.5	—	ND	no standard (mg/l)
Selenium	0.0012	0.0004	ND	0.05 mg/l
Thallium	—	—	ND	0.002 mg/l
Zinc	0.073	0.036	ND	5.0 mg/l

† units of measure for each analyte are given in the last column

ND = analyte not detected

* Lead and copper values from City of Hayward tap water. 90th percentile value for copper is 0.08 mg/L

Table 7(s)-3. Circulating water quality with EBDA Supply

Contaminant	Units	RO Permeate (To Cooling Tower)	Cooling Tower Blowdown at 50 Cycles	Cooling Tower Blowdown at 100 Cycles
Alkalinity-Bicarbonate	mg/L	17.000	232.900	465.800
Alkalinity-Carbonate	mg/L	0.000	5.100	32.700
Alkalinity-P-BaCl2	mg/L	0.000	0.000	0.000
Alkalinity-Phenol	mg/L	0.000	5.100	32.700
Alkalinity-Total	mg/L	17.000	253.000	504.500
Ammonia	mg/L	3.000	150.000	300.000
Arsenic	mg/L	0.000	0.000	0.000
Barium	mg/L	0.000	0.000	0.000
Biochemical Oxygen Demand	mg/L	0.100	< 1.0	< 1.0
Cadmium	mg/L	0.000	0.000	0.000
Chloride	mg/L	8.000	611.410	1223.000
Chromium	mg/L	0.000	0.000	0.000
Copper	mg/L	0.0001	0.005	0.010
Cyanide	mg/L	0.0002	0.010	0.020
Fluoride	mg/L	0.000	0.000	0.000
Hardness-Calcium	mg/L	0.300	15.000	30.000
Hardness-Magnesium	mg/L	0.200	10.000	20.000
Iron	mg/L	0.000	1.000	1.000
Lead	mg/L	0.000	0.000	0.000
Manganese	mg/L	0.000	0.000	0.000
Mercury	mg/L	0.000	0.000	0.000
Nickel	mg/L	0.0001	0.005	0.010
Nitrate as NO_3	mg/L	0.000	0.000	0.000
pH	s.u.	5.400	7.940	8.360
Phosphate	mg/L	0.000	15.000	15.000
Potassium	mg/L	0.000	0.000	0.000
Selenium	mg/L	0.000	0.000	0.000
Silica	mg/L	0.530	26.500	53.000
Silver	mg/L	0.000	0.000	0.000
Sodium	mg/L	6.000	300.000	600.000
Sulfate	mg/L	1.000	50.000	100.000
Total Dissolved Solids	mg/L	28.000	1510.000	2963.000
Total Organic Carbon	mg/L	1.000	1.000	1.000
Total Suspended Solids	mg/L	0.000	<6.000	<6.000
Temperature	Degrees F	64	100	100
Zinc	mg/L	0.0002	0.010	0.020

The amount of TDS discharged to the atmosphere using the EBDA supply is very low due to the use of cooling towers with the lowest achievable drift (0.0005%). The drift quality is equivalent to the blowdown quality; therefore, the concentration of TDS in the drift is expected to be a maximum of 2,963 mg/L at a flowrate of approximately 0.69 gpm, or equivalent to 25 lb/day.

The waste streams identified in Section 7.3.1 would also result from the AWT operating with the EBDA water supply (i.e. the MF backwash and RO Concentrate). However, as the metals concentrations in the USD/EBDA effluent are equivalent to or lower than Hayward WPCF's effluent, the metals removal processes are expected to achieve lower concentrations prior to discharge than those achievable with the RO Concentrate generated from the Hayward WPCF secondary effluent. Therefore, the concentrations presented in Table 7-3 are assumed to be the worst case scenario of concentrations that will be sent to the EBDA outfall. Water quality characterization of the Hayward effluent with the AWT plant discharges during the use of the EBDA back-up supply are presented in Table 7(s)-4.

Table 7(s)-4. Predicted Water Quality Characteristics for AWT Wastewater with EBDA Supply

Constituent	Hayward + AWT Wastewater Discharge		EBDA Discharge Limit*	
PH	7-8	units	6-9	
Total Dissolved Solids	834	mg/l	NA	
Total Suspended Solids	21	mg/l	30 ‡	mg/l
BOD	18	mg/l	25 ‡	mg/l
Hardness	169	mg/l	NA	
Calcium (total)	37	mg/l	NA	
Magnesium (total)	14	mg/l	NA	
Manganese	0.1	mg/l	NA	
Sodium (total)	131	mg/l	NA	
Potassium	19	mg/l	NA	
Total Alkalinity	259	mg/l	NA	
Silica	13	mg/l	NA	
Sulfate	105	mg/l	NA	
Chloride	171	mg/l	NA	
Copper (total)	0.022	mg/l	0.023	mg/l
Cadmium	0.0006	mg/l	NA	
Chromium (total)	0.005	mg/l	NA	
Cyanide (total)	0.0038	mg/l	0.021	mg/l
Iron (total)	1.3	mg/l	NA	
Lead (total)	0.0021	mg/l	0.056	mg/l
Mercury (total)	0.00005	mg/l	0.00021	mg/l
Nickel (total)	0.014	mg/l	0.021	mg/l
Nitrate	5.4	mg/l	NA	
Fluoride	2.4	mg/l	NA	
Arsenic	0.002	mg/l	NA	
Selenium (total)	0.0012	mg/l	0.050	mg/l
Silver (total)	0.0017	mg/l	0.023	mg/l
Zinc (total)	0.069	mg/l	0.58	mg/l

*EBDA discharge limits for settleable matter, benzo(a)anthracene, bis(2-Ethylhexyl) Phthalate, Chrysene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene also exist and will be met in the combined Hayward + AWT discharge.
‡ Monthly average concentration

6. Project Wastewater Quality Data (12-month process [Appendix B (g)(14)(C)(ii)]):

The physical and chemical characteristics of the source and discharge water;

Information required to make AFC conform with regulations:

Tables 7.3 and 8.15-4 provide combined water quality characteristics for the Hayward Wastewater and RCEC discharge. Please provide separate water quality characteristics for the project wastewater.

Response—The three main RCEC wastewater streams are the cooling tower blowdown (shown in Table 7-2 and Table 7(s)-3), plant drainage, and sanitary wastewater. As described in section 7.3.4, plant drainage will consist of area washdown, sample drainage, equipment leakage, and drainage from facility equipment areas. Drains that contain oil or grease would be routed through an oil/water separator. The estimated water quality of plant drainage is identical to the RO permeate water presented in Table 7-2, with the exception of an increase in the amount of TDS, from 20 mg/L to approximately 30 mg/L. If the back-up water supply is used, the plant drainage would have identical quality to the characterization presented in Table 7(s)-3, with an increase in TDS from 28 mg/L to approximately 38 mg/L.

As described in section 7.3.3, sanitary wastewater from sinks, toilets, and other sanitary facilities will be collected and discharged to the existing sanitary sewer. Typical water quality characterization of sanitary wastewater is shown in Table 7(s)-5.

Table 7(s)-5. Predicted Water Quality Characteristics for Sanitary Wastewater

Constituent	Concentration	Unit
Total Dissolved Solids	500	mg/l
Total Suspended Solids	220	mg/l
BOD	220	mg/l
TOC	160	mg/l
COD	500	mg/l
Total Nitrogen	40	mg/l
Organic N	15	mg/l
Ammonia	25	mg/l
Phosphorus	8	mg/l
Chlorides	50	mg/l
Sulfate	30	mg/l
Alkalinity as $CaCO_3$	100	mg/l
Grease	100	mg/l
Total Coliform	10^7-10^8	no/100 mL
Volatile Organic Compounds	100-400	µg/L

*McGraw Hill Series in Water Resources and Environmental Engineering, Metcalf and Eddy, 1991, Table 3-16

The treated waste stream quality discharged from the AWT when operating with Hayward secondary effluent, as well as the combined Hayward and AWT effluent is presented in Table 7(s)-6. The quality of the combined effluent is compared to the EBDA discharge permit limits. The treated waste stream quality discharged from the AWT when operating with USD/EBDA water supply is shown in Table 7(s)-7. As can be seen from the tables, operation of the AWT will not cause EBDA to exceed its constituent limits included in the NPDES permit.

Table 7(s)-6. AWT waste stream quality using Hayward secondary effluent

I. Hayward Effluent

	Hayward Secondary Effluent	AWT RO Concentrate	AWT MF BW	Combined AWT Effluent	Combined Hayward + AWT Effluent	EDBA Limit
Flow (MGD)	8.04	0.67	0.79	1.46	9.50	
PH	8	11.5	7.8	7-8	7-8	6-9
Total Dissolved Solids	564	4138	607	2227	820	
Total Suspended Solids	20	5	66	38	22.8	30,45
BOD	17	87.6	24	53	22.3	25,40
Hardness	160	255	160	204	167	
Calcium	33	101	33	64	37.8	
Magnesium	14	0.72	14	8	13.1	
Manganese	0.06	0.3	0.1	0.2	0.08	
Sodium	133	1	133	72	124	
Potassium	16	101	16	55	22.0	
Total Alkalinity	255	255	255	255	255	
Silica	13	8.34	13	11	12.7	
Sulfate	44	950	44	460	108	
Chloride	153	393	153	263	170	
Cadmium	0.0006	0.004	0.0006	0.0022	0.0008	
Chromium	0.0051	0.0339	0.0051	0.018	0.007	
Copper	0.0235	0.015	0.0235	0.020	0.0229	0.023
Cyanide	0.003	0.019	0.003	0.010	0.0041	0.021
Lead	0.0022	0.005	0.0022	0.003	0.0024	0.056
Mercury	0.00005	0.00025	0.00005	0.0001	0.00006	0.00021
Nickel	0.012	0.0599	0.012	0.034	0.0154	0.021
Nitrate	6.0	0.7	6.0	3.6	5.6	
Fluoride	2.2	14.6	2.2	7.9	3.1	
Arsenic	0.0017	0.0113	0.0017	0.006	0.002	
Boron	0.5	1.1	0.5	0.8	0.5	
Iron	1.4	0.1	8.2	4.5	1.9	
Selenium	0.0012	0.007	0.0012	0.004	0.0016	0.05
Silver	0.0018	0.01	0.0018	0.006	0.0024	0.023
Zinc	0.073	0.0694	0.073	0.071	0.073	0.58

Notes:

Hayward Effluent Concentrations from Table 8 15-3

RO concentrate from jar testing when available, else Table 1 from SPI, April 13

MF Backwash from SPI Table 1

Flows are assumed at 90 degrees F

All units are mg/L

Assumptions:

TSS in MF BW will be reduced 50% from 132 mg/L to 66 mg/L

BOD in MF BW will be removed from 36 to 24 mg/L (assume 1/3 particulate BOD)

Total Alkalinity would be the same for each stream after treatment

Ideally copper will be removed from the RO concentrate to 15 ug/L total

Table 7(s)-7. AWT waste stream quality using USD/EBDA secondary effluent

	Hayward Secondary Effluent	AWT RO Concentrate	AWT MF BW	Combined AWT Effluent	Combined Hayward + AWT Effluent	EDBA Limit
Flow (MGD)	13.3	0.67	0.79	1.46	14.77	
pH	8	11.5	7.6	7-8	7-8	6-9
Total Dissolved Solids	564	6132	896	3299	834	
Total Suspended Solids	20	5	47	28	20.7	30,45
BOD	17	47.2	12.8	29	17.9	25,40
Hardness	160	255	240	247	169	
Calcium	33	101	48	72	36.9	
Magnesium	14	0.72	29	16	14.2	
Manganese	0.06	0.3	0.2	0.2	0.1	
Sodium	133	1	200	109	131	
Potassium	16	78	12	42	18.6	
Total Alkalinity	255	300	300	300	259	
Silica	13	8.34	18	14	13.1	
Sulfate	44	1343	85	662	105	
Chloride	153	393	280	332	171	
Cadmium	0.0006	0.0006	0.0001	0.0003	0.0006	
Chromium	0.0051	0.008	0.0012	0.004	0.005	
Copper	0.0235	0.00844	0.0127	0.011	0.0222	0.023
Cyanide	0.003	0.020	0.003	0.011	0.0038	0.021
Lead	0.0022	0.002	0.001	0.002	0.0021	0.056
Mercury	0.00005	0.00007	0.00001	0.00004	0.00005	0.00021
Nickel	0.012	0.062	0.012	0.035	0.0143	0.021
Nitrate	6.0	0.7	0.2	0.4	5.4	
Fluoride	2.2	7.3	1.1	3.9	2.4	
Arsenic	0.0017	0.0068	0.001	0.004	0.002	
Iron	1.4	0.1	0.2	0.2	1.3	
Selenium	0.0012	0.0025	0.0004	0.001	0.0012	0.05
Silver	0.0018	0.0018	0.0003	0.001	0.0017	0.023
Zinc	0.073	0.033	0.036	0.034	0.069	0.58

Notes:

Hayward Effluent Concs from Table 8.15-3

RO concentrate from jar testing for cations/anions, else same removal efficiencies obtained from jar testing assumed from projected concentrations in Table 1 from SPI, June 14

MF Backwash from SPI Table 1

Flows are assumed at 90 degrees F

All units are mg/L

Assumptions:

TSS in MF BW will be reduced 50% from 93 mg/L to 47 mg/L

BOD in MF BW will be removed from 19 to 13 mg/L (assume 1/3 particulate BOD)

Total Alkalinity would be the same for each stream after treatment

7. Water Pipeline Routes (12-month process [Appendix B (g)(14)(C)(iv)]):

A description of all facilities to be used in water conveyance, treatment, and discharge. Include a water mass balance diagram.

Information required to make AFC conform with regulations:

Energy Commission staff finds Figure 2.3-2 (Water Pipeline Routes) to be confusing. Please provide legible drawings that show clear connection points and routes for the different water lines. Staff recommends the use of a mapping symbols legend to avoid plan congestion.

Section 2.2.7.1 identifies RCEC operation requiring 43,730 acre-ft/year. Please provide further clarification regarding this large water demand.

Section 2.2.18.4 references Appendix 5-A regarding information on water availability. This Appendix is an evaluation of the Natural Gas Pipeline. Please provide further clarification.

Response—To simplify Figure 2.3-2 the water supply and discharge pipelines have been placed on separate figures. Figures 2.3-2a (Water Supply Pipeline Routes) and 2.3-2b (Water Discharge Pipeline Routes) are included at the end of this section. Additionally, connection points to existing facilities are identified.

There is a typographic error in Section 2.2.7.1 of the AFC. RCEC operation will require 3,730 acre-ft/year.

There is also a typographic error in Section 2.2.18.4 of the AFC; the reference for water availability information should be Appendix 7-A.

8. Stormwater Hydrologic Evaluation and Drainage Plan (12-month process [Appendix B (g)(14)(D)(ii)]):

Drainage facilities and design criteria.

Information required to make AFC conform with regulations:

Please provide drawings that exhibit all stormwater infrastructures associated with the proposed project (stormwater pipe routes and discharge locations, inlets, oil/water separator locations). Please provide pre vs. post hydrologic calculations and design specifications/calculations for the proposed stormwater management basins.

Please refer to Appendix B (h) (2) (Information Required to Make AFC Conform with Regulations).

Response—A drainage plan displaying stormwater infrastructures is included at the end of this section. Detailed hydrologic calculations for the stormwater management basins are also provided.

The basins are sized to maintain the post-development peak discharges at the 15-year, 24-hour pre-development peak flow rate from the entire site (9 cfs). Additional detail is provided in the analysis. On page 8.15-21 of the AFC it is incorrectly stated that the basins will be sized based the 25-year, 24-hour pre-development runoff of 18 cfs.

9. FEMA Flood Zones (12-month process [Appendix B (g)(14)(iii)]):

The effects of the project on the 100-year flood plain or other water inundation zones.

Information required to make AFC conform with regulations:

The Applicant has indicated that no project related facility is located within the 100-year or 500-year floodplain. Please provide mapping at a legible scale that identifies all natural gas, water pipelines, transmission lines (along with tower locations), and laydown/parking areas with respects to the FEMA Flood Zones.

Also, Figure 8.15-3 displays a portion of the RCEC located within the 100-year flood zone. Please provide further clarification. If the project will be within the flood zone, provide a discussion on impacts and proposed mitigation measures.

Response—The requested map of FEMA flood zones including project facilities is included at the end of this section. No project facilities will be constructed within the 100-year flood zone. A portion of the RCEC site is currently at an elevation below the 100-year flood elevation as shown on the FEMA maps; however, the property is currently protected from 100-year flood events by berms at the southern end of the property. Additionally, ground level at the RCEC will be increased approximately 5 feet with fill material before construction. Therefore, the RCEC will be protected from 100-year flood events.

10. USD Backup Water Supply LORS (6-month and 12-month processes [Appendix B (h)(1)(A), §2022(b)(1)(A)]):

Tables which identify laws, regulations, ordinances, standards, adopted local, regional, state, and federal land use plans, and permits applicable to the proposed project, and a discussion of the applicability of each. The table or matrix shall explicitly reference pages in the application wherein conformance, with each law or standard during both construction and operation of the facility is discussed;

Information required to make AFC conform with regulations:

Please provide LORS information pertaining to the proposed backup water supply from the Union Sanitary District (USD) wastewater treatment plant.

Provide a "will serve" letter from USD that accepts the Applicants proposal to use their water as backup supply.

The "will serve" letter from the City of Hayward (Appendix 7A) does not indicate whether the City will accept sanitary wastewater. Please provide clarification regarding the aforementioned issue.

Response— The attached letter from Alex Ameri, Deputy Director of Public Works for Utilities, City of Hayward, to the Regional Water Quality Control Board explains that the backup water supply from the Union Sanitary District belongs to EBDA once it enters the EBDA outfall pipeline downstream of the Union Sanitary District's Alvarado Treatment Plant. The backup water supply would be provided by the City of Hayward, through their agreement with EBDA. The LORS that apply to the backup supply are thus the same as those that apply to the primary supply. The City of Hayward's "will serve" letter thus covers both the primary and backup supplies.

Attached is a copy of an e-mail communication from Mr. Alex Ameri, Deputy Director of Public Works for Utilities, City of Hayward indicating that the City is willing to accept the RCEC's sanitary effluent.

11. Alameda County Hydrology Manual (12-month process [Appendix B (h)(2)]):

A discussion of the conformity of the project with the requirements listed in subsection (h)(1)(A).

Information required to make AFC conform with regulations:

The Applicant has indicated drainage conformance related to the Alameda County Hydrology Manual referenced as A.3.3.4. Energy Commission staff was unable to locate the aforementioned reference and supporting information. Please provide the appropriate reference and supporting information related to drainage conformance.

Response—The correct reference for this document is the *Hydrology and Hydraulics Criteria Summary for Western Alameda County, Revised August 7, 1989*. This document is available from the Alameda County Public Works Agency. The document is intended to define current district practices in the hydrologic and hydraulic design of flood control facilities in western Alameda County. Hydrologic and hydraulic design of the RCEC stormwater conveyance systems will be in accordance with these guidelines. Because of the size and format of this document, it is not practical to include it with this supplement. One copy will be provided directly to CEC staff technical reviewer.

LETTER FROM CITY OF HAYWARD TO REGIONAL WATER QUALITY CONTROL BOARD

CITY OF
HAYWARD
HEART OF THE BAY

June 15, 2001

Ms. Shin Roei Lee
Division Chief, NPDES Division
California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612

Subject: Permitting Considerations Regarding Russell City Energy Center (RCEC) and Advanced Water Treatment Facility

Dear Ms. Lee:

Recently, some issues have arisen regarding the above-referenced. In order for the City of Hayward and Calpine/Bechtel to move forward as expeditiously as possible with State Energy Commission certification of this energy project which is so critical to California's energy needs and Governor Davis' stated priorities, I would like to request your assistance in better understanding the issues involved with NPDES and/or other permitting elements which need to be addressed. Hopefully, the City and Calpine/Bechtel can work through these issues with you and the RWQCB as quickly as possible in order to keep this project moving forward and on schedule.

As you may be aware from information provided in Calpine/Bechtel's Application for Certification (AFC), the RCEC project will generate several wastewater streams. The first group of wastewater streams, which will be discharged to the City of Hayward sanitary sewer system and WPCF influent, are those which will be generated by the power plant, itself. These include cooling tower blow down, and, of course, sanitary discharges generated within the power plant facility. All of these will be regulated under an Industrial Wastewater Discharge Permit issued through the City's approved Industrial Pretreatment Program. The standards to be applied to these discharges will be those contained in the City of Hayward Wastewater Discharge Regulations and, as applicable, those provided in the USEPA Categorical Pretreatment Standards for the NSPS Steam Electric Generating Category.

Stormwater discharges from the power plant will be regulated under State of California General Industrial and General Construction Stormwater NPDES Permits. A description of the Stormwater Management and Monitoring Plans proposed for the power plant and in compliance with these permits is contained in the AFC and is being further developed as part of facility design.

Of the wastewater streams generated within the power plant and discharged to the sanitary sewer system, only the cooling tower blow down stream will fall under the federal categorical standards. These flows are, in aggregate, quite small and the City's Industrial Pretreatment Program staff has evaluated the discharges to be permitted under the City's authority and have found them to be compliant with all standards. We intend to begin the permitting process within 6 months, or so, of start-up of facility operation. This is consistent with the time schedule used for most other new industrial dischargers and, due to the pre-evaluation and approval process which this discharge has already undergone, we foresee no problems, whatsoever, with satisfactory completion of the process prior to the start-up of the RCEC. It is important to note that NO process wastewater from the power plant portion of the RCEC, owned and operated by Calpine/Bechtel, will be discharged directly to waters of the State of California

The other group of wastestreams which will be generated as a result of the RCEC project are those associated with the Advanced Water Treatment Facility. This facility will produce virtually all of the water required for the RCEC power plant and will use, as its primary raw water feedstock, the secondary effluent produced by the City of Hayward Water Pollution Control Plant. The AWT will be constructed and operated at the expense of Calpine/Bechtel, but will be transferred to, owned and operated by the City of Hayward. It will be operated as an integral part of the City's Water Pollution Control Plant and the effluent from the AWT portion of the plant will be treated to the same, or higher, standards as the remaining secondary effluent. In essence, there will be two secondary effluent quality wastewater streams discharging to the same effluent channel and, from there, through chlorination and into the EBDA system. However, as a result of evaporative losses by the RCEC power plant, the overall volumes of wastewater discharged from the City of Hayward Water Pollution Control Plant will be significantly reduced.

Based upon several previous discussions with RWQCB staff and our understanding of RWQCB's NPDES permitting requirements and policy, we did not consider that any new or separate NPDES permit or Waste Discharge Requirements would be necessary for the either the RCEC power plant or the AWT. As described, all of the power plant wastewater will be discharged to the City of Hayward Sanitary Sewer System under permit by and regulation of our approved Industrial Pretreatment Program. The AWT, and all discharges therefrom, will be part of our existing City of Hayward Water Pollution Control Plant. Of course, we understand that our existing NPDES permit for the plant discharge, which is held by EBDA of which the City of Hayward is a member agency and co-permittee, may require modification and/or amendment in order to incorporate the new process description and new unit process elements into the facility description for the City of Hayward plant. It would seem that any such permit modifications and/or amendments would be most appropriately dealt with as the project is further developed and closer to becoming operational. In any event, and as described in the AFC, the RCEC will not generate any significant new loadings for the City of Hayward Water Pollution Control Plant. In addition, the new AWT component of the City's plant will generate a discharge component which will be equal to or better than secondary effluent standards, a reduced loading of several heavy metals and other

constituents will occur as a result of AWT MF backwash/RO concentrate treatment, and overall City of Hayward discharge volumes to EBDA and San Francisco Bay will be substantially reduced. Consequently, the overall project will generate a substantial water quality benefit over the condition that would exist absent the construction of the RCEC.

Beyond the substantial water quality benefits, this project represents a real and viable water reclamation/reuse project which goes well beyond the normal irrigation-use-only projects which, themselves, are few-and-far-between. The AWT will produce, using as its feedstock secondary wastewater effluent otherwise discharged to San Francisco Bay, extremely high quality water suitable for virtually any use. Since the AWT will have capacity excess to the needs of the power plant during the vast majority of power plant operational periods, there will be surplus water available for distribution to other industrial customers. It is the intent of both Calpine/Bechtel and the City of Hayward to develop other users of this excess capacity. The benefits to other industrial customers include extremely high quality water AND an assured supply irrespective of even serious drought conditions which may occur in the future. Quite frankly, the high quality AWT water project will be one of the first projects of its type that we are aware of in northern California and, due to the great benefit to the public interest, the City and Calpine/Bechtel would like to see it brought on-line as soon as possible.

In order to assist you in understanding the wastewater streams generated by the RCEC, including the power plant and the AWT, a process flow diagram is attached for your convenience.

I would greatly appreciate an opportunity to discuss with you and/or any other members of the RWQCB staff the permitting issues associated with this project from the perspective of the RWQCB. Hopefully, we can work through these issues and/or clear up any confusion or misconceptions that may exist. It is certainly the intention of the City and of Calpine to address all issues of concern to the RWQCB and Board staff. However, in consideration of the importance of the expeditious development of this project, I would appreciate hearing from you as soon as possible. I can be reached at (510) 583-4720, or by e-mail at alexa@ci.hayward.ca.us.

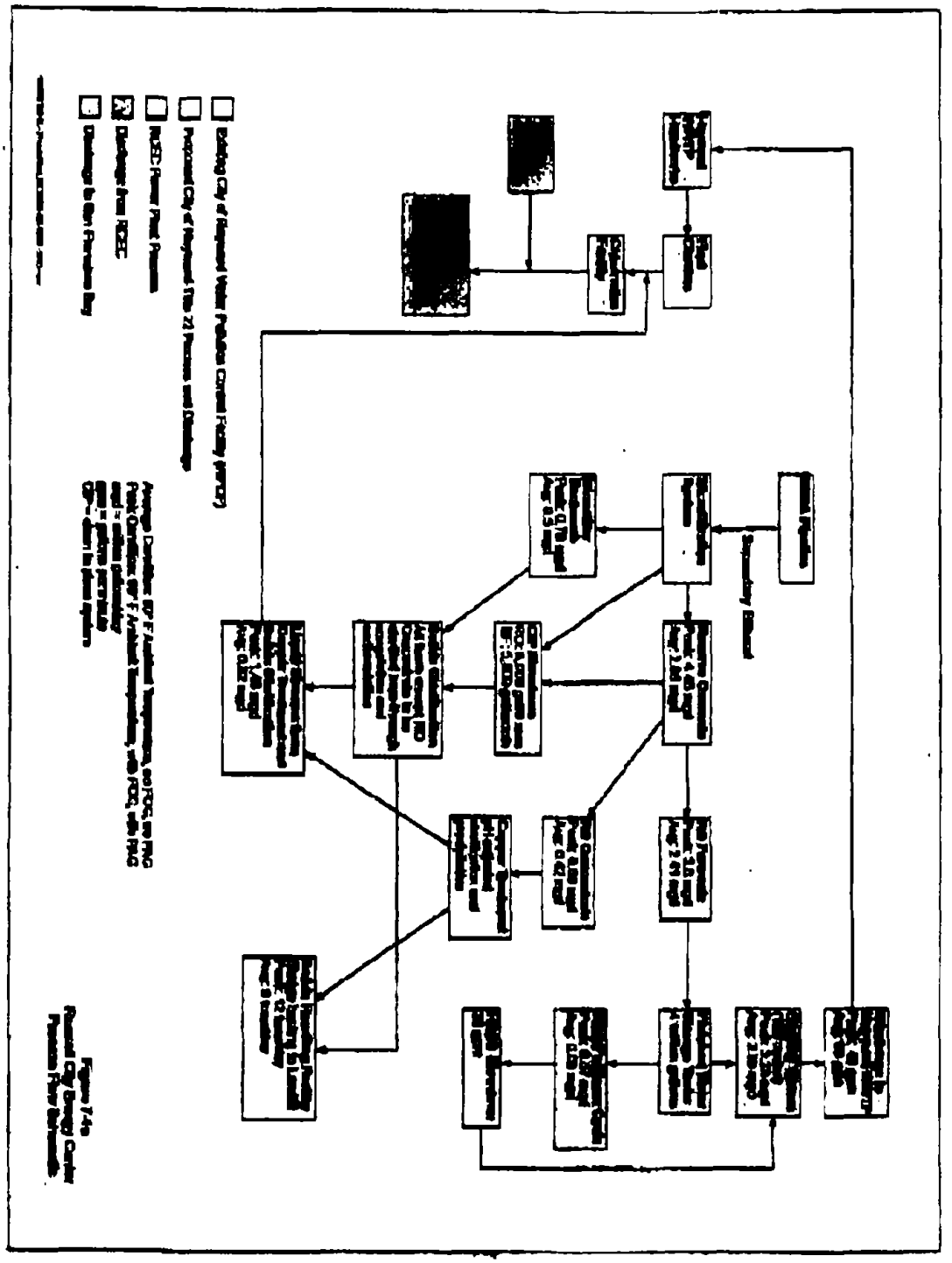
Sincerely,

A. Ameri

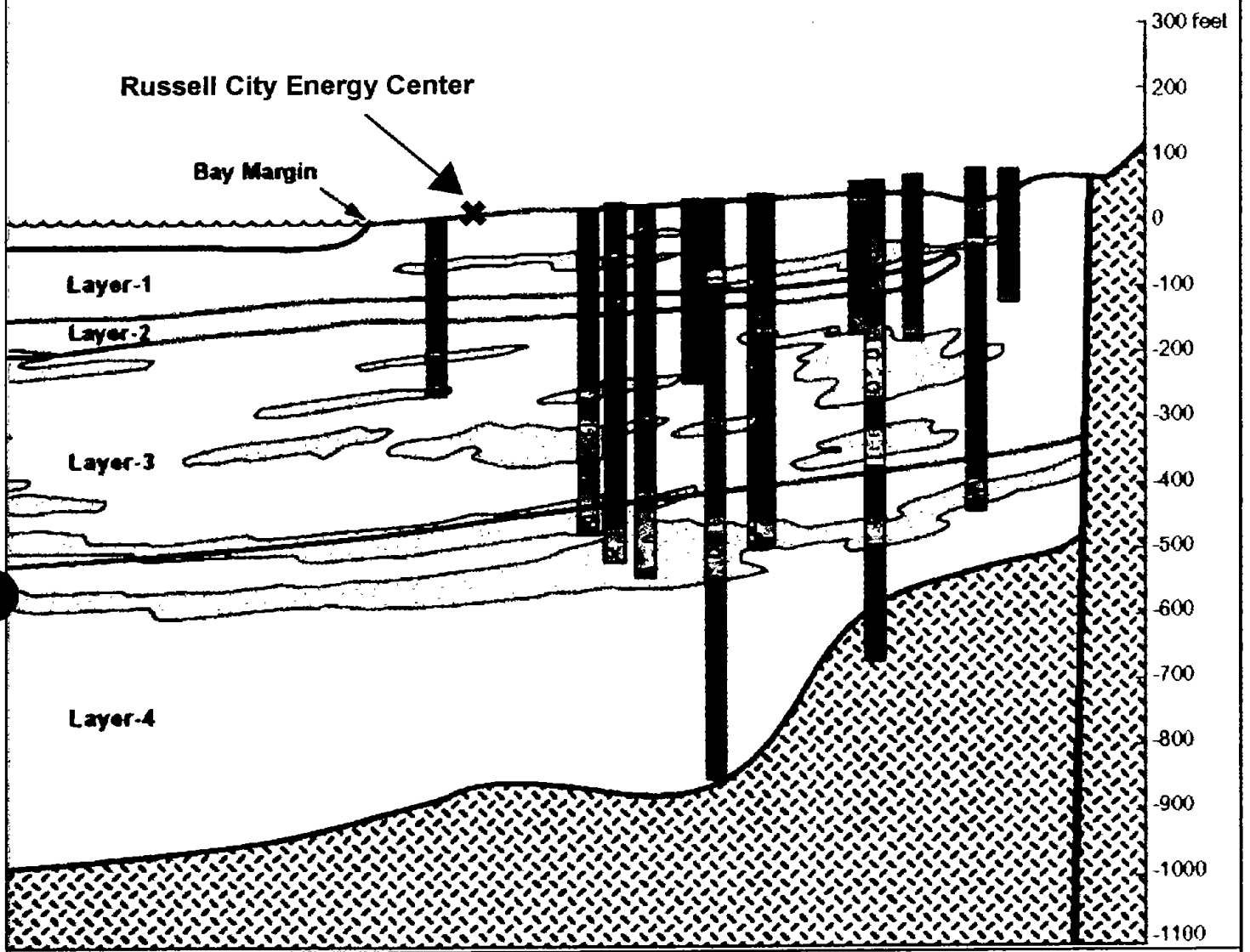
Alex Ameri, P.E.
Deputy Director of Public Works/Utilities

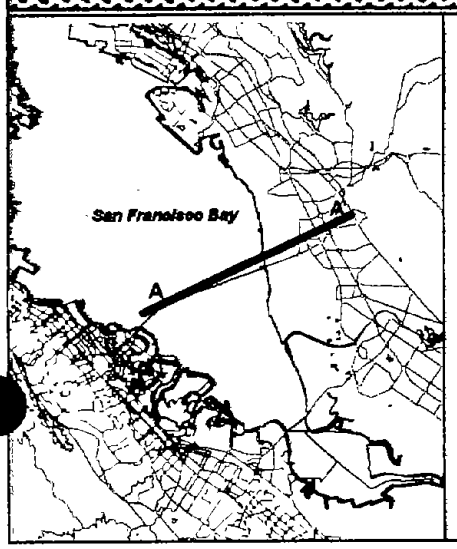
Attachment: RCEC Process Flow Schematic

cc: Lila Tang
Judy Chen



HYDROSTRATIGRAPHIC MAP OF PROJECT AREA





Bedrock
Clay
Fill
Gravels
Silts
Sands
Unknown
Aquifer Unit Correlation

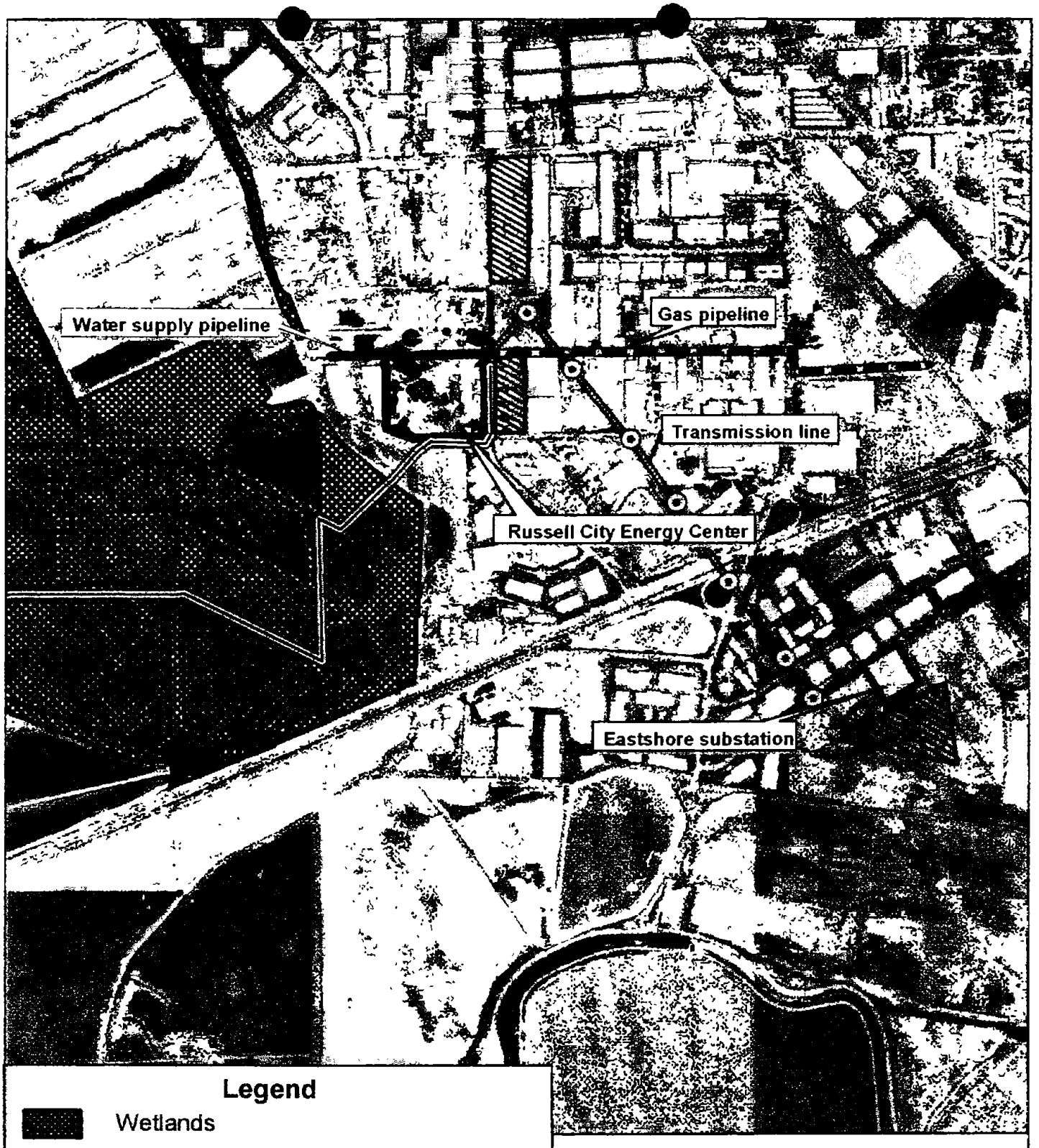
Figure 8.15(s) -1

Hydrologic Cross Section

RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

MAP OF WETLANDS AND WATERCOURSES



Legend

- Wetlands
- Construction laydown and parking areas
- Engineered drainage channel
- Transmission towers

1000 0 1000 2000 Feet

Scale = 1:12,000

Figure 8.15(s)-2

Wetlands/watercourses near project facilities

RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

PROCESS FLOW DIAGRAM

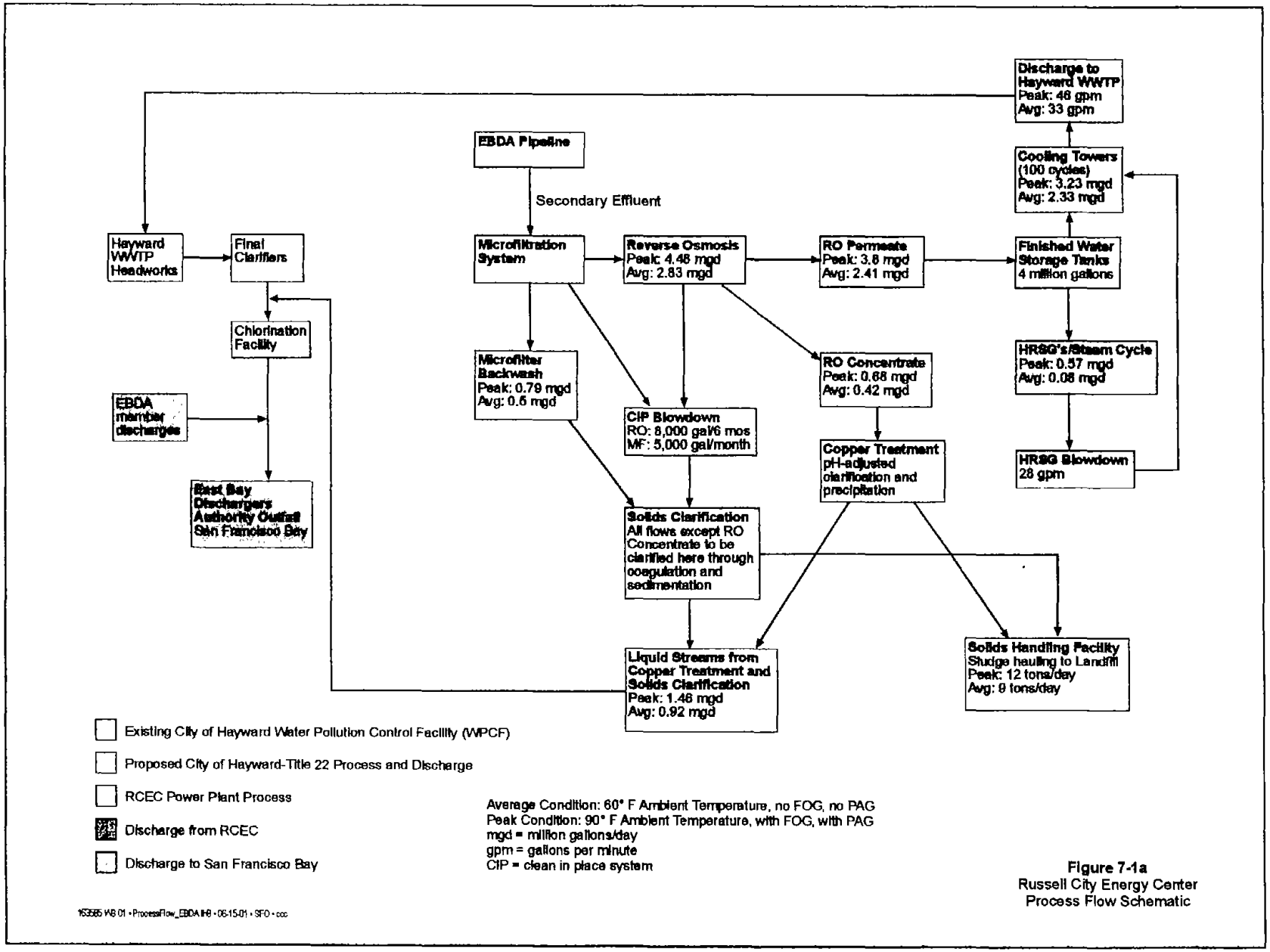
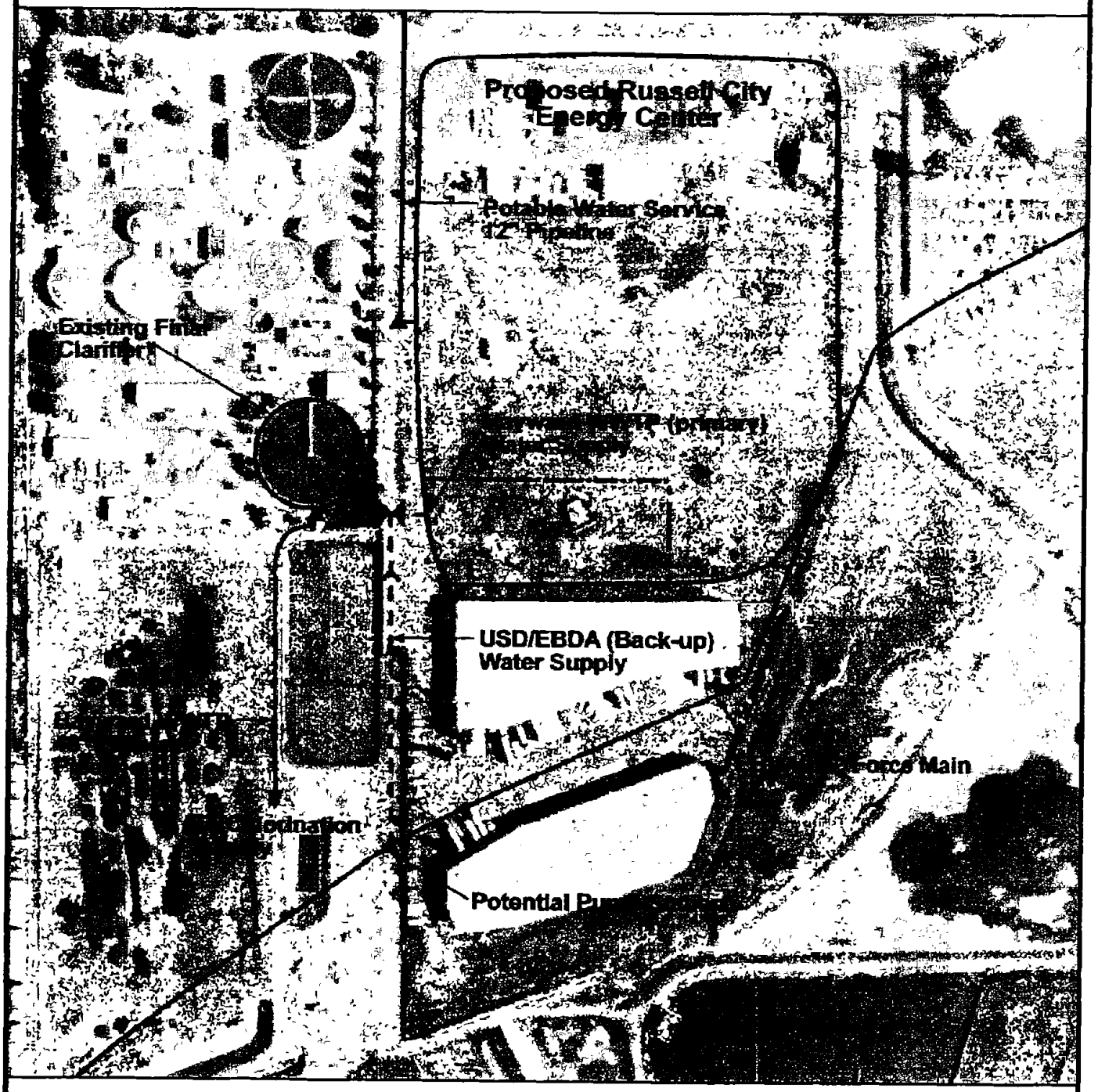


Figure 7-1a
Russell City Energy Center
Process Flow Schematic

WATER PIPELINE ROUTES



Proposed Pipeline

Existing Pipeline

Connection Point to Existing Facilities

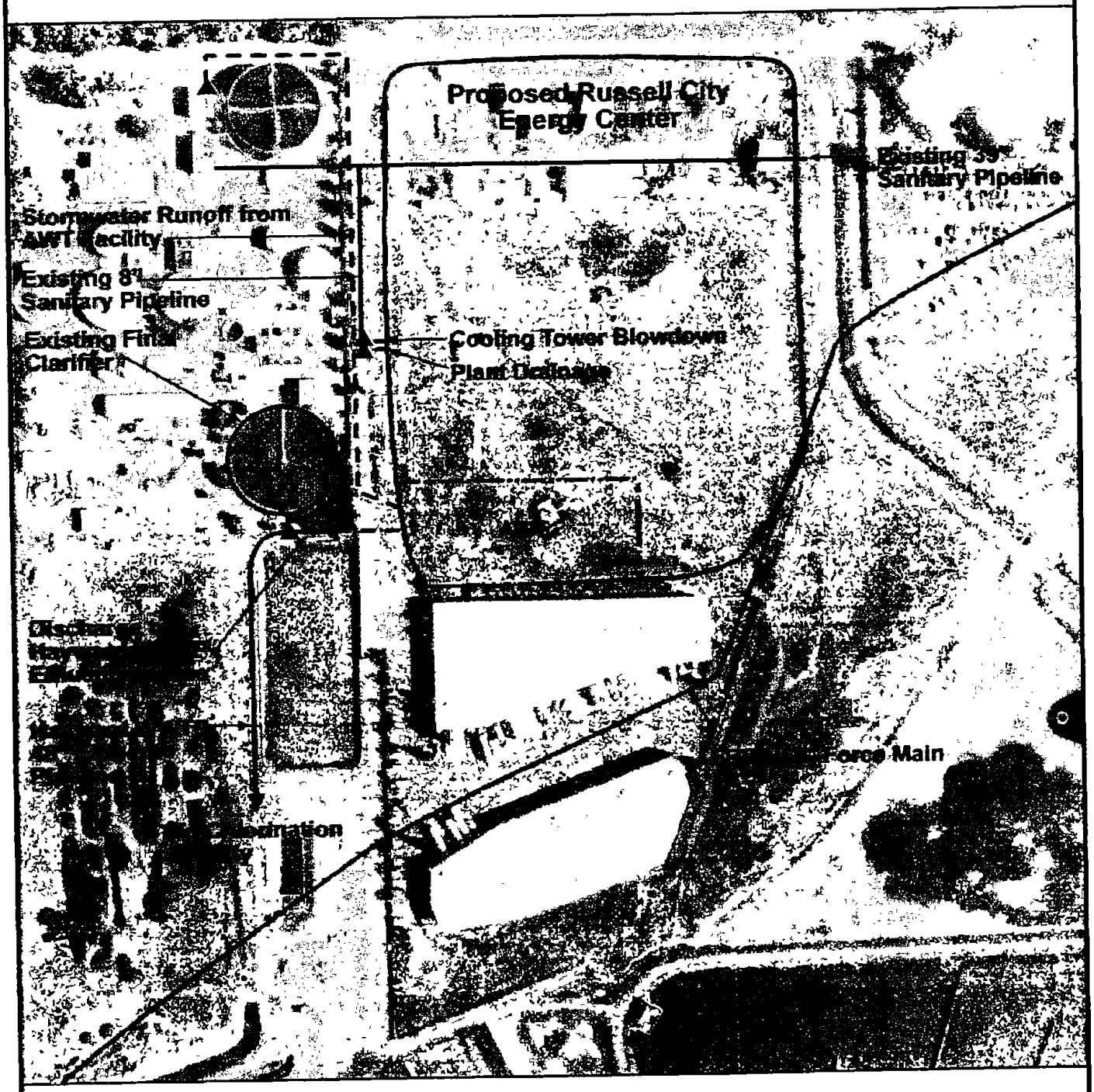
Not to Scale

Source: CH2M Hill

Figure 8.15(s)-3a

Water Supply Pipeline Routes
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION



Proposed Pipeline

Existing Pipeline

Connection Point to Existing Facilities

Not to Scale

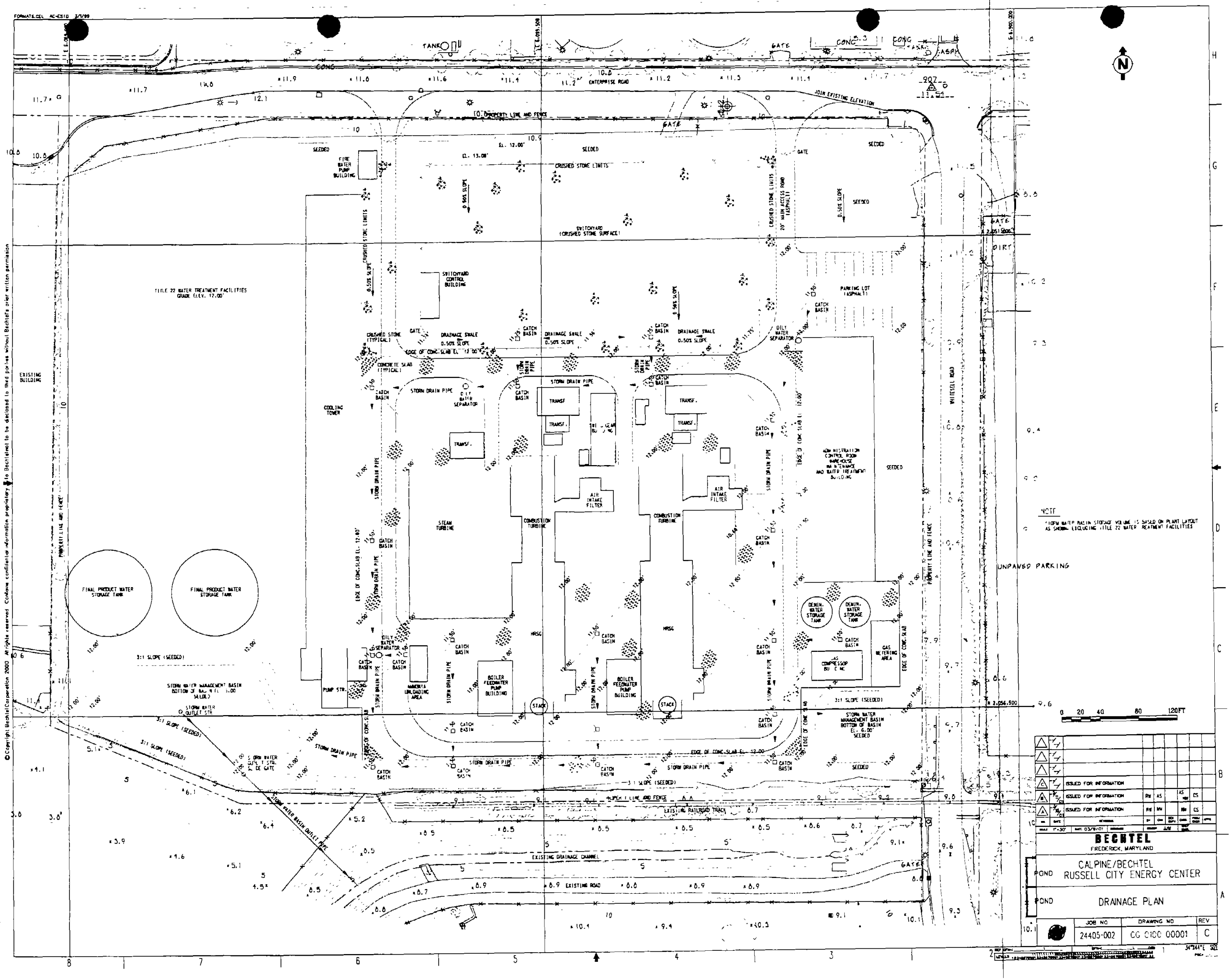
Source: CH2M Hill

Figure 8.15(s)-3b

Water Discharge Pipeline Routes
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

RCEC DRAINAGE PLAN



1	ISSUED FOR INFORMATION	RW	AS	AS	CS
0	ISSUED FOR INFORMATION	RW	MV	MV	CS
NO.	DATE	REVISION	BY	CHK	DES APP'D	PROJ ENGR	APP'D

SCALE 1"=30' DATE 03/8/01 DESIGNED AM

BECHTEL
FREDERICK, MARYLAND

CALPINE/BECHTEL
POND RUSSELL CITY ENERGY CENTER

POND DRAINAGE PLAN

JOB NO	DRAWING NO	REV
24405-002	CG C10C 00001	C

SHEET 1 OF 1

PRE- AND POST DEVELOPMENT HYDROLOGIC ANALYSIS

RUSSELL CITY ENERGY CENTER

PRELIMINARY STORM WATER MANAGEMENT BASIN SIZING, PRE- & POST-DEVELOPMENT RUNOFF ANALYSIS

Calculation No. H&H-1

Job No. 24405

BECHTEL CORPORATION
GEOTECHNICAL & HYDRAULIC ENGINEERING SERVICES
FREDERICK, MARYLAND

June 2001

CALCULATION SHEET		PROJECT Russell City Energy Center
		JOB NUMBER 24405
SUBJECT Preliminary Storm Water Management Basin Sizing, Pre- and Post-Development Runoff		CALC NO H&H-1
BY Craig J. Talbot	DATE June 11 2001	SHEET NO 2
CHECKER SWT	DATE 6/14/01	SHEET REV 0

I. Objective

To size the storm water management basin for the Russell Energy Center Project located Hayward, CA. The basin will collect the runoff from the power plant portion of the Russell City Energy Facility site. A portion of the site will be dedicated to a Title 22 water treatment facility. Runoff from this portion of the site will not drain to the proposed basin. The basin will be sized to control peak discharges from storms up to and including the 25-year, 24-hour storm, per the project scope book. The basin will discharge to an existing Alameda County drainage canal south of the site. This canal was designed for the 15-year peak flow from the existing site. Therefore, the basin is sized to maintain the post-development peak discharges at the 15-year, 24-hour pre-development peak flow rate from the entire site. Alameda County drawings for the canal indicate that this discharge was estimated to be about 9.0 cfs. NRCS (formerly SCS) methodologies and the NRCS computer program TR-20 are used to determine the pre- and post-development peak discharges as well as perform the flood routing through the storm water management basin.

II. Rainfall Data

The 24-hour rainfall depths for site are determined from the Application for Certification (Attachment1) and are tabulated below for the design frequencies:

2-Year	1.98 inches
10-Year	3.34 inches
25-Year	4.01 inches
50-Year	4.50 inches
100-Year	4.98 inches

The 15-Year, 24-hour rainfall depth is determined by plotting the 24-hour values above on extreme probability paper. This plot is shown on sheet 3. From this plot, the 15-year, 24-hour value is estimated to be about 3.63 inches.

An SCS Type I rainfall distribution is used to simulate the 24-hour events.

III. Soils Information

Based on field observation of slow draining soils, for this analysis hydrologic soil group C, which is typical of floodplain areas, is assumed to represent the site soil conditions.

CALCULATION SHEET

PROJECT Russell City Energy Center

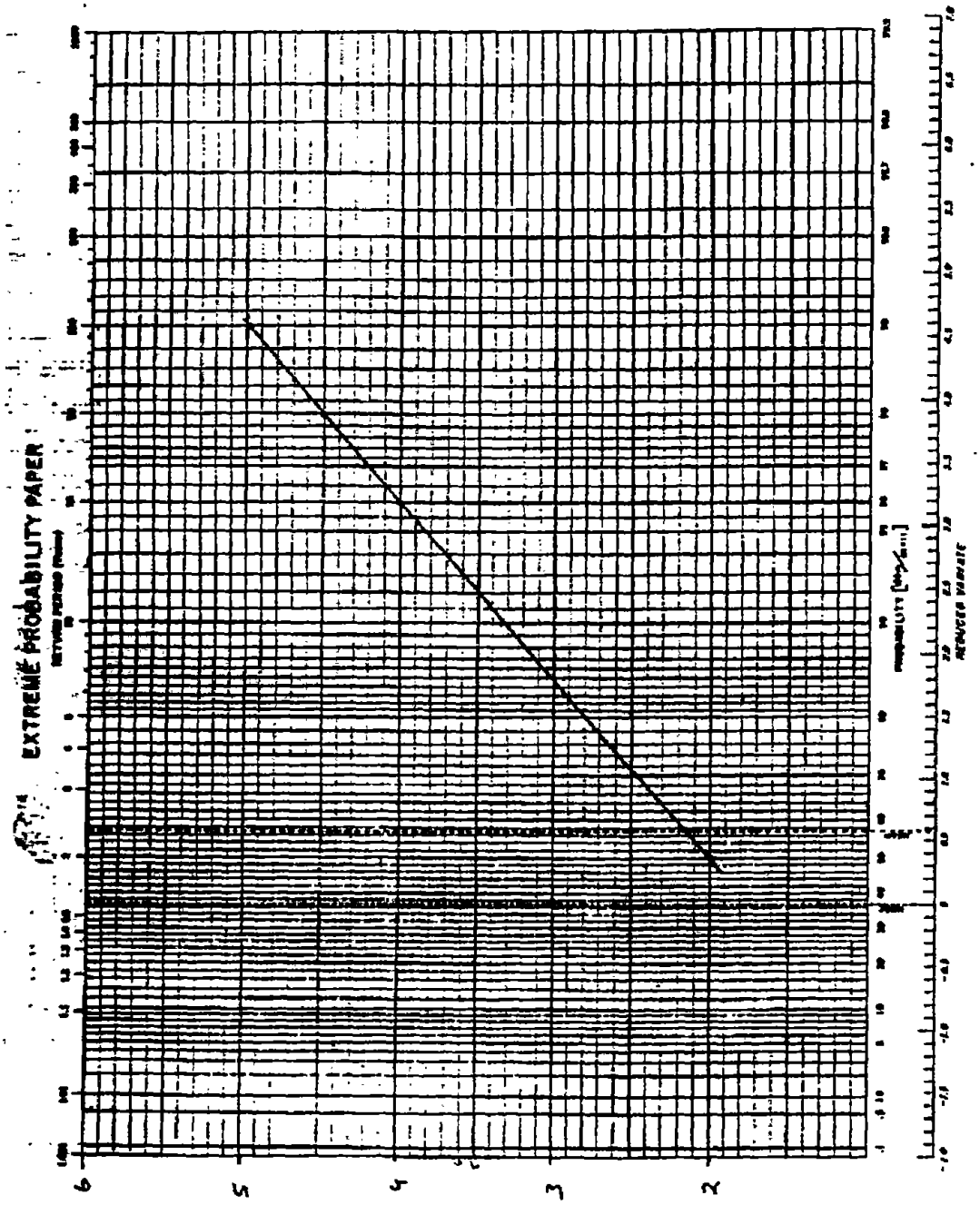
JOB NUMBER 24405

SUBJECT Preliminary Storm Water Management Basin Sizing, Pre- and Post-Development Runoff

CALC NO H&H-1

BY Craig J. Talbot DATE June 11 2001 SHEET NO 3

CHECKER SWT DATE 6/14/01 SHEET REV 0



IV. Pre-Development Runoff Analysis

The pre-development peak discharges for the various storm frequencies is determined based in the following hydrologic parameters:

IV.1 Drainage Area:

The pre-development drainage area for the proposed development is equal to about 15.5 acres and is shown on sheet 5.

IV.2 Time of Concentration

The pre-development time of concentration flow path is also shown on sheet 5 and is calculated below using NRCS methodologies:

Segment A-B, Sheet Flow (Reference 1)

$$T_t = \frac{0.007(nl)^{0.8}}{P^{0.5}S^{0.4}}$$

Where:

n = Surface roughness, (0.24, Ref. 1, dense grass)
l = Length, (150 ft)
P= 2-yr, 24-hr depth (1.98 in.)
S = Slope, $(\frac{10-7.8}{150} = 0.015)$

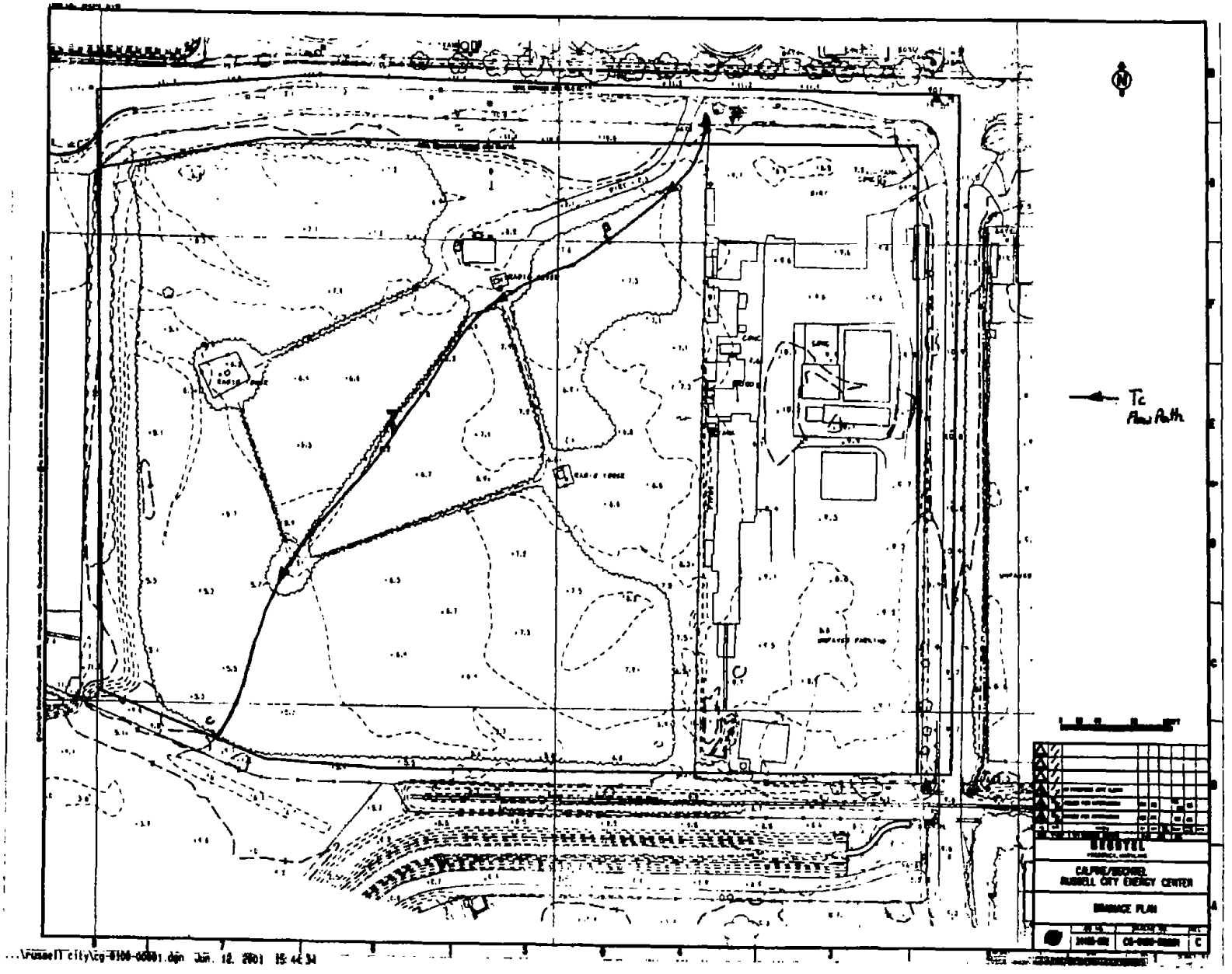
$$T_t = \frac{0.007(0.24*150)^{0.8}}{1.98^{0.5}0.015^{0.4}} = 0.47 \text{ hour}$$

Segment B-C, Shallow Concentrated Flow, (Reference 2)

$$T_t = \frac{L}{3600V}$$ L = 785 ft. For S = $\frac{7.8-4.7}{785} = 0.004$, V = 1.02 fps (Ref. 2, Figure 3-1)

$$T_t = \frac{780}{3600*1.02} = 0.21 \text{ hour}$$

$$T_c = \sum T_t = 0.47 + 0.21 = 0.68 \text{ hour}$$



Job No. 24405
Calculation H28-1
Rev 0.
Sheet 5
Orig: CJT
12 June 2001
Chkd: SWT, 6/19/01

IV.3 Runoff Curve Number

Approximately 4.8 acres of the eastern portion of the site is presently used for industrial purposes and is almost completely paved. The remaining site ground cover consists mainly of grasses and shrub. A runoff curve number of 74 (pasture grassland) is selected for the undeveloped portion and a curve number of 91(industrial) for the developed portion. The composite pre-development curve number is calculated below:

Land Cover	Area, (ac)	CN (Ref 3)	Area X CN
Pature	10.70	74	791.8
Impervious	4.80	91	436.8
Total	15.50		1228.6

Composite CN = Total Area X CN/ Total Area = 79.26

Use CN = 80

Based on NRCS methodologies using a curve number of 80, a 15-year, 24-hour precipitation depth of 3.63 inches, the runoff depth will be 1.74 inches. This is equivalent to a runoff coefficient of about 0.48.

IV.4 Peak Discharges

The pre-development peak discharges are determined using the NRCS computer program TR-20. Attachment 2 contains the pre-development output file from TR-20. The results are summarized below:

Return Period	Peak Discharge (cfs)
2-Yr	2.14
10-Yr	7.45
15-Yr	8.74
25-Yr	10.50
50-Yr	12.83
100-Yr	15.23

V. Post-Development Runoff Analysis

V.1 Drainage Area

The post-development drainage area is 11.8 acres and is shown on sheet 8. The drainage area does not include the Title 22 Water Treatment Facility (3.0 acres) or the cooling tower basin (0.70 acre). The runoff from the Title 22 facility will be handled by a separate storm water collection system. Precipitation over the cooling tower area will be collected in the cooling tower basin and thus there will be no runoff from this area.

V.2 Time of Concentration

The post-development time of concentration flow path is shown on sheet 6. The time of concentration is calculated below:

Segment A-B, Sheet Flow

$$T_i = \frac{0.007(nl)^{0.8}}{P^{0.5}S^{0.4}}$$

Where:

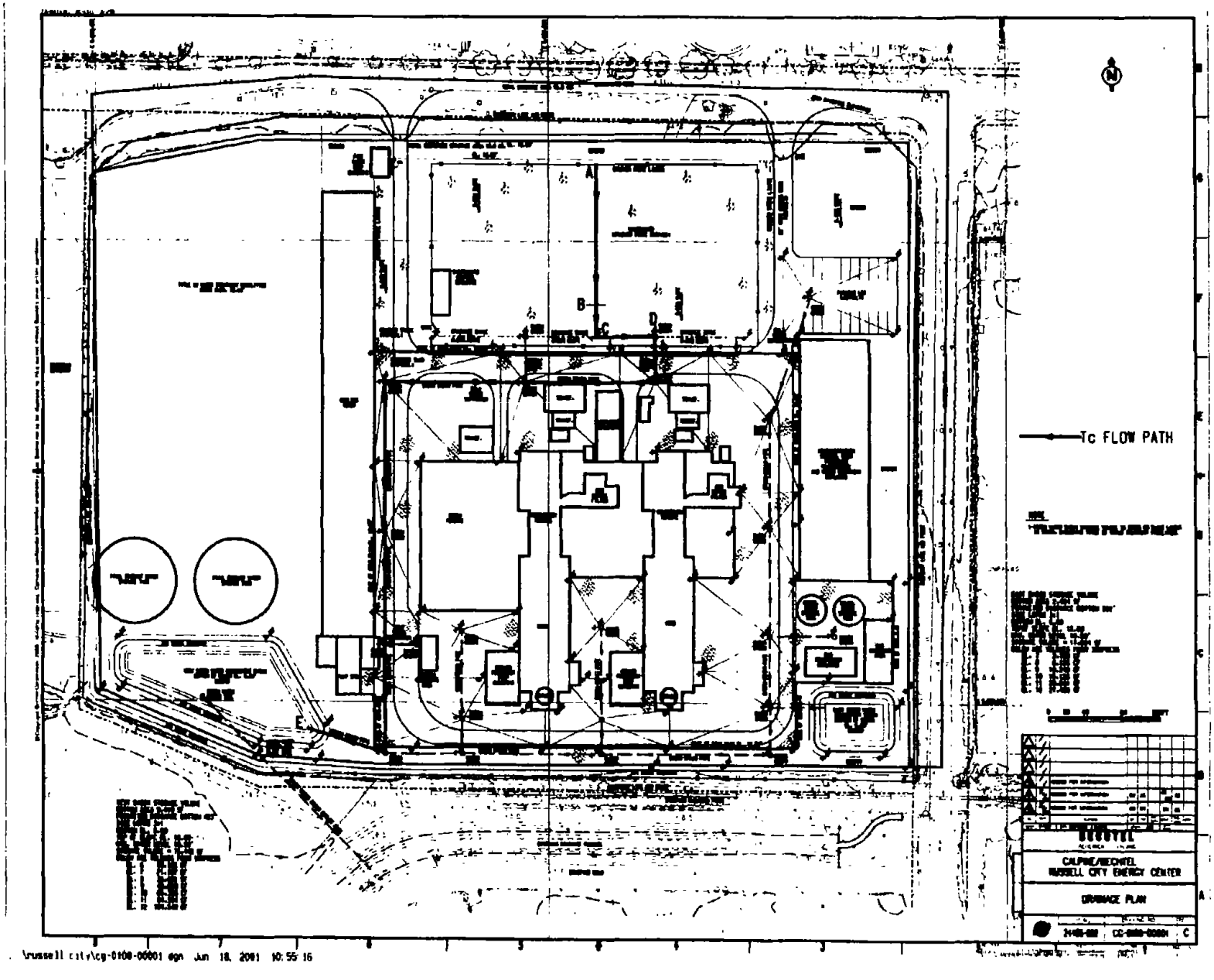
n = Surface roughness, (0.05 Loose Gravel Ref. 1)
l = Length, (150 ft)
P= 2-yr, 24-hr depth (1.98 in.)
S = Slope, (0.005)

$$T_i = \frac{0.007(0.05*150)^{0.8}}{1.98^{0.5}0.005^{0.4}} = 0.208 \text{ hour}$$

Segment B-C, Shallow Concentrated Flow

$$T_i = \frac{L}{3600V}$$ L = 52 ft. For S = 0.005, V = 1.14 fps

$$T_i = \frac{52}{3600*1.14} = 0.012 \text{ hour}$$



Job No. 24405
Calculation HDH-1
Rev 0.
Sheet 8
Orig: CJT
Chkd: SWT, 6/14/01

Segment C-D, Swale Flow, estimate V = 3.0 fps, L = 74 ft

$$T_i = \frac{74}{3600 * 3.0} = 0.007 \text{ hour}$$

Segment D-E, Pipe Flow, estimate V = 4.0 fps, L = 850 feet

$$T_i = \frac{850}{3600 * 4.0} = 0.059 \text{ hour}$$

$$T_c = \sum T_i = 0.208 + 0.012 + 0.007 + 0.059 = 0.286 \text{ hour}$$

V.3 Runoff Curve Number

The post-development composite runoff curve number is calculated below based on hydrologic soil classification C.

Land Cover	Area, (ac)	CN (Ref 3)	Area X CN
Pond	0.70	100	70
Impervious	7.77	98	761.46
Grass	0.90	74	66.6
Gravel	2.43	85	206.6
Total	11.80		1104.6

Composite CN = Total Area X CN/ Total Area = 93.61

Use CN = 94

Note: Pond = 0.50 ac + 0.20 ac
Impervious = 5.0 ac + 0.1 ac + 0.05 ac + 0.45 ac + 0.17 ac + (15.5 ac - 13.5 ac)
Grass = 0.90 ac
Gravel = 11.80 ac - 0.7 ac - 7.77 ac - 0.90 ac

V.4 SWM Basin Stage-Storage

There are two storm water management basins, one located in the southwest corner of the site and the other in the southeast corner. The basins are interconnected by the plant storm drain piping system and thus will act together as a single storage facility. The basins will be treated as a single storage basin for the purposes of this calculation. The combined basin storage volume versus water level relationship is developed from information provided on sheet 8 and is summarized below:

Combined SWM Basin
Stage vs Storage Data

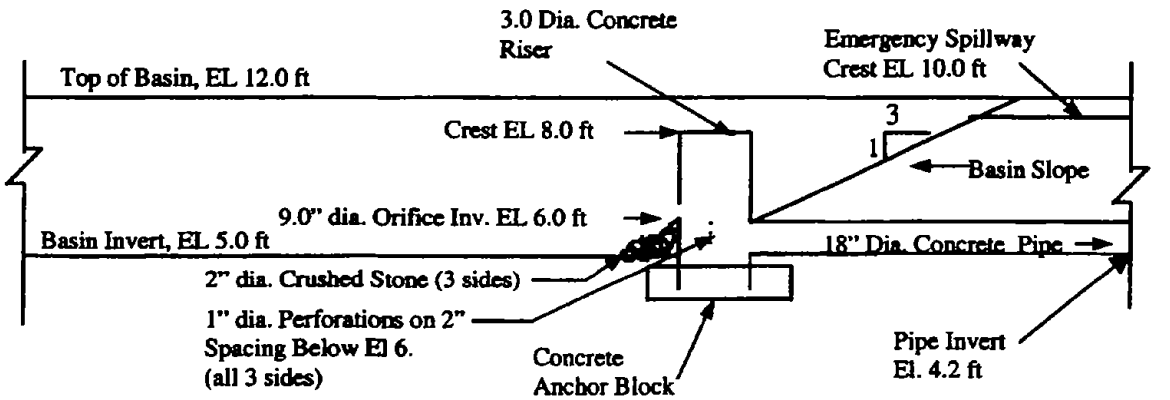
Basin Invert = 5.0 ft
Top of Basin 12.0 ft
Basin Side Slopes: 3 horizontal to 1 vertical

Elevation (ft)	Total Volume (ft^3)	Total Volume (ac-ft)
5.00	0.00	0.00
6.00	10125.00	0.23
7.00	27913.00	0.64
8.00	41127.00	0.94
9.00	60070.00	1.38
10.00	81455.00	1.87
11.00	105395.00	2.42
12.00	131976.00	3.03

V.5 SWM Basin Stage-Discharge

The water level versus discharge flow rate is determined based on the configuration of the principal and emergency spillways for the basin. The basin outlets to the existing drainage canal along the south side of the site. Two tail water scenarios will be analyzed. For case 1, the tailwater elevation in the canal will be the design high water level which is estimated to be 7.4 ft (Ref 3.) The starting water level in the basin shall be elevation 6.0 at the beginning of the storm to account for sediment deposition. Due to the high tail water level, no discharge will occur from the basin until the water level reaches at least elevation 7.4 ft. The outlet will be equipped with a tide valve to prevent backflow into the basin. For Case 2, the tailwater elevation will be equal to the top of the outlet pipe at elevation 5.7 ft. to simulate a low flow condition in the canal. For Case 2, the starting water level in the basin will also be elevation 6.0 ft.

SWM Basin



In addition to the outlet structure shown above, there is also a 10 foot lined emergency spillway with a crest invert elevation of 10.0ft. The discharge versus elevation equations for each component of the structure are shown below:

Orifice Equation: (9.0" diameter orifice center line outlet at EL 6.375 ft.(for Case 1 El. 7.4 ft))

$$Q = CdA\sqrt{2gh}$$ Where: $Cd = 0.6$

$$A = \frac{0.75^2\pi}{4} = 0.442 \text{ ft}^2$$

h = W.L. EL. - 6.375* ft

$$Q = 2.127\, h^{1/2} \text{ cfs}$$

*Note: for Case 1 the value is 7.4 ft

Riser Weir Equation: (Weir crest at EL 8.0 ft.)

$$Q = CLH^{3/2}$$ Where: $C = 2.8$

$L = 9.42$, ft.

H = W. L. EL. - 8.0 ft

$$Q = 26.39H^{3/2} \text{ cfs}$$

Pipe Flow Equation:

The equation for pipe flow conditions is as follows:

$$h = \left(K_e + K_{ex} + \frac{29n^2L}{R^{4/3}} \right) \frac{Q_P{}^2/A^2}{2g}$$ Where: $n = 0.013$ (concrete pipe)

$$h = \left(0.0233 + \frac{0.45n^2L}{R^{4/3}} \right) Q^2/A^2$$

$$A = \frac{1.5^2\pi}{4} = 1.767 \text{ ft}^2$$

$R = 1.5/4 = 0.375$ ft

$L = 260.0$ ft

$h = 0.0309Q^2$

$Q = 5.69h^{1/2}$

$K_e = 0.5$ (entrance loss)

$K_{ex} = 1.0$ (exit loss)

h = W. L. El – TW ft.

Emergency Spillway Flow: (Crest EL 10.0 ft.)

$$Q = CLH^{3/2}$$

Where: $C = 2.8$, $L = 10.0$ ft, H = W. L. EL - 10.0 ft

$$Q = 28.0H^{3/2} \text{ cfs}$$

The combined stage-discharge flow is summarized for each case below:

SWM Basin
Case 1 Stage Discharge Summary (TW = 7.4 ft.)

Elevation (ft)	Orifice Flow h (ft)	Orifice Flow Q (cfs)	Riser Weir Flow H (ft)	Riser Weir Flow Q (cfs)	Total Riser Flow (cfs)	Pipe Flow h (ft)	Pipe Flow Q (cfs)	Spillway Flow H (ft)	Spillway Flow Q (cfs)	Total Basin Flow* (cfs)
6.00					**0.00**					0.00
6.50	0.00	0.00			**0.00**					0.00
6.75	0.00	0.00			**0.00**					0.00
7.00	0.00	0.00			**0.00**					0.00
7.50	0.10	0.67			**0.67**	0.10	1.80			0.67
8.00	0.60	1.65	0.00	0.00	**1.65**	0.60	4.41			1.65
8.25	0.85	1.96	0.25	3.30	5.26	0.85	**5.25**			5.25
8.50			0.50	9.33	9.33	1.10	**5.97**			5.97
9.00			1.00	26.39	26.39	1.60	**7.20**			7.20
10.00			2.00	74.64	74.64	2.60	**9.17**	0.00	0.00	9.17
10.25			2.25	89.07	89.07	2.85	**9.61**	0.25	3.50	13.11
10.50			2.50	104.32	104.32	3.10	**10.02**	0.50	9.90	19.92
11.00			3.00	137.13	137.13	3.60	**10.80**	1.00	28.00	38.80
12.00			4.00	211.12	211.12	4.60	**12.28**	2.00	79.20	91.40

* Note: Total Basin Flow is determined by adding either the Total Riser Flow or Pipe Flow, which ever is controlling (bold type face indicates controlling flow), to the spillway flow

Total Riser Flow = Orifice + Weir Flow

Orifice flow is considered negligible once the orifice is submerged

CALCULATION SHEET

PROJECT Russell City Energy Center

JOB NUMBER 24405

SUBJECT Preliminary Storm Water Management Basin Sizing, Pre- and Post-Development Runoff

CALC NO H&H-1

BY Craig J. Talbot DATE June 11 2001 SHEET NO 14

CHECKER SWT DATE 6/14/01 SHEET REV 0

SWM Basin
Case 2 Stage Discharge Summary (TW = 5.7 ft.)

Elevation (ft)	Orifice Flow h (ft)	Orifice Flow Q (cfs)	Riser Weir Flow H (ft)	Riser Weir Flow Q (cfs)	Total Riser Flow (cfs)	Pipe Flow h (ft)	Pipe Flow Q (cfs)	Spillway Flow H (ft)	Spillway Flow Q (cfs)	Total Basin Flow* (cfs)
6.00					**0.00**					0.00
6.50	0.13	0.75			**0.75**					0.75
6.75	0.38	1.30			**1.30**					1.30
7.00	0.63	1.68			**1.68**					1.68
7.50	1.13	2.26			**2.26**	1.80	7.63			2.26
8.00	1.63	2.71	0.00	0.00	**2.71**	2.30	8.63			2.71
8.25	1.88	2.91	0.25	3.30	**6.21**	2.55	9.09			6.21
8.50			0.50	9.33	9.33	2.80	**9.52**			9.52
9.00			1.00	26.39	26.39	3.30	**10.34**			10.34
10.00			2.00	74.64	74.64	4.30	**11.80**	0.00	0.00	11.80
10.25			2.25	89.07	89.07	4.55	**12.14**	0.25	3.50	15.64
10.50			2.50	104.32	104.32	4.80	**12.47**	0.50	9.90	22.37
11.00			3.00	137.13	137.13	5.30	**13.10**	1.00	28.00	41.10
12.00			4.00	211.12	211.12	6.30	**14.28**	2.00	79.20	93.48

* Note: Total Basin Flow is determined by adding either the Total Riser Flow or Pipe Flow, which ever is controlling (bold type face indicates controlling flow), to the spillway flow

Total Riser Flow = Orifice + Weir Flow

Orifice flow is considered negligible once the orifice is submerged

V.6 Peak Discharge Results

The results of the post-development runoff analysis are contained in the TR-20 program output files included in Attachments 3 and 4. The results are also summarized in the following table:

Post-Development Runoff Summary
Case 1 Tailwater El. 7.4 ft

Storm Frequency (Year)	24 Hour Rainfall Depth (in)	Runoff Depth (in)	Peak Basin Inflow (cfs)	Peak Water Level (ft)	Peak Basin Outflow (cfs)	Pre-Development Peak Discharge (cfs)
2	1.98	1.38	7.46	7.74	1.14	2.14
10	3.34	2.68	14.44	8.54	6.07	7.45
15	3.63	2.96	15.92	8.74	6.55	8.74
25	4.01	3.33	17.86	8.99	7.18	10.50
50	4.50	3.81	20.35	9.29	7.77	12.83
100	4.98	4.29	22.78	9.57	8.31	15.23

Post-Development Runoff Summary
Case 2 Tailwater El. 5.7 ft

Storm Frequency (Year)	24 Hour Rainfall Depth (in)	Runoff Depth (in)	Peak Basin Inflow (cfs)	Peak Water Level (ft)	Peak Basin Outflow (cfs)	Pre-Development Peak Discharge (cfs)
2	1.98	1.38	7.46	7.11	1.80	2.14
10	3.34	2.68	14.44	8.22	5.79	7.45
15	3.63	2.96	15.92	8.34	7.34	8.74
25	4.01	3.33	17.86	8.48	9.29	10.50
50	4.50	3.81	20.35	8.72	9.89	12.83
100	4.98	4.29	22.78	9.00	10.34	15.23

V.7 Emergency Spillway Capacity

To determine the adequacy of the emergency spillway to pass the 100-year discharge without overtopping the basin embankment, the valve in the riser and pipe outlet structure will be closed such that at the outlet from the basin will be the emergency spillway. The starting water level in the basin will be elevation 6.0 ft. Only the 100-year storm will be modeled for this scenario. The results are contained in Attachment 5 and summarized in the following table. Note all flow over the emergency spillway will flow to the wetland area southwest of the site and not to the existing canal.

Post-Development Emergency Spillway Summary

Storm Frequency (Year)	24 Hour Rainfall Depth (in)	Runoff Depth (in)	Peak Basin Inflow (cfs)	Peak Water Level (ft)	Peak Basin Outflow (cfs)	Pre-Development Peak Discharge (cfs)
100	4.98	4.29	22.78	10.43	8.13	15.83

VI. Results and Conclusions

Based on the pre- and post-development runoff calculations performed the following items can be concluded:

- For all storm frequencies in both Case 1 and Case 2, the post-development peak discharge rates from the site are lower than the pre-development peak discharges.
- For Case1, the post-development peak discharges for all storm frequencies are also lower than the estimated 15-year, pre-development peak discharge rate from the site into the existing canal of 9.0 cfs. Thus, the design capacity of the canal is not compromised by the development of the RCEC.
- For Case 2, only the 25-, 50-, and 100-year, peak discharge rates are higher than the 9.0 cfs limit. Since the canal water level in Case 2 is low, then the upstream discharges must be below capacity and thus the capacity of the canal is not compromised during low flow events.
- The maximum 100-year, water level in the basin is elevation 9.57, which is 0.43 ft below the crest of the emergency spillway and 2.43 feet below the top of the basin embankment.
- The maximum 100-year water level with the principal spillway structure closed and all flow over the emergency spillway to the wetland area southeast of the site is elevation 10.43 which is 1.57 ft below the top of the basin embankment.

VII. References

1. US Department of Agriculture, Soil Conservation Service, Technical Release 55, "Urban Hydrology for Small Watersheds", June 1986.

2. US Department of Agriculture, Soil Conservation Service, Technical Release 20 , "Project Formulation Hydrology", Computer Program, Version PC 09/83(.2).

3. Alameda County Flood Control and Water Conservation District, "Plans for Construction of Line F in the Vicinity of Whitesell Street", Alameda County, California, 1980

8.15.1.1 Climate and Precipitation

The climate in the project area is Mediterranean (NOAA division CA-04: Central Coast) with moderate year-round temperatures and a winter rainy season.

Since 1958, normal temperatures in the area typically have exhibited a seasonal pattern ranging from winters of approximately 40-57°F (mean daily temperature of 49°F) in December and January, to summer temperatures ranging from 53-76°F (mean daily temperature of 65°F) in August and September. The average annual temperature is 59°F. The average annual evaporation pan rate is approximately 55 inches, indicating that the project site experiences evaporation rates significantly exceeding local precipitation.

The closest long-term precipitation gage is Station 62, located on the Hayward Corporation Yard, at an elevation of 55 feet msl. Between 1957 and 1992, the annual rainfall at that location averaged 17.9 inches per year. This amount is in very close agreement with the area rainfall map published for Alameda County and vicinity. As shown on this figure, the project site, with elevation of 14 feet msl, falls in an area that typically receives, on average, approximately 16 inches of rain per year. Most of this precipitation occurs during the months of October through April, while summers are relatively dry.

Table 8.15-1 lists the average rainfall amounts by month over a continuous 35-year period from 1957-1992 as recorded at Meteorological Station #62. (Frank Codd, Alameda County Public Works Agency, Flood Control and Water Conservation District, personal communication 2001.)

The California Department of Water resources and the Alameda County Public Works Agency have compiled precipitation frequency data for all of Alameda County. Table 8.15-2 summarizes the storm duration-recurrence data for the Hayward area for storm events ranging from the 2-year to the 100-year event (Jim Goodridge, California Department of Water Resources, personal communication 2001). These precipitation data are used in AFC Section 8.15.2.4 for estimating flooding impacts by calculating the expected stormwater runoff from the project site.

Table 8.15-1. Average monthly rainfall amounts at Station #62: Hayward, CA (inches)

Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
0.05	0.05	0.34	1.23	2.57	2.60	3.40	2.95	2.92	1.36	0.28	0.14

Annual Average =17.9 inchesSource: Frank Codd, Alameda County Flood Control and Water Conservation District.

Table 8.15-2. Storm duration-recurrence intervals - Station #62: Hayward Corporation Yard.

Recurrence	Maximum precipitation (inches)					
(years)	15-min.	1-hour	6-hour	12-hour	24-hour	Annual Mean
2	0.26	0.53	1.14	1.52	1.98	16.54
10	0.43	0.89	1.92	2.56	3.34	24.58
25	0.52	1.07	2.31	3.08	4.01	27.94
50	0.59	1.20	2.59	3.45	4.50	30.23
100	0.65	1.33	2.86	3.82	4.98	32.37

Sources: Alameda County Public Works Agency: Frank Codd; CA-DWR: Jim Goodridge

1

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 ******************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY*****************

 JOB TR-20                        FULLPRINT          SUMMARY    NOPLOTS
 TITLE 000 RCEC PRE-DEVELOPMENT RUNOFF ANALYSIS
 TITLE     2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS
  6 RUNOFF 1 001        4 0.02422      80.          0.68         1 1   1   1
    ENDATA
  7 INCREM 6             0.1
  7 COMPUT 7 001    001   0.0          1.98         1.0          1 2  01  02
    ENDCMP 1
  7 COMPUT 7 001    001   0.0          3.34         1.0          1 2  01  10
    ENDCMP 1
  7 COMPUT 7 001    001   0.0          3.63         1.0          1 2  01  15
    ENDCMP 1
  7 COMPUT 7 001    001   0.0          4.01         1.0          1 2  01  25
    ENDCMP 1
  7 COMPUT 7 001    001   0.0          4.50         1.0          1 2  01  50
    ENDCMP 1
  7 COMPUT 7 001    001   0.0          4.98         1.0          1 2  01  99
    ENDCMP 1
    ENDJOB 2
0*******************************END OF 80-80 LIST*******************************
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1


 TR20 XEQ 06-14-01  15:47        RCEC PRE-DEVELOPMENT RUNOFF ANALYSIS                                  JOB  1   PASS   1
      REV PC 09/83(.2)           2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS                            PAGE   1


 EXECUTIVE CONTROL OPERATION INCREM                                                                    RECORD ID
+                                  MAIN TIME INCREMENT =   .10 HOURS

 EXECUTIVE CONTROL OPERATION COMPUT                                                                    RECORD ID
+                                  FROM XSECTION   1
+                                                TO XSECTION   1
         STARTING TIME =   .00     RAIN DEPTH =  1.98     RAIN DURATION=  1.00     RAIN TABLE NO.= 1     ANT. MOIST. COND= 2
         ALTERNATE NO.= 1          STORM NO.= 2     MAIN TIME INCREMENT =   .10 HOURS

 OPERATION RUNOFF   CROSS SECTION   1
           OUTPUT HYDROGRAPH=  4
           AREA=     .02 SQ MI    INPUT RUNOFF CURVE= 80.     TIME OF CONCENTRATION=    .68 HOURS
           INTERNAL HYDROGRAPH TIME INCREMENT= .0907 HOURS

           PEAK TIME(HRS)               PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
             10.33                            2.14                        (RUNOFF)

 TIME(HRS)          FIRST HYDROGRAPH POINT =   .00 HOURS      TIME INCREMENT =  .10 HOURS      DRAINAGE AREA =    .02 SQ.MI.
    9.00    DISCHG        .00       .00       .00       .01       .03       .05       .10       .21       .43       .78
   10.00    DISCHG       1.21      1.65      1.99      2.13      2.10      1.98      1.83      1.69      1.55      1.42
   11.00    DISCHG       1.31      1.21      1.13      1.06      1.00       .94       .90       .86       .83       .80
   12.00    DISCHG        .78       .76       .75       .73       .72       .70       .69       .68       .67       .66
   13.00    DISCHG        .66       .65       .64       .63       .62       .62       .61       .60       .59       .58
   14.00    DISCHG        .57       .56       .56       .55       .54       .54       .53       .53       .53       .52
   15.00    DISCHG        .52       .51       .51       .51       .51       .51       .51       .51       .51       .50
   16.00    DISCHG        .50       .49       .49       .49       .48       .48       .47       .47       .46       .45
   17.00    DISCHG        .45       .44       .44       .44       .44       .44       .44       .44       .43       .43
   18.00    DISCHG        .42       .42       .41       .41       .40       .40       .39       .39       .39       .40
   19.00    DISCHG        .40       .41       .41       .41       .40       .40       .39       .39       .38       .38
   20.00    DISCHG        .37       .37       .36       .36       .36       .36       .36       .36       .36       .36
   21.00    DISCHG        .36       .36       .36       .36       .36       .36       .36       .36       .35       .35
   22.00    DISCHG        .34       .34       .34       .33       .33       .33       .33       .33       .33       .33
   23.00    DISCHG        .33       .33       .33       .33       .33       .33       .33       .33       .33       .32
   24.00    DISCHG        .31       .30       .28       .24       .19       .15       .10       .07       .05       .03
   25.00    DISCHG        .02       .02       .01       .01       .01       .00

   RUNOFF VOLUME ABOVE BASEFLOW =   .55 WATERSHED INCHES,      8.59 CFS-HRS,      .71 ACRE-FEET;   BASEFLOW =    .00 CFS

 EXECUTIVE CONTROL OPERATION ENDCMP                                                                    RECORD ID
+                                  COMPUTATIONS COMPLETED FOR PASS   1

1


 TR20 XEQ 06-14-01  15:47        RCEC PRE-DEVELOPMENT RUNOFF ANALYSIS                                  JOB  1   PASS   2
      REV PC 09/83(.2)           2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS                            PAGE   2


 EXECUTIVE CONTROL OPERATION COMPUT                                                                    RECORD ID
+                                  FROM XSECTION   1
+                                                TO XSECTION   1
         STARTING TIME =   .00     RAIN DEPTH =  3.34     RAIN DURATION=  1.00     RAIN TABLE NO.= 1     ANT. MOIST. COND= 2
         ALTERNATE NO.= 1          STORM NO.=10     MAIN TIME INCREMENT =   .10 HOURS

 OPERATION RUNOFF   CROSS SECTION   1
           OUTPUT HYDROGRAPH=  4
           AREA=     .02 SQ MI    INPUT RUNOFF CURVE= 80.     TIME OF CONCENTRATION=    .68 HOURS
           INTERNAL HYDROGRAPH TIME INCREMENT= .0907 HOURS

           PEAK TIME(HRS)               PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
             10.27                            7.45                        (RUNOFF)

 TIME(HRS)          FIRST HYDROGRAPH POINT =   .00 HOURS      TIME INCREMENT =  .10 HOURS      DRAINAGE AREA =    .02 SQ.MI.
    7.00    DISCHG        .00       .00       .01       .01       .02       .04       .05       .07       .08       .10
    8.00    DISCHG        .12       .14       .17       .19       .22       .26       .29       .34       .39       .45
    9.00    DISCHG        .52       .59       .68       .78       .90      1.03      1.27      1.76      2.67      3.93
   10.00    DISCHG       5.32      6.55      7.32      7.42      7.02      6.39      5.71      5.12      4.60      4.13
```

11.00	DISCHG	3.73	3.39	3.12	2.89	2.68	2.51	2.37	2.26	2.16	2.08
12.00	DISCHG	2.01	1.95	1.90	1.86	1.81	1.77	1.74	1.71	1.68	1.65
13.00	DISCHG	1.62	1.60	1.58	1.55	1.53	1.50	1.48	1.46	1.43	1.40
14.00	DISCHG	1.38	1.35	1.34	1.32	1.30	1.29	1.27	1.26	1.25	1.23
15.00	DISCHG	1.22	1.21	1.20	1.20	1.20	1.20	1.19	1.19	1.18	1.17
16.00	DISCHG	1.16	1.15	1.14	1.13	1.11	1.10	1.09	1.08	1.06	1.05
17.00	DISCHG	1.03	1.02	1.01	1.01	1.01	1.00	1.00	1.00	.99	.98
18.00	DISCHG	.96	.95	.94	.93	.91	.90	.89	.88	.89	.90
19.00	DISCHG	.91	.91	.92	.91	.90	.90	.89	.87	.86	.85
20.00	DISCHG	.83	.82	.81	.80	.80	.80	.80	.80	.80	.80
21.00	DISCHG	.80	.80	.80	.80	.80	.80	.80	.79	.78	.77
22.00	DISCHG	.76	.75	.74	.74	.73	.73	.73	.73	.73	.73
23.00	DISCHG	.73	.73	.73	.73	.73	.73	.73	.72	.71	.70
24.00	DISCHG	.69	.66	.61	.53	.42	.32	.23	.16	.11	.08
25.00	DISCHG	.05	.04	.02	.02	.01	.01	.01	.00		

RUNOFF VOLUME ABOVE BASEFLOW = 1.51 WATERSHED INCHES, 23.57 CFS-HRS, 1.95 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
+ COMPUTATIONS COMPLETED FOR PASS 2

1

TR20 XEQ 06-14-01 15:47 RCEC PRE-DEVELOPMENT RUNOFF ANALYSIS JOB 1 PASS 3
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 3

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID
+ FROM XSECTION 1
+ TO XSECTION 1
STARTING TIME = .00 RAIN DEPTH = 3.63 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.=15 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 4
AREA= .02 SQ MI INPUT RUNOFF CURVE= 80. TIME OF CONCENTRATION= .68 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0907 HOURS

PEAK TIME(HRS) 10.26 | PEAK DISCHARGE(CFS) 8.74 | PEAK ELEVATION(FEET) (RUNOFF)

TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS				TIME INCREMENT = .10 HOURS			DRAINAGE AREA = .02 SQ.MI.		
6.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.01	.01
7.00	DISCHG	.02	.03	.05	.06	.08	.10	.12	.14	.16	.18
8.00	DISCHG	.21	.23	.26	.29	.33	.37	.42	.47	.53	.61
9.00	DISCHG	.69	.78	.88	1.00	1.14	1.31	1.59	2.16	3.25	4.72
10.00	DISCHG	6.34	7.76	8.62	8.71	8.21	7.44	6.64	5.93	5.32	4.77
11.00	DISCHG	4.29	3.90	3.58	3.31	3.07	2.87	2.71	2.58	2.47	2.37
12.00	DISCHG	2.29	2.22	2.16	2.11	2.06	2.01	1.97	1.94	1.90	1.87
13.00	DISCHG	1.84	1.81	1.79	1.76	1.73	1.70	1.67	1.65	1.62	1.59
14.00	DISCHG	1.56	1.53	1.51	1.49	1.47	1.45	1.44	1.42	1.41	1.39
15.00	DISCHG	1.38	1.37	1.36	1.35	1.35	1.35	1.35	1.34	1.33	1.32
16.00	DISCHG	1.31	1.30	1.28	1.27	1.25	1.24	1.23	1.21	1.20	1.18
17.00	DISCHG	1.16	1.15	1.14	1.13	1.13	1.13	1.13	1.12	1.11	1.10
18.00	DISCHG	1.08	1.07	1.06	1.04	1.02	1.01	1.00	.99	1.00	1.01
19.00	DISCHG	1.02	1.03	1.03	1.02	1.01	1.00	.99	.98	.96	.95
20.00	DISCHG	.93	.92	.91	.90	.90	.89	.89	.89	.89	.89
21.00	DISCHG	.89	.89	.89	.89	.89	.89	.89	.89	.88	.86
22.00	DISCHG	.85	.84	.83	.82	.82	.82	.81	.81	.81	.81
23.00	DISCHG	.81	.81	.81	.81	.81	.81	.81	.81	.80	.78
24.00	DISCHG	.77	.74	.69	.59	.47	.36	.25	.18	.12	.08
25.00	DISCHG	.06	.04	.03	.02	.01	.01	.01	.00		

RUNOFF VOLUME ABOVE BASEFLOW = 1.74 WATERSHED INCHES, 27.16 CFS-HRS, 2.24 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
+ COMPUTATIONS COMPLETED FOR PASS 3

1

TR20 XEQ 06-14-01 15:47 RCEC PRE-DEVELOPMENT RUNOFF ANALYSIS JOB 1 PASS 4
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 4

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 EXECUTIVE CONTROL OPERATION COMPUT                                                                    RECORD ID
+                                  FROM XSECTION   1
+                                                TO XSECTION   1
        STARTING TIME =   .00    RAIN DEPTH =  4.01    RAIN DURATION=  1.00    RAIN TABLE NO.= 1    ANT. MOIST. COND= 2
        ALTERNATE NO.= 1         STORM NO.=25    MAIN TIME INCREMENT =   .10 HOURS


 OPERATION RUNOFF   CROSS SECTION   1
           OUTPUT HYDROGRAPH=  4
           AREA=    .02 SQ MI   INPUT RUNOFF CURVE= 80.    TIME OF CONCENTRATION=   .68 HOURS
           INTERNAL HYDROGRAPH TIME INCREMENT=  .0907 HOURS

           PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
              10.26                          10.50                       (RUNOFF)

 TIME(HRS)        FIRST HYDROGRAPH POINT =   .00 HOURS      TIME INCREMENT =  .10 HOURS      DRAINAGE AREA =    .02 SQ.MI.
    6.00    DISCHG        .00       .00       .00       .01       .01       .02       .03       .04       .06       .07
    7.00    DISCHG        .09       .11       .13       .15       .17       .20       .22       .25       .27       .30
    8.00    DISCHG        .33       .36       .40       .44       .49       .54       .59       .66       .74       .83
    9.00    DISCHG        .94      1.04      1.17      1.32      1.49      1.68      2.03      2.73      4.04      5.81
   10.00    DISCHG       7.74      9.40     10.38     10.44      9.80      8.86      7.87      7.01      6.27      5.61
   11.00    DISCHG       5.04      4.57      4.19      3.87      3.59      3.35      3.16      3.00      2.87      2.75
   12.00    DISCHG       2.66      2.58      2.51      2.45      2.39      2.33      2.28      2.24      2.20      2.16
   13.00    DISCHG       2.13      2.09      2.06      2.03      1.99      1.96      1.93      1.90      1.87      1.83
   14.00    DISCHG       1.80      1.76      1.74      1.71      1.69      1.67      1.65      1.64      1.62      1.60
   15.00    DISCHG       1.58      1.57      1.56      1.55      1.55      1.55      1.55      1.54      1.53      1.52
   16.00    DISCHG       1.50      1.49      1.47      1.46      1.44      1.42      1.40      1.39      1.37      1.35
   17.00    DISCHG       1.33      1.32      1.31      1.30      1.29      1.29      1.29      1.28      1.27      1.25
   18.00    DISCHG       1.24      1.22      1.21      1.19      1.17      1.15      1.14      1.13      1.14      1.15
   19.00    DISCHG       1.16      1.17      1.18      1.17      1.16      1.15      1.13      1.12      1.10      1.08
   20.00    DISCHG       1.06      1.05      1.04      1.03      1.02      1.02      1.02      1.02      1.02      1.02
   21.00    DISCHG       1.02      1.02      1.02      1.02      1.02      1.02      1.02      1.01      1.00       .98
   22.00    DISCHG        .97       .96       .94       .94       .93       .93       .93       .93       .93       .93
   23.00    DISCHG        .93       .93       .93       .93       .93       .93       .93       .92       .91       .89
   24.00    DISCHG        .87       .84       .78       .68       .54       .41       .29       .20       .14       .10
   25.00    DISCHG        .07       .05       .03       .02       .01       .01       .01       .00

   RUNOFF VOLUME ABOVE BASEFLOW =  2.05 WATERSHED INCHES,     31.99 CFS-HRS,     2.64 ACRE-FEET;   BASEFLOW =    .00 CFS

 EXECUTIVE CONTROL OPERATION ENDCMP                                                                    RECORD ID
+                                  COMPUTATIONS COMPLETED FOR PASS   4

1


 TR20 XEQ 06-14-01  15:47        RCEC PRE-DEVELOPMENT RUNOFF ANALYSIS                                  JOB  1   PASS   5
      REV PC 09/83(.2)           2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS                          PAGE   5


 EXECUTIVE CONTROL OPERATION COMPUT                                                                    RECORD ID
+                                  FROM XSECTION   1
+                                                TO XSECTION   1
        STARTING TIME =   .00    RAIN DEPTH =  4.50    RAIN DURATION=  1.00    RAIN TABLE NO.= 1    ANT. MOIST. COND= 2
        ALTERNATE NO.= 1         STORM NO.=50    MAIN TIME INCREMENT =   .10 HOURS


 OPERATION RUNOFF   CROSS SECTION   1
           OUTPUT HYDROGRAPH=  4
           AREA=    .02 SQ MI   INPUT RUNOFF CURVE= 80.    TIME OF CONCENTRATION=   .68 HOURS
           INTERNAL HYDROGRAPH TIME INCREMENT=  .0907 HOURS

           PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
              10.25                          12.83                       (RUNOFF)
              23.45                           1.07                       (RUNOFF)

 TIME(HRS)        FIRST HYDROGRAPH POINT =   .00 HOURS      TIME INCREMENT =  .10 HOURS      DRAINAGE AREA =    .02 SQ.MI.
    5.00    DISCHG        .00       .00       .00       .00       .00       .00       .00       .00       .01       .01
    6.00    DISCHG        .02       .03       .05       .06       .08       .10       .11       .13       .15       .18
    7.00    DISCHG        .20       .23       .25       .28       .31       .34       .37       .40       .44       .47
    8.00    DISCHG        .51       .55       .59       .65       .71       .77       .84       .92      1.02      1.15
    9.00    DISCHG       1.27      1.41      1.56      1.75      1.96      2.20      2.63      3.49      5.11      7.28
   10.00    DISCHG       9.61     11.60     12.73     12.74     11.91     10.73      9.51      8.44      7.53      6.73
   11.00    DISCHG       6.03      5.46      4.99      4.60      4.26      3.98      3.74      3.56      3.40      3.26
   12.00    DISCHG       3.14      3.04      2.96      2.88      2.81      2.75      2.69      2.64      2.59      2.54
   13.00    DISCHG       2.50      2.46      2.42      2.38      2.34      2.30      2.27      2.23      2.19      2.14
   14.00    DISCHG       2.10      2.07      2.04      2.01      1.98      1.96      1.94      1.92      1.89      1.87
   15.00    DISCHG       1.85      1.84      1.82      1.82      1.81      1.81      1.81      1.80      1.79      1.77
   16.00    DISCHG       1.75      1.74      1.72      1.70      1.68      1.66      1.64      1.62      1.60      1.57
```

17.00	DISCHG	1.55	1.53	1.52	1.51	1.51	1.50	1.50	1.49	1.48	1.46
18.00	DISCHG	1.44	1.42	1.40	1.38	1.36	1.34	1.32	1.32	1.32	1.34
19.00	DISCHG	1.35	1.36	1.36	1.36	1.35	1.33	1.32	1.30	1.28	1.26
20.00	DISCHG	1.23	1.22	1.20	1.19	1.19	1.18	1.18	1.18	1.18	1.18
21.00	DISCHG	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.17	1.16	1.14
22.00	DISCHG	1.12	1.11	1.09	1.09	1.08	1.08	1.08	1.07	1.07	1.07
23.00	DISCHG	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.06	1.05	1.03
24.00	DISCHG	1.01	.97	.90	.78	.62	.47	.33	.23	.16	.11
25.00	DISCHG	.08	.05	.04	.03	.02	.01	.01	.01	.00	

RUNOFF VOLUME ABOVE BASEFLOW = 2.46 WATERSHED INCHES, 38.42 CFS-HRS, 3.17 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
+ COMPUTATIONS COMPLETED FOR PASS 5

1

TR20 XEQ 06-14-01 15:47 RCBC PRE-DEVELOPMENT RUNOFF ANALYSIS JOB 1 PASS 6
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 6

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID
+ FROM XSECTION 1
+ TO XSECTION 1
STARTING TIME = .00 RAIN DEPTH = 4.98 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.=99 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 4
AREA= .02 SQ MI INPUT RUNOFF CURVE= 80. TIME OF CONCENTRATION= .68 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0907 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
10.25	15.23	(RUNOFF)
23.45	1.22	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .02 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.01	.01	.02	.04	.05	.07
6.00	DISCHG	.09	.11	.13	.16	.18	.20	.22	.24	.27	.30
7.00	DISCHG	.33	.36	.39	.42	.46	.49	.53	.57	.61	.65
8.00	DISCHG	.70	.75	.80	.86	.94	1.01	1.10	1.20	1.32	1.47
9.00	DISCHG	1.63	1.79	1.97	2.20	2.45	2.74	3.24	4.28	6.20	8.77
10.00	DISCHG	11.50	13.81	15.09	15.04	14.03	12.60	11.14	9.87	8.79	7.83
11.00	DISCHG	7.01	6.34	5.79	5.33	4.93	4.60	4.32	4.10	3.91	3.75
12.00	DISCHG	3.61	3.50	3.41	3.32	3.23	3.16	3.09	3.03	2.97	2.92
13.00	DISCHG	2.87	2.82	2.78	2.73	2.68	2.64	2.59	2.55	2.50	2.45
14.00	DISCHG	2.41	2.37	2.33	2.30	2.26	2.24	2.21	2.19	2.16	2.14
15.00	DISCHG	2.11	2.10	2.08	2.07	2.07	2.06	2.06	2.05	2.04	2.02
16.00	DISCHG	2.00	1.98	1.96	1.94	1.91	1.89	1.87	1.84	1.82	1.79
17.00	DISCHG	1.77	1.75	1.73	1.72	1.72	1.71	1.71	1.70	1.68	1.66
18.00	DISCHG	1.64	1.62	1.60	1.57	1.55	1.52	1.50	1.50	1.50	1.52
19.00	DISCHG	1.53	1.55	1.55	1.54	1.53	1.51	1.50	1.48	1.45	1.43
20.00	DISCHG	1.40	1.38	1.37	1.36	1.35	1.34	1.34	1.34	1.34	1.34
21.00	DISCHG	1.34	1.34	1.34	1.34	1.34	1.34	1.34	1.33	1.31	1.29
22.00	DISCHG	1.27	1.25	1.24	1.23	1.23	1.22	1.22	1.22	1.22	1.22
23.00	DISCHG	1.21	1.21	1.21	1.22	1.22	1.22	1.21	1.20	1.19	1.17
24.00	DISCHG	1.14	1.10	1.02	.88	.71	.53	.38	.26	.18	.13
25.00	DISCHG	.09	.06	.04	.03	.02	.01	.01	.01	.00	

RUNOFF VOLUME ABOVE BASEFLOW = 2.87 WATERSHED INCHES, 44.88 CFS-HRS, 3.71 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
+ COMPUTATIONS COMPLETED FOR PASS 6

EXECUTIVE CONTROL OPERATION ENDJOB RECORD ID

1

TR20 XEQ 06-14-01 15:47 RCEC PRE-DEVELOPMENT RUNOFF ANALYSIS JOB 1 SUMMARY
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 7

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 2													
+ XSECTION 1	RUNOFF	.02	1	2	.10	.0	1.98	24.00	.55	---	10.33	2.14	88.3
ALTERNATE 1 STORM 10													
+ XSECTION 1	RUNOFF	.02	1	2	.10	.0	3.34	24.00	1.51	---	10.27	7.45	307.4
ALTERNATE 1 STORM 15													
+ XSECTION 1	RUNOFF	.02	1	2	.10	.0	3.63	24.00	1.74	---	10.26	8.74	361.0
ALTERNATE 1 STORM 25													
+ XSECTION 1	RUNOFF	.02	1	2	.10	.0	4.01	24.00	2.05	---	10.26	10.50	433.4
ALTERNATE 1 STORM 50													
+ XSECTION 1	RUNOFF	.02	1	2	.10	.0	4.50	24.00	2.46	---	10.25	12.83	529.9
ALTERNATE 1 STORM 99													
+ XSECTION 1	RUNOFF	.02	1	2	.10	.0	4.98	24.00	2.87	---	10.25	15.23	628.8

1

TR20 XEQ 06-14-01 15:47 RCEC PRE-DEVELOPMENT RUNOFF ANALYSIS JOB 1 SUMMARY
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 8

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 2	10	15	25	50	99
0 XSECTION 1	.02						
+ ALTERNATE 1		2.14	7.45	8.74	10.50	12.83	15.23

1END OF 1 JOBS IN THIS RUN

```
1


 ******************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY*****************

 JOB TR-20                       FULLPRINT          SUMMARY   NOPLOTS
 TITLE 001 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 1
 TITLE     2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS
  3 STRUCT      01
  8                      5.0          0.0          0.0
  8                      6.0          0.000001     0.23
  8                      7 0          0.000002     0.64
  8                      7.4          0.000003     0.76
  8                      7.5          0.67         0.79
  8                      8.0          1.65         0.94
  8                      8.25         5.25         1.05
  8                      8.50         5.97         1.16
  8                      9.0          7.20         1.38
  8                      10.0         9.17         1.87
  8                      10.25        13.11        2.01
  8                      10.50        19.92        2.15
  8                      11.0         38.8         2.42
  8                      12.0         91.4         3.03
  9 ENDTBL
  6 RUNOFF 1 001       4 0.0184       94.          0.286       1 1   1   1
  6 RESVOR 2    01 4   5 6.0                                    1 1 1 1   1
    ENDATA
  7 INCREM 6           0.1
  7 COMPUT 7 001       01 0.0         1.98         1.0         1 2  01  02
    ENDCMP 1
  7 COMPUT 7 001       01 0.0         3.34         1.0         1 2  01  10
    ENDCMP 1
  7 COMPUT 7 001       01 0.0         3.63         1.0         1 2  01  15
    ENDCMP 1
  7 COMPUT 7 001       01 0 0         4.01         1 0         1 2  01  25
    ENDCMP 1
  7 COMPUT 7 001       01 0 0         4.50         1.0         1 2  01  50
    ENDCMP 1
  7 COMPUT 7 001       01 0.0         4.98         1.0         1 2  01  99
    ENDCMP 1
    ENDJOB 2
0*******************************END OF 80-80 LIST*******************************
```

```
1


 TR20 XEQ 06-12-01  15:12        RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 1                          JOB  1   PASS   1
      REV PC 09/83(.2)           2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS                             PAGE   1


 EXECUTIVE CONTROL OPERATION INCREM                                                                    RECORD ID
+                                  MAIN TIME INCREMENT =    .10 HOURS

 EXECUTIVE CONTROL OPERATION COMPUT                                                                    RECORD ID
+                                  FROM XSECTION   1
+                                                TO STRUCTURE  1
         STARTING TIME =    .00     RAIN DEPTH =  1.98     RAIN DURATION=  1.00     RAIN TABLE NO.= 1     ANT. MOIST. COND= 2
         ALTERNATE NO.= 1           STORM NO.= 2     MAIN TIME INCREMENT =    .10 HOURS


 OPERATION RUNOFF    CROSS SECTION   1
           OUTPUT HYDROGRAPH=  4
           AREA=     .02 SQ MI    INPUT RUNOFF CURVE= 94.     TIME OF CONCENTRATION=    .29 HOURS
           INTERNAL HYDROGRAPH TIME INCREMENT=  .0381 HOURS

           PEAK TIME(HRS)               PEAK DISCHARGE(CFS)            PEAK ELEVATION(FEET)
              10.01                           7.46                          (RUNOFF)

 TIME(HRS)          FIRST HYDROGRAPH POINT =    .00 HOURS       TIME INCREMENT =  .10 HOURS       DRAINAGE AREA =     .02 SQ.MI.
    3.00    DISCHG          .00       .00       .00       .00       .00       .00       .00       .00       .01       .01
    4.00    DISCHG          .02       .03       .03       .04       .05       .05       .06       .07       .08       .08
    5.00    DISCHG          .09       .10       .11       .12       .12       .13       .14       .15       .16       .17
    6.00    DISCHG          .18       .18       .19       .20       .21       .21       .22       .24       .26       .27
    7.00    DISCHG          .28       .29       .31       .33       .34       .35       .37       .39       .41       .43
    8.00    DISCHG          .44       .46       .52       .56       .59       .61       .65       .76       .85       .91
    9.00    DISCHG          .94      1.01      1.18      1.33      1.41      1.47      2.16      4.15      5.94      6.90
   10.00    DISCHG         7.45      7.14      5.36      3.84      3.18      2.90      2.66      2.23      1.90      1.75
   11.00    DISCHG         1.70      1.63      1.48      1.36      1.30      1.28      1.26      1.20      1.15      1.13
   12.00    DISCHG         1.12      1.10      1.06      1.02      1.01      1.00       .99       .96       .94       .93
   13.00    DISCHG          .92       .91       .88       .86       .85       .84       .83       .80       .78       .77
   14.00    DISCHG          .76       .76       .74       .73       .72       .72       .72       .70       .69       .68
   15.00    DISCHG          .68       .68       .68       .68       .68       .68       .68       .66       .65       .65
   16.00    DISCHG          .64       .64       .62       .61       .60       .60       .60       .58       .57       .56
   17.00    DISCHG          .56       .56       .56       .56       .56       .56       .56       .54       .53       .52
   18.00    DISCHG          .52       .51       .50       .49       .48       .48       .48       .50       .51       .52
   19.00    DISCHG          .52       .51       .50       .49       .48       .48       .47       .46       .44       .44
   20.00    DISCHG          .44       .44       .44       .44       .44       .44       .44       .44       .44       .44
   21.00    DISCHG          .44       .44       .44       .44       .44       .44       .43       .42       .40       .40
   22.00    DISCHG          .39       .39       .39       .39       .39       .39       .39       .39       .39       .39
   23.00    DISCHG          .39       .39       .39       .39       .39       .39       .39       .37       .36       .36
   24.00    DISCHG          .35       .31       .18       .08       .03       .01       .01       .00

   RUNOFF VOLUME ABOVE BASEFLOW =  1.38 WATERSHED INCHES,     16.35 CFS-HRS,     1.35 ACRE-FEET;   BASEFLOW =     .00 CFS


 OPERATION RESVOR    STRUCTURE  1
           INPUT HYDROGRAPH= 4     OUTPUT HYDROGRAPH= 5
           SURFACE ELEVATION=    6.00

 *** WARNING-NO PEAK FOUND, MAXIMUM DISCHARGE =          .51 CFS.
1


 TR20 XEQ 06-12-01  15:12        RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 1                          JOB  1   PASS   1
      REV PC 09/83(.2)           2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS                             PAGE   2


           PEAK TIME(HRS)               PEAK DISCHARGE(CFS)            PEAK ELEVATION(FEET)
              19.10                           .51                           7.48
              11.80                          1.14                           7.74

 TIME(HRS)          FIRST HYDROGRAPH POINT =    .00 HOURS       TIME INCREMENT =  .10 HOURS       DRAINAGE AREA =     .02 SQ.MI.
   10.00    DISCHG          .00       .00       .00       .00       .27       .69       .80       .89       .95       .99
   10.00      ELEV         5.00      5.00      5.00      5.00      7.44      7.51      7.57      7.61      7.64      7.67
   11.00    DISCHG         1.03      1.07      1.09      1.11      1.12      1.13      1.14      1.14      1.14      1.14
   11.00      ELEV         7.69      7.70      7.72      7.72      7.73      7.73      7.74      7.74      7.74      7.74
   12.00    DISCHG         1.14      1.14      1.14      1.13      1.13      1.12      1.11      1.11      1.10      1.09
   12.00      ELEV         7.74      7.74      7.74      7.74      7.73      7.73      7.73      7.72      7.72      7.71
   13.00    DISCHG         1.08      1.07      1.06      1.05      1.04      1.03      1.02      1.01      1.00       .99
   13.00      ELEV         7.71      7.71      7.70      7.70      7.69      7.68      7.68      7.67      7.67      7.66
   14.00    DISCHG          .98       .96       .95       .94       .93       .92       .91       .90       .89       .88
   14.00      ELEV         7.66      7.65      7.64      7.64      7.63      7.63      7.62      7.62      7.61      7.61
```

15.00	DISCHG	.87	.86	.85	.84	.83	.82	.82	.81	.80	.79
15.00	ELEV	7.60	7.60	7.59	7.59	7.58	7.58	7.57	7.57	7.57	7.56
16.00	DISCHG	.78	.78	.77	.76	.75	.75	.74	.73	.72	.71
16.00	ELEV	7.56	7.55	7.55	7.55	7.54	7.54	7.53	7.53	7.53	7.52
17.00	DISCHG	.71	70	.69	.68	.68	.67	.65	.64	.62	.60
17.00	ELEV	7.52	7.51	7.51	7.51	7.50	7.50	7.50	7.49	7.49	7.49
18.00	DISCHG	59	.58	.56	.55	.54	.53	.52	.52	.51	.51
18.00	ELEV	7.49	7.49	7.48	7.48	7.48	7.48	7.48	7.48	7.48	7.48
19.00	DISCHG	.51	.51	.51	.51	.51	.50	.50	.49	.48	.48
19.00	ELEV	7.48	7.48	7.48	7.48	7.48	7.47	7.47	7.47	7.47	7.47
20.00	DISCHG	.47	.46	.46	.46	.45	.45	.45	.45	.44	.44
20.00	ELEV	7.47	7.47	7.47	7.47	7.47	7.47	7.47	7.47	7.47	7.47
21.00	DISCHG	.44	.44	.44	.44	.44	.44	.44	.43	.43	.43
21.00	ELEV	7.47	7.47	7.47	7.47	7.47	7.47	7.47	7.46	7.46	7.46
22.00	DISCHG	.42	.42	.41	.41	.41	.40	.40	.40	.40	.40
22.00	ELEV	7.46	7.46	7.46	7.46	7.46	7.46	7.46	7.46	7.46	7.46
23.00	DISCHG	.40	.40	.40	.40	.40	.40	.40	.39	.39	.38
23.00	ELEV	7.46	7.46	7.46	7.46	7.46	7.46	7.46	7.46	7.46	7.46
24.00	DISCHG	.38	.37	.35	.31	.27	.23	.19	.16	.13	.11
24.00	ELEV	7.46	7.46	7.45	7.45	7.44	7.43	7.43	7.42	7.42	7.42
25.00	DISCHG	.09	.08	.06	.05	.04	.04	.03	.02	.02	.02
25.00	ELEV	7.41	7.41	7.41	7.41	7.41	7.41	7.40	7.40	7.40	7.40
26.00	DISCHG	.01	.01	.01	.01						
26.00	ELEV	7.40	7.40	7.40	7.40						

RUNOFF VOLUME ABOVE BASEFLOW = .86 WATERSHED INCHES, 9.93 CFS-HRS, .82 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID

\+ COMPUTATIONS COMPLETED FOR PASS 1

1

TR20 XEQ 06-12-01 15:12 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 1 JOB 1 PASS 2
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 3

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID

\+ FROM XSECTION 1

\+ TO STRUCTURE 1

STARTING TIME = .00 RAIN DEPTH = 3.34 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.=10 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 4
AREA= .02 SQ MI INPUT RUNOFF CURVE= 94. TIME OF CONCENTRATION= .29 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0381 HOURS

PEAK TIME(HRS) 10.00 PEAK DISCHARGE(CFS) 14.44 PEAK ELEVATION(FEET) (RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .02 SQ.MI.

2.00	DISCHG	.00	.00	.00	.00	.01	.02	.03	.05	.06	.08
3.00	DISCHG	.09	.11	.12	.13	.14	.16	.17	.19	.21	.22
4.00	DISCHG	.24	.25	.26	.27	.28	.29	.31	.33	.35	.37
5.00	DISCHG	.38	.39	.42	.44	.45	.47	.48	.51	.53	.55
6.00	DISCHG	.56	.57	.59	.60	.61	.62	.64	.68	.72	.74
7.00	DISCHG	.76	.78	.83	.87	.89	.91	.94	.99	1.03	1.06
8.00	DISCHG	1.07	1.12	1.24	1.33	1.38	1.41	1.51	1.74	1.93	2.03
9.00	DISCHG	2.09	2.23	2.58	2.87	3.01	3.11	4.50	8.48	11.93	13.59
10.00	DISCHG	14.44	13.65	10.17	7.23	5.95	5.39	4.93	4.12	3.50	3.23
11.00	DISCHG	3.12	2.99	2.70	2.48	2.38	2.34	2.29	2.18	2.09	2.05
12.00	DISCHG	2.04	2.00	1.92	1.85	1.83	1 81	1.79	1.74	1.69	1.67
13.00	DISCHG	1.67	1.64	1.59	1.54	1.53	1.52	1.50	1.44	1.40	1.38
14.00	DISCHG	1.37	1.36	1.33	1.31	1.30	1.29	1.28	1.25	1.23	1.22
15.00	DISCHG	1.22	1.22	1.22	1.22	1.22	1.22	1.21	1.18	1.16	1.15
16.00	DISCHG	1.15	1.14	1.11	1.09	1.08	1.07	1.06	1.03	1.01	1.00
17.00	DISCHG	1.00	.99	.99	.99	.99	.99	.98	.96	.93	.93
18.00	DISCHG	.92	.91	.88	.86	.85	.85	.85	.88	.90	.91
19.00	DISCHG	.92	.91	.88	.86	.85	.85	.84	.81	.78	.77
20.00	DISCHG	.77	.77	.77	.77	.77	.77	.77	.77	.77	.77
21.00	DISCHG	.77	.77	.77	.77	.77	.77	.76	.73	.71	.70
22.00	DISCHG	.70	.69	.69	.69	.69	.69	.69	.69	.69	.69
23.00	DISCHG	.69	.69	.69	.69	.69	.69	.68	.66	.63	.62
24.00	DISCHG	.62	.54	.32	.14	.06	.02	.01	.00		

RUNOFF VOLUME ABOVE BASEFLOW = 2.68 WATERSHED INCHES, 31.81 CFS-HRS, 2.63 ACRE-FEET; BASEFLOW = .00 CFS

```
 OPERATION RESVOR   STRUCTURE  1
           INPUT HYDROGRAPH= 4     OUTPUT HYDROGRAPH= 5
           SURFACE ELEVATION=    6.00

           PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
             10.41                          6.07                         8.54

 TIME(HRS)        FIRST HYDROGRAPH POINT =    .00 HOURS      TIME INCREMENT =  .10 HOURS      DRAINAGE AREA =    .02 SQ.MI.
1


 TR20 XEQ 06-12-01  15:12        RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 1                                    JOB  1   PASS   2
      REV PC 09/83(.2)           2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS                                PAGE   4

    9.00    DISCHG          .00      .00      .00      .00      .00      .00      .00      .00     1.00     1.62
    9.00      ELEV         5.00     5.00     5.00     5.00     5.00     5.00     5.00     5.00     7.67     7.98
   10.00    DISCHG         4.45     5.58     5.91     6.05     6.07     6.05     6.01     5.94     5.83     5.70
   10.00      ELEV         8.19     8.36     8.48     8.53     8.54     8.53     8.52     8.49     8.45     8.41
   11.00    DISCHG         5.57     5.43     5.30     4.82     4.25     3.80     3.45     3.16     2.91     2.71
   11.00      ELEV         8.36     8.31     8.27     8.22     8.18     8.15     8.12     8.10     8.09     8.07
   12.00    DISCHG         2.55     2.43     2.32     2.21     2.12     2.05     1.99     1.94     1.88     1.84
   12.00      ELEV         8.06     8.05     8.05     8.04     8.03     8.03     8.02     8.02     8.02     8.01
   13.00    DISCHG         1.80     1.76     1.73     1.69     1.65     1.64     1.64     1.63     1.62     1.60
   13.00      ELEV         8.01     8.01     8.01     8.00     8.00     8.00     7.99     7.99     7.98     7.98
   14.00    DISCHG         1.59     1.58     1.57     1.55     1.54     1.53     1.52     1.50     1.49     1.48
   14.00      ELEV         7.97     7.96     7.96     7.95     7.94     7.94     7.93     7.92     7.92     7.91
   15.00    DISCHG         1.46     1.45     1.44     1.43     1.41     1.40     1.39     1.38     1.37     1.36
   15.00      ELEV         7.90     7.90     7.89     7.89     7.88     7.87     7.87     7.86     7.86     7.85
   16.00    DISCHG         1.35     1.34     1.33     1.32     1.30     1.29     1.28     1.27     1.25     1.24
   16.00      ELEV         7.85     7.84     7.84     7.83     7.82     7.82     7.81     7.80     7.80     7.79
   17.00    DISCHG         1.23     1.22     1.20     1.19     1.18     1.17     1.16     1.15     1.14     1.13
   17.00      ELEV         7.78     7.78     7.77     7.77     7.76     7.76     7.75     7.75     7.74     7.74
   18.00    DISCHG         1.12     1.11     1.10     1.09     1.07     1.06     1.05     1.04     1.03     1.03
   18.00      ELEV         7.73     7.72     7.72     7.71     7.71     7.70     7.69     7.69     7.69     7.68
   19.00    DISCHG         1.02     1.02     1.01     1.00      .99      .99      .98      .97      .96      .95
   19.00      ELEV         7.68     7.68     7.67     7.67     7.67     7.66     7.66     7.65     7.65     7.64
   20.00    DISCHG          .94      .93      .92      .92      .91      .90      .89      .89      .88      .88
   20.00      ELEV         7.64     7.63     7.63     7.63     7.62     7.62     7.61     7.61     7.61     7.60
   21.00    DISCHG          .87      .86      .86      .85      .85      .85      .84      .84      .83      .82
   21.00      ELEV         7.60     7.60     7.60     7.59     7.59     7.59     7.59     7.58     7.58     7.58
   22.00    DISCHG          .82      .81      .80      .80      .79      .79      .78      .78      .77      .77
   22.00      ELEV         7.58     7.57     7.57     7.57     7.56     7.56     7.56     7.56     7.55     7.55
   23.00    DISCHG          .77      .76      .76      .75      .75      .75      .75      .74      .74      .73
   23.00      ELEV         7.55     7.55     7.54     7.54     7.54     7.54     7.54     7.54     7.53     7.53
   24.00    DISCHG          .72      .72      .70      .68      .59      .50      .42      .35      .29      .24
   24.00      ELEV         7.53     7.52     7.52     7.50     7.49     7.47     7.46     7.45     7.44     7.44
   25.00    DISCHG          .20      .17      .14      .12      .10      .08      .07      .05      .05      .04
   25.00      ELEV         7.43     7.42     7.42     7.42     7.41     7.41     7.41     7.41     7.41     7.41
   26.00    DISCHG          .03      .03      .02      .02      .02      .01      .01      .01      .01
   26.00      ELEV         7.40     7.40     7.40     7.40     7.40     7.40     7.40     7.40     7.40

   RUNOFF VOLUME ABOVE BASEFLOW =  2.13 WATERSHED INCHES,     25.34 CFS-HRS,     2.09 ACRE-FEET;   BASEFLOW =     .00 CFS

 EXECUTIVE CONTROL OPERATION ENDCMP                                                                          RECORD ID
+                              COMPUTATIONS COMPLETED FOR PASS   2

1


 TR20 XEQ 06-12-01  15:12        RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 1                                    JOB  1   PASS   3
      REV PC 09/83(.2)           2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS                                PAGE   5


 EXECUTIVE CONTROL OPERATION COMPUT                                                                          RECORD ID
+                              FROM XSECTION   1
+                                                TO STRUCTURE  1
        STARTING TIME =    .00    RAIN DEPTH =  3.63    RAIN DURATION=  1.00    RAIN TABLE NO.= 1    ANT. MOIST. COND= 2
        ALTERNATE NO.= 1          STORM NO.=15    MAIN TIME INCREMENT =   .10 HOURS


 OPERATION RUNOFF   CROSS SECTION   1
           OUTPUT HYDROGRAPH=  4
           AREA=     .02 SQ MI    INPUT RUNOFF CURVE= 94.    TIME OF CONCENTRATION=    .29 HOURS
           INTERNAL HYDROGRAPH TIME INCREMENT=  .0381 HOURS

           PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
             10.00                          15.92                        (RUNOFF)
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TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .02 SQ.MI.

2.00	DISCHG	.00	.00	.01	.02	.03	.05	.07	.08	.10	.12
3.00	DISCHG	.13	.15	.16	.18	.19	.20	.22	.24	.26	.28
4.00	DISCHG	.29	.31	.32	.33	.34	.36	.37	.40	.42	.44
5.00	DISCHG	.45	.47	.49	.52	.54	.55	.57	.60	.62	.64
6.00	DISCHG	.65	.67	.68	.69	.70	.71	.73	.78	.82	.85
7.00	DISCHG	.87	.89	.95	.99	1.02	1.04	1.06	1.12	1.17	1.20
8.00	DISCHG	1.22	1.27	1.40	1.50	1.56	1.59	1.70	1.95	2.17	2.28
9.00	DISCHG	2.34	2.50	2.88	3.20	3.36	3.47	5.00	9.41	13.20	15.01
10.00	DISCHG	15.92	15.03	11.19	7.94	6.53	5.92	5.40	4.52	3.84	3.54
11.00	DISCHG	3.42	3.27	2.96	2.72	2.61	2.57	2.51	2.39	2.29	2.25
12.00	DISCHG	2.23	2.19	2.10	2.03	2.00	1.99	1.96	1.90	1.85	1.83
13.00	DISCHG	1.82	1.80	1.74	1.69	1.67	1.66	1.64	1.58	1.53	1.51
14.00	DISCHG	1.50	1.48	1.45	1.43	1.42	1.41	1.40	1.37	1.35	1.34
15.00	DISCHG	1.33	1.33	1.33	1.33	1.33	1.33	1.32	1.29	1.27	1.26
16.00	DISCHG	1.25	1.24	1.21	1.19	1.17	1.17	1.16	1.13	1.10	1.09
17.00	DISCHG	1.09	1.09	1.09	1.09	1.09	1.09	1.08	1.05	1.02	1.01
18.00	DISCHG	1.01	.99	.96	.94	.93	.92	.93	.96	.99	1.00
19.00	DISCHG	1.00	.99	.96	.94	.93	.92	.91	.88	.86	.85
20.00	DISCHG	.84	.84	.84	.84	.84	.84	.84	.84	.84	.84
21.00	DISCHG	.84	.84	.84	.84	.84	.84	.83	.80	.77	.76
22.00	DISCHG	.76	.76	.76	.76	.76	.76	.76	.76	.76	.76
23.00	DISCHG	.76	.76	.76	.76	.76	.76	.75	.72	.69	.68
24.00	DISCHG	.67	.59	.35	.15	.06	.03	.01	.00		

RUNOFF VOLUME ABOVE BASEFLOW = 2.96 WATERSHED INCHES, 35.16 CFS-HRS, 2.91 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 1
INPUT HYDROGRAPH= 4 OUTPUT HYDROGRAPH= 5
SURFACE ELEVATION= 6.00

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
10.42	6.55	8.74

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .02 SQ.MI.
1

TR20 XEQ 06-12-01 15:12 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 1 JOB 1 PASS 3
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 6

9.00	DISCHG	.00	.00	.00	.00	.00	.00	.31	.92	1.47	3.83
9.00	ELEV	5.00	5.00	5.00	5.00	5.00	5.00	7.45	7.63	7.91	8.15
10.00	DISCHG	5.55	6.06	6.38	6.52	6.55	6.54	6.50	6.43	6.33	6.21
10.00	ELEV	8.35	8.54	8.67	8.72	8.74	8.73	8.71	8.69	8.65	8.60
11.00	DISCHG	6.08	5.96	5.81	5.65	5.50	5.34	5.00	4.39	3.90	3.51
11.00	ELEV	8.55	8.50	8.44	8.39	8.34	8.28	8.23	8.19	8.16	8.13
12.00	DISCHG	3.21	2.97	2.77	2.61	2.46	2.35	2.26	2.18	2.11	2.05
12.00	ELEV	8.11	8.09	8.08	8.07	8.06	8.05	8.04	8.04	8.03	8.03
13.00	DISCHG	1.99	1.95	1.91	1.86	1.82	1.78	1.75	1.72	1.68	1.65
13.00	ELEV	8.02	8.02	8.02	8.01	8.01	8.01	8.01	8.00	8.00	8.00
14.00	DISCHG	1.64	1.63	1.62	1.61	1.60	1.59	1.58	1.57	1.56	1.55
14.00	ELEV	7.99	7.99	7.99	7.98	7.98	7.97	7.97	7.96	7.96	7.95
15.00	DISCHG	1.54	1.53	1.52	1.51	1.50	1.49	1.48	1.47	1.46	1.45
15.00	ELEV	7.94	7.94	7.93	7.93	7.92	7.92	7.91	7.91	7.90	7.90
16.00	DISCHG	1.44	1.43	1.42	1.41	1.40	1.38	1.37	1.36	1.35	1.33
16.00	ELEV	7.89	7.89	7.88	7.88	7.87	7.86	7.86	7.85	7.85	7.84
17.00	DISCHG	1.32	1.31	1.30	1.29	1.28	1.27	1.26	1.25	1.23	1.22
17.00	ELEV	7.83	7.83	7.82	7.81	7.81	7.80	7.80	7.79	7.79	7.78
18.00	DISCHG	1.21	1.20	1.19	1.18	1.16	1.15	1.14	1.13	1.12	1 11
18.00	ELEV	7.78	7.77	7.76	7.76	7.75	7.75	7.74	7.73	7.73	7.73
19.00	DISCHG	1.11	1.10	1.10	1.09	1.08	1.07	1.06	1.06	1.05	1.04
19.00	ELEV	7.72	7.72	7.72	7.71	7.71	7.71	7.70	7.70	7.69	7.69
20.00	DISCHG	1.02	1.02	1.01	1.00	.99	.98	.97	.97	.96	.95
20.00	ELEV	7.68	7.68	7.67	7.67	7.66	7.66	7.65	7.65	7.65	7.64
21.00	DISCHG	.95	.94	.94	.93	.93	.92	.92	.91	.90	90
21.00	ELEV	7.64	7.64	7.64	7.63	7.63	7.63	7.63	7.62	7.62	7 62
22.00	DISCHG	.89	.88	.88	.87	.86	.86	.85	.85	.84	.84
22.00	ELEV	7.61	7.61	7.61	7.60	7.60	7.60	7.59	7.59	7.59	7.59
23.00	DISCHG	.83	.83	.83	.82	.82	.82	.81	.81	.80	.80
23.00	ELEV	7.58	7.58	7.58	7.58	7.58	7.57	7.57	7.57	7.57	7.56
24.00	DISCHG	.79	.78	.77	.74	.71	.67	.56	.47	.39	.32
24.00	ELEV	7.56	7.56	7.55	7.53	7.52	7.50	7.48	7.47	7.46	7.45
25.00	DISCHG	.27	.22	.19	.15	.13	.11	.09	.07	.06	.05
25.00	ELEV	7.44	7.43	7.43	7.42	7.42	7.42	7.41	7.41	7.41	7.41
26.00	DISCHG	.04	.04	.03	.02	.02	.02	.01	.01	.01	.01
26.00	ELEV	7.41	7.41	7.40	7.40	7.40	7.40	7.40	7.40	7.40	7.40

RUNOFF VOLUME ABOVE BASEFLOW = 2.42 WATERSHED INCHES, 28.74 CFS-HRS, 2.38 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID

```
+                                COMPUTATIONS COMPLETED FOR PASS   3

1


 TR20 XEQ 06-12-01  15:12        RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 1                                  JOB  1   PASS   4
      REV PC 09/83(.2)           2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS                                 PAGE   7


 EXECUTIVE CONTROL OPERATION COMPUT                                                                          RECORD ID
+                                FROM XSECTION   1
+                                                TO STRUCTURE  1
        STARTING TIME =    .00     RAIN DEPTH =  4.01     RAIN DURATION=  1.00     RAIN TABLE NO.= 1     ANT. MOIST. COND= 2
        ALTERNATE NO.= 1           STORM NO.=25     MAIN TIME INCREMENT =    .10 HOURS


 OPERATION RUNOFF   CROSS SECTION   1
           OUTPUT HYDROGRAPH=  4
           AREA=     .02 SQ MI    INPUT RUNOFF CURVE= 94.     TIME OF CONCENTRATION=    .29 HOURS
           INTERNAL HYDROGRAPH TIME INCREMENT=   .0381 HOURS

           PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
              10.00                          17.86                       (RUNOFF)

 TIME(HRS)          FIRST HYDROGRAPH POINT =    .00 HOURS      TIME INCREMENT =   .10 HOURS      DRAINAGE AREA =     .02 SQ.MI.
    2.00    DISCHG      .00      .02      .03      .05      .07      .09      .11      .13      .15      .17
    3.00    DISCHG      .19      .21      .22      .24      .25      .27      .29      .31      .34      .35
    4.00    DISCHG      .37      .39      .40      .41      .43      .44      .46      .49      .51      .53
    5.00    DISCHG      .55      .57      .60      .62      .64      .66      .68      .71      .74      .76
    6.00    DISCHG      .78      .79      .80      .81      .83      .84      .86      .92      .96      .99
    7.00    DISCHG     1.01     1.04     1.10     1.15     1.18     1.20     1.24     1.30     1.35     1.38
    8.00    DISCHG     1.40     1.46     1.61     1.73     1.79     1.83     1.95     2.24     2.48     2.60
    9.00    DISCHG     2.67     2.85     3.28     3.64     3.81     3.93     5.66    10.63    14.88    16.88
   10.00    DISCHG    17.86    16.83    12.52     8.88     7.30     6.61     6.03     5.04     4.28     3.94
   11.00    DISCHG     3.81     3.65     3.30     3.03     2.91     2.86     2.79     2.66     2.55     2.50
   12.00    DISCHG     2.48     2.44     2.34     2.26     2.22     2.21     2.19     2.11     2.06     2.04
   13.00    DISCHG     2.03     2.00     1.93     1.88     1.86     1.85     1.82     1.75     1.70     1.67
   14.00    DISCHG     1.66     1.65     1.61     1.59     1.58     1.57     1.56     1.52     1.50     1.49
   15.00    DISCHG     1.48     1.48     1.48     1.48     1.48     1.48     1.47     1.43     1.41     1.40
   16.00    DISCHG     1.39     1.38     1.34     1.32     1.30     1.30     1.29     1.25     1.22     1.21
   17.00    DISCHG     1.21     1.21     1.21     1.20     1.20     1.20     1.19     1.16     1.13     1.12
   18.00    DISCHG     1.12     1.10     1.07     1.04     1.03     1.02     1.03     1.07     1.09     1.11
   19.00    DISCHG     1.11     1.10     1.07     1.04     1.03     1.03     1.01      .98      .95      .94
   20.00    DISCHG      .93      .93      .93      .93      .93      .93      .93      .93      .93      .93
   21.00    DISCHG      .93      .93      .93      .93      .93      .93      .92      .89      .86      .85
   22.00    DISCHG      .84      .84      .84      .84      .84      .84      .84      .84      .84      .84
   23.00    DISCHG      .84      .84      .84      .84      .84      .84      .83      .79      .77      .75
   24.00    DISCHG      .75      .66      .39      .17      .07      .03      .01      .00

   RUNOFF VOLUME ABOVE BASEFLOW =  3.33 WATERSHED INCHES,     39.57 CFS-HRS,     3.27 ACRE-FEET;   BASEFLOW =     .00 CFS


 OPERATION RESVOR   STRUCTURE  1
           INPUT HYDROGRAPH= 4     OUTPUT HYDROGRAPH= 5
           SURFACE ELEVATION=    6.00

           PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
              10.43                          7.18                        8.99

 TIME(HRS)          FIRST HYDROGRAPH POINT =    .00 HOURS      TIME INCREMENT =   .10 HOURS      DRAINAGE AREA =     .02 SQ.MI.
1


 TR20 XEQ 06-12-01  15:12        RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 1                                  JOB  1   PASS   4
      REV PC 09/83(.2)           2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS                                 PAGE   8


    9.00    DISCHG      .00      .00      .00      .10      .68      .85     1.06     1.43     3.35     5.49
    9.00      ELEV     5.00     5.00     5.00     7.41     7.51     7.59     7.70     7.89     8.12     8.33
   10.00    DISCHG     6.10     6.60     6.97     7.14     7.18     7.17     7.13     7.06     6.95     6.82
   10.00      ELEV     8.55     8.76     8.91     8.97     8.99     8.99     8.97     8.94     8.90     8.85
   11.00    DISCHG     6.69     6.56     6.42     6.27     6.12     5.97     5.81     5.65     5.49     5.33
   11.00      ELEV     8.79     8.74     8.68     8.62     8.56     8.50     8.44     8.39     8.33     8.28
   12.00    DISCHG     4.94     4.35     3.88     3.50     3.20     2.97     2.78     2.63     2.50     2.39
   12.00      ELEV     8.23     8.19     8.15     8.13     8.11     8.09     8.08     8.07     8.06     8.05
   13.00    DISCHG     2.31     2.24     2.17     2.11     2.05     2.00     1.96     1.92     1.87     1.83
   13.00      ELEV     8.05     8.04     8.04     8.03     8.03     8.02     8.02     8.02     8.02     8.01
   14.00    DISCHG     1.79     1.76     1.73     1.70     1.67     1.65     1.64     1.64     1.63     1.63
   14.00      ELEV     8.01     8.01     8.01     8.00     8.00     8.00     8.00     7.99     7.99     7.99
   15.00    DISCHG     1.62     1.61     1.60     1.60     1.59     1.58     1.58     1.57     1.56     1.56
```

15.00	ELEV	7.98	7.98	7.98	7.97	7.97	7.97	7.96	7.96	7.96	7.95
16.00	DISCHG	1.55	1.54	1.53	1.52	1.51	1.50	1.49	1.47	1.46	1.45
16.00	ELEV	7.95	7.94	7.94	7.93	7.93	7.92	7.92	7.91	7.90	7.90
17.00	DISCHG	1.44	1.42	1.41	1.40	1.39	1.38	1.37	1.36	1.35	1.34
17.00	ELEV	7.89	7.89	7.88	7.87	7.87	7.86	7.86	7.85	7.85	7.84
18.00	DISCHG	1.33	1.32	1.30	1.29	1.28	1.26	1.25	1.24	1.23	1.23
18.00	ELEV	7.84	7.83	7.82	7.82	7.81	7.80	7.80	7.79	7.79	7.78
19.00	DISCHG	1.22	1.21	1.21	1.20	1.19	1.18	1.17	1.16	1.15	1.14
19.00	ELEV	7.78	7.78	7.77	7.77	7.77	7.76	7.76	7.75	7.75	7.74
20.00	DISCHG	1.13	1.12	1.11	1.10	1.09	1.08	1.08	1.07	1.06	1.05
20.00	ELEV	7.74	7.73	7.73	7.72	7.72	7.71	7.71	7.70	7.70	7.70
21.00	DISCHG	1.05	1.04	1.04	1.03	1.02	1.02	1.01	1.01	1.00	.99
21.00	ELEV	7.69	7.69	7.69	7.68	7.68	7.68	7.68	7.67	7.67	7.67
22.00	DISCHG	.99	.98	.97	.96	.96	.95	.95	.94	.93	.93
22.00	ELEV	7.66	7.66	7.65	7.65	7.65	7.64	7.64	7.64	7.63	7.63
23.00	DISCHG	.92	.92	.92	.91	.91	.90	.90	.90	.89	.88
23.00	ELEV	7.63	7.63	7.63	7.62	7.62	7.62	7.62	7.62	7.61	7.61
24.00	DISCHG	.88	.87	.85	.82	.78	.74	.71	.67	.55	.46
24.00	ELEV	7.61	7.60	7.59	7.58	7.56	7.54	7.52	7.50	7.48	7.47
25.00	DISCHG	.38	.32	.26	.22	.18	.15	.13	.10	.09	.07
25.00	ELEV	7.46	7.45	7.44	7.43	7.43	7.42	7.42	7.42	7.41	7.41
26.00	DISCHG	.06	.05	.04	.03	.03	.02	.02	.02	.01	.01
26.00	ELEV	7.41	7.41	7.41	7.41	7.40	7.40	7.40	7.40	7.40	7.40
27.00	DISCHG	.01	.01								
27.00	ELEV	7.40	7.40								

RUNOFF VOLUME ABOVE BASEFLOW = 2.79 WATERSHED INCHES, 33.14 CFS-HRS, 2.74 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID

\+ COMPUTATIONS COMPLETED FOR PASS 4

1

TR20 XEQ 06-12-01 15:12 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 1 JOB 1 PASS 5
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 9

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID

\+ FROM XSECTION 1

\+ TO STRUCTURE 1

STARTING TIME = .00 RAIN DEPTH = 4.50 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.=50 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 4
AREA= .02 SQ MI INPUT RUNOFF CURVE= 94. TIME OF CONCENTRATION= .29 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0381 HOURS

PEAK TIME(HRS) 10.00 PEAK DISCHARGE(CFS) 20.35 PEAK ELEVATION(FEET) (RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .02 SQ.MI.

1.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.02
2.00	DISCHG	.04	.06	.08	.11	.14	.16	.18	.21	.23	.25
3.00	DISCHG	.27	.29	.31	.32	.34	.36	.38	.41	.44	.46
4.00	DISCHG	.48	.50	.51	.53	.54	.56	.58	.61	.64	.66
5.00	DISCHG	.68	.70	.74	.77	.79	.81	.83	.87	.90	.92
6.00	DISCHG	.94	.95	.97	.98	.99	1.00	1.03	1.10	1.15	1.18
7.00	DISCHG	1.20	1.24	1.31	1.36	1.40	1.42	1.46	1.53	1.59	1.62
8.00	DISCHG	1.65	1.72	1.88	2.02	2.09	2.13	2.27	2.60	2.88	3.02
9.00	DISCHG	3.09	3.30	3.79	4.20	4.40	4.53	6.51	12.19	17.02	19.27
10.00	DISCHG	20.35	19.15	14.23	10.08	8.28	7.49	6.83	5.71	4.85	4.47
11.00	DISCHG	4.31	4.13	3.74	3.43	3.29	3.23	3.16	3.00	2.88	2.83
12.00	DISCHG	2.80	2.76	2.64	2.55	2.51	2.50	2.46	2.39	2.33	2.30
13.00	DISCHG	2.29	2.26	2.18	2.12	2.10	2.08	2.05	1.98	1.92	1.89
14.00	DISCHG	1.88	1.86	1.82	1.79	1.78	1.77	1.76	1.72	1.69	1.68
15.00	DISCHG	1.67	1.67	1.67	1.67	1.67	1.67	1.66	1.62	1.59	1.57
16.00	DISCHG	1.57	1.55	1.52	1.48	1.47	1.47	1.45	1.41	1.38	1.37
17.00	DISCHG	1.36	1.36	1.36	1.36	1.36	1.36	1.35	1.31	1.28	1.26
18.00	DISCHG	1.26	1.24	1.21	1.17	1.16	1.16	1.17	1.20	1.23	1.25
19.00	DISCHG	1.25	1.24	1.21	1.18	1.16	1.16	1.14	1.10	1.07	1.06
20.00	DISCHG	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
21.00	DISCHG	1.05	1.05	1.05	1.05	1.05	1.05	1.04	1.00	.97	.95
22.00	DISCHG	.95	.95	.94	.94	.94	.94	.94	.94	.94	.94
23.00	DISCHG	.94	.94	.94	.94	.95	.94	.93	.89	.86	.85
24.00	DISCHG	.84	.74	.44	.19	.08	.03	.01	.01	.00	

RUNOFF VOLUME ABOVE BASEFLOW = 3.81 WATERSHED INCHES, 45.29 CFS-HRS, 3.74 ACRE-FEET; BASEFLOW = .00 CFS

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 OPERATION RESVOR   STRUCTURE  1
           INPUT HYDROGRAPH= 4     OUTPUT HYDROGRAPH= 5
           SURFACE ELEVATION=    6.00

           PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
              10.67                         7.77                         9.29
1


 TR20 XEQ 06-12-01  15:12       RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 1                                  JOB  1   PASS   5
      REV PC 09/83(.2)          2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS                                 PAGE  10


 TIME(HRS)          FIRST HYDROGRAPH POINT =    .00 HOURS      TIME INCREMENT =   .10 HOURS      DRAINAGE AREA =    .02 SQ.MI.
    9.00    DISCHG        .46       .75       .90      1.06      1.23      1.40      1.62      3.34      5.42      6.07
    9.00      ELEV       7.47      7.54      7.62      7.70      7.79      7.87      7.98      8.12      8.31      8.54
   10.00    DISCHG       6.69      7.26      7.57      7.72      7.77      7.77      7.75      7.70      7.62      7.53
   10.00      ELEV       8.79      9.03      9.19      9.26      9.29      9.29      9.28      9.25      9.21      9.17
   11.00    DISCHG       7.42      7.32      7.21      7.05      6.88      6.72      6.56      6.40      6.24      6.09
   11.00      ELEV       9.11      9.06      9.00      8.94      8.87      8.80      8.74      8.68      8.61      8.55
   12.00    DISCHG       5.94      5.77      5.61      5.45      5.30      4.80      4.25      3.81      3.47      3.19
   12.00      ELEV       8.49      8.43      8.38      8.32      8.27      8.22      8.18      8.15      8.13      8.11
   13.00    DISCHG       2.98      2.81      2.67      2.55      2.44      2.36      2.29      2.22      2.16      2.10
   13.00      ELEV       8.09      8.08      8.07      8.06      8.06      8.05      8.04      8.04      8.04      8.03
   14.00    DISCHG       2.05      2.00      1.97      1.93      1.89      1.87      1.84      1.82      1.79      1.76
   14.00      ELEV       8.03      8.02      8.02      8.02      8.02      8.01      8.01      8.01      8.01      8.01
   15.00    DISCHG       1.74      1.73      1.71      1.70      1.69      1.69      1.68      1.67      1.65      1.65
   15.00      ELEV       8.01      8.01      8.00      8.00      8.00      8.00      8.00      8.00      8.00      8.00
   16.00    DISCHG       1.64      1.64      1.63      1.63      1.62      1.61      1.60      1.59      1.58      1.57
   16.00      ELEV       8.00      7.99      7.99      7.99      7.98      7.98      7.98      7.97      7.97      7.96
   17.00    DISCHG       1.56      1.55      1.54      1.53      1.52      1.51      1.51      1.50      1.49      1.47
   17.00      ELEV       7.95      7.95      7.94      7.94      7.93      7.93      7.93      7.92      7.92      7.91
   18.00    DISCHG       1.46      1.45      1.44      1.43      1.41      1.40      1.39      1.38      1.37      1.36
   18.00      ELEV       7.90      7.90      7.89      7.89      7.88      7.87      7.87      7.86      7.86      7.85
   19.00    DISCHG       1.36      1.35      1.34      1.33      1.33      1.32      1.31      1.30      1.29      1.28
   19.00      ELEV       7.85      7.85      7.84      7.84      7.83      7.83      7.83      7.82      7.82      7.81
   20.00    DISCHG       1.26      1.25      1.24      1.23      1.22      1.21      1.20      1.20      1.19      1.18
   20.00      ELEV       7.80      7.80      7.79      7.79      7.78      7.78      7.77      7.77      7.76      7.76
   21.00    DISCHG       1.17      1.17      1.16      1.16      1.15      1.14      1.14      1.13      1.12      1.12
   21.00      ELEV       7.76      7.75      7.75      7.75      7.74      7.74      7.74      7.74      7.73      7.73
   22.00    DISCHG       1.11      1.10      1.09      1.08      1.08      1.07      1.06      1.06      1.05      1.04
   22.00      ELEV       7.72      7.72      7.71      7.71      7.71      7.70      7.70      7.70      7.69      7.69
   23.00    DISCHG       1.04      1.03      1.03      1.03      1.02      1.02      1.01      1.01      1.00       .99
   23.00      ELEV       7.69      7.69      7.68      7.68      7.68      7.68      7.68      7.67      7.67      7.67
   24.00    DISCHG        .99       .98       .95       .92       .88       .84       .79       .75       .71       .68
   24.00      ELEV       7.66      7.66      7.65      7.63      7.61      7.58      7.56      7.54      7.52      7.50
   25.00    DISCHG        .57       .48       .40       .33       .27       .23       .19       .16       .13       .11
   25.00      ELEV       7.49      7.47      7.46      7.45      7.44      7.43      7.43      7.42      7.42      7.42
   26.00    DISCHG        .09       .07       .06       .05       .04       .04       .03       .02       .02       .02
   26.00      ELEV       7.41      7.41      7.41      7.41      7.41      7.41      7.40      7.40      7.40      7.40
   27.00    DISCHG        .01       .01       .01       .01
   27.00      ELEV       7.40      7.40      7.40      7.40

   RUNOFF VOLUME ABOVE BASEFLOW =  3.27 WATERSHED INCHES,     38.85 CFS-HRS,     3.21 ACRE-FEET;   BASEFLOW =    .00 CFS

 EXECUTIVE CONTROL OPERATION ENDCMP                                                                        RECORD ID
+                          COMPUTATIONS COMPLETED FOR PASS   5

1


 TR20 XEQ 06-12-01  15:12       RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 1                                  JOB  1   PASS   6
      REV PC 09/83(.2)          2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS                                 PAGE  11


 EXECUTIVE CONTROL OPERATION COMPUT                                                                        RECORD ID
+                                FROM XSECTION   1
+                                                TO STRUCTURE  1
        STARTING TIME =    .00    RAIN DEPTH =  4.98    RAIN DURATION=  1.00    RAIN TABLE NO.= 1    ANT. MOIST. COND= 2
        ALTERNATE NO.= 1          STORM NO.=99    MAIN TIME INCREMENT =   .10 HOURS


 OPERATION RUNOFF   CROSS SECTION   1
           OUTPUT HYDROGRAPH=  4
           AREA=     .02 SQ MI   INPUT RUNOFF CURVE= 94.    TIME OF CONCENTRATION=   .29 HOURS
           INTERNAL HYDROGRAPH TIME INCREMENT= .0381 HOURS
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PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
10.00	22.78	(RUNOFF)
23.36	1.05	(RUNOFF)

TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS				TIME INCREMENT = .10 HOURS			DRAINAGE AREA = .02 SQ.MI		
1.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.01	.03	.06
2.00	DISCHG	.08	.11	.14	.17	.20	.23	.26	.28	.31	.33
3.00	DISCHG	.35	.37	.39	.41	.43	.45	.47	.51	.54	.57
4.00	DISCHG	.59	.61	.62	64	.66	.67	.70	.73	.77	.79
5.00	DISCHG	.81	.83	.87	.91	.93	.95	.98	1.02	1.06	1.08
6.00	DISCHG	1.10	1.12	1.13	1.14	1.16	1.17	1.20	1.27	1.33	1.37
7.00	DISCHG	1.39	1.43	1.51	1.57	1.61	1.64	1.68	1.76	1.82	1.86
8.00	DISCHG	1.89	1.96	2.15	2.31	2.39	2.43	2.58	2.96	3.28	3.43
9.00	DISCHG	3.51	3.74	4.29	4.75	4.97	5.12	7.33	13.71	19.12	21.60
10.00	DISCHG	22.77	21.41	15.89	11.26	9.24	8.35	7.62	6.36	5.40	4.98
11.00	DISCHG	4.80	4.60	4.16	3.81	3.66	3.60	3.52	3.34	3.21	3.14
12.00	DISCHG	3.12	3.07	2.94	2.84	2.79	2.78	2.74	2.66	2.59	2.56
13.00	DISCHG	2.55	2.51	2.43	2.36	2.33	2.32	2.28	2.20	2.13	2.10
14.00	DISCHG	2.09	2.07	2.03	1.99	1.98	1.97	1.95	1.91	1.88	1.86
15.00	DISCHG	1.86	1.85	1.85	1.85	1.85	1.85	1.84	1.80	1.76	1.75
16.00	DISCHG	1.74	1.73	1.68	1.65	1.63	1.63	1.61	1.57	1.53	1.52
17.00	DISCHG	1.51	1.51	1.51	1.51	1.51	1.51	1.49	1.45	1.42	1.40
18.00	DISCHG	1.40	1.38	1.34	1.30	1.29	1.28	1.29	1.34	1.37	1.38
19.00	DISCHG	1.39	1.38	1.34	1.30	1.29	1.28	1.27	1.22	1.19	1.17
20.00	DISCHG	1.17	1.17	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
21.00	DISCHG	1.16	1.16	1.16	1.16	1.16	1.16	1.15	1.11	1.07	1.06
22.00	DISCHG	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
23.00	DISCHG	1.05	1.05	1.05	1.05	1.05	1.05	1.03	.99	.96	.94
24.00	DISCHG	.93	.82	.48	.21	.09	.04	.02	.01	.00	

RUNOFF VOLUME ABOVE BASEFLOW = 4.29 WATERSHED INCHES, 50.90 CFS-HRS, 4.21 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 1
INPUT HYDROGRAPH= 4 OUTPUT HYDROGRAPH= 5
SURFACE ELEVATION= 6.00

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
10.51	8.31	9.57

1

TR20 XEQ 06-12-01 15:12 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 1 JOB 1 PASS 6
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 12

TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS				TIME INCREMENT = .10 HOURS			DRAINAGE AREA = .02 SQ.MI.		
8.00	DISCHG	.00	.00	.00	.00	.00	.00	.26	.67	.80	.94
8.00	ELEV	5.00	5.00	5.00	5.00	5.00	5.00	7.44	7.50	7.57	7.64
9.00	DISCHG	1.07	1.20	1.35	1.52	1.85	2.61	3.47	5.15	5.82	6.50
9.00	ELEV	7.70	7.77	7.85	7.93	8.01	8.07	8.13	8.24	8.45	8.72
10.00	DISCHG	7.21	7.69	8.05	8.23	8.30	8.31	8.30	8.26	8.18	8.08
10.00	ELEV	9.00	9.25	9.43	9.52	9.56	9.56	9.56	9.54	9.50	9.45
11.00	DISCHG	7.98	7.87	7.76	7.63	7.51	7.38	7.26	7.10	6.93	6.76
11.00	ELEV	9.40	9.34	9.28	9.22	9.16	9.09	9.03	8.96	8.89	8.82
12.00	DISCHG	6.60	6.44	6.28	6.13	5.98	5.81	5.65	5.50	5.35	5.03
12.00	ELEV	8.76	8.69	8.63	8.57	8.50	8.45	8.39	8.34	8.28	8.23
13.00	DISCHG	4.44	3.98	3.62	3.33	3.09	2.91	2.77	2.64	2.53	2.43
13.00	ELEV	8.19	8.16	8.14	8.12	8.10	8.09	8.08	8.07	8.06	8.05
14.00	DISCHG	2.35	2.29	2.23	2.18	2.13	2.09	2.06	2.03	2.00	1.97
14.00	ELEV	8.05	8.04	8.04	8.04	8.03	8.03	8.03	8.03	8.02	8.02
15.00	DISCHG	1.94	1.92	1.91	1.89	1.88	1.88	1.87	1.86	1.84	1.82
15.00	ELEV	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.01	8.01	8.01
16.00	DISCHG	1.80	1.79	1.77	1.74	1.72	1.70	1.68	1.66	1.65	1.64
16.00	ELEV	8.01	8.01	8.01	8.01	8.00	8.00	8.00	8.00	8.00	7.99
17.00	DISCHG	1.63	1.63	1.62	1.61	1.61	1.60	1.60	1.59	1.58	1.57
17.00	ELEV	7.99	7.99	7.99	7.98	7.98	7.98	7.97	7.97	7.97	7.96
18.00	DISCHG	1.57	1.56	1.55	1.53	1.52	1.51	1.50	1.49	1.48	1.48
18.00	ELEV	7.96	7.95	7.95	7.94	7.93	7.93	7.92	7.92	7.91	7.91
19.00	DISCHG	1.47	1.47	1.46	1.45	1.45	1.44	1.43	1.42	1.41	1.40
19.00	ELEV	7.91	7.91	7.90	7.90	7.90	7.89	7.89	7.88	7.88	7.87
20.00	DISCHG	1.38	1.37	1.36	1.35	1.34	1.33	1.32	1.31	1.31	1.30
20.00	ELEV	7.86	7.86	7.85	7.85	7.84	7.84	7.83	7.83	7.82	7.82
21.00	DISCHG	1.29	1.29	1.28	1.27	1.27	1.26	1.26	1.25	1.24	1.23
21.00	ELEV	7.82	7.81	7.81	7.81	7.80	7.80	7.80	7.80	7.79	7.79
22.00	DISCHG	1.22	1.21	1.21	1.20	1.19	1.18	1.17	1.17	1.16	1.16
22.00	ELEV	7.78	7.78	7.77	7.77	7.76	7.76	7.76	7.75	7.75	7.75
23.00	DISCHG	1.15	1.14	1.14	1.13	1.13	1.13	1.12	1.12	1.11	1.10
23.00	ELEV	7.74	7.74	7.74	7.74	7.73	7.73	7.73	7.73	7.72	7.72
24.00	DISCHG	1.09	1.08	1.06	1.02	.97	.93	.88	.83	.79	75
24.00	ELEV	7.72	7.71	7.70	7.68	7.66	7.63	7.61	7.58	7.56	7.54
25.00	DISCHG	.71	.67	.56	.47	.39	.32	.27	.22	.19	.15

25.00	ELEV	7.52	7.50	7.48	7.47	7.46	7.45	7.44	7.43	7.43	7.42
26.00	DISCHG	.13	.11	.09	.07	.06	.05	.04	.04	.03	.02
26.00	ELEV	7.42	7.42	7.41	7.41	7.41	7.41	7.41	7.41	7.40	7.40
27.00	DISCHG	.02	.02	.01	.01	.01	.01				
27.00	ELEV	7.40	7.40	7.40	7.40	7.40	7.40				

RUNOFF VOLUME ABOVE BASEFLOW = 3.75 WATERSHED INCHES, 44.48 CFS-HRS, 3.68 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID

\+ COMPUTATIONS COMPLETED FOR PASS 6

1

TR20 XEQ 06-12-01 15:12 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 1 JOB 1 PASS 7
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 13

EXECUTIVE CONTROL OPERATION ENDJOB RECORD ID

1

TR20 XEQ 06-12-01 15:12 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 1 JOB 1 SUMMARY
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 14

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 2													
XSECTION 1	RUNOFF	.02	1	2	.10	.0	1.98	24.00	1.38	---	10.01	7.46	405.6
STRUCTURE 1	RESVOR	.02	1	2	.10	.0	1.98	24.00	.84	7.74	11.80	1.14	62.1
ALTERNATE 1 STORM 10													
XSECTION 1	RUNOFF	.02	1	2	.10	.0	3.34	24.00	2.68	---	10.00	14.44	784.8
STRUCTURE 1	RESVOR	.02	1	2	.10	.0	3.34	24.00	2.13	8.54	10.41	6.07	329.9
ALTERNATE 1 STORM 15													
XSECTION 1	RUNOFF	.02	1	2	.10	.0	3.63	24.00	2.96	---	10.00	15.92	865.4
STRUCTURE 1	RESVOR	.02	1	2	.10	.0	3.63	24.00	2.42	8.74	10.42	6.55	356.2
ALTERNATE 1 STORM 25													
XSECTION 1	RUNOFF	.02	1	2	.10	.0	4.01	24.00	3.33	---	10.00	17.86	970.6
STRUCTURE 1	RESVOR	.02	1	2	.10	.0	4.01	24.00	2.79	8.99	10.43	7.18	390.3
ALTERNATE 1 STORM 50													
XSECTION 1	RUNOFF	.02	1	2	.10	.0	4.50	24.00	3.81	---	10.00	20.35	1105.9
STRUCTURE 1	RESVOR	.02	1	2	.10	.0	4.50	24.00	3.27	9.29	10 47	7.77	422.4
ALTERNATE 1 STORM 99													
XSECTION 1	RUNOFF	.02	1	2	.10	.0	4.98	24.00	4.29	---	10.00	22.78	1237.8
STRUCTURE 1	RESVOR	.02	1	2	.10	.0	4.98	24.00	3.75	9.57	10.51	8.31	451.8

1

TR20 XEQ 06-12-01 15:12 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 1 JOB 1 SUMMARY
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 15

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS 2	10	15	25	50	99
0 STRUCTURE 1	.02						
ALTERNATE 1		1.14	6.07	6.55	7.18	7.77	8.31
0 XSECTION 1	.02						
ALTERNATE 1		7.46	14.44	15.92	17.86	20.35	22.78

1END OF 1 JOBS IN THIS RUN

ATTACHMENT NO. 4

PROJECT Russell City Energy Center

JOB NUMBER 24405

SUBJECT Storm Water Management Basin Sizing, Pre- and Post-Development Runoff

CALC NO H&H-1

SHEET NO 1 OF 12

REV. NO. 0

```
1


 ******************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY*****************

 JOB TR-20                      FULLPRINT          SUMMARY   NOPLOTS
 TITLE 001 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 2
 TITLE     2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS
  3 STRUCT       01
  8                        5.0          0.0          0.0
  8                        6.0          0.000001     0.23
  8                        6.5          0.75         0.44
  8                        6.75         1.30         0.54
  8                        7.0          1.68         0.64
  8                        7.5          2.26         0.79
  8                        8.0          2.71         0.94
  8                        8.25         6.21         1.05
  8                        8.50         9.52         1.16
  8                        9.0          10.34        1.38
  8                        10.0         11.80        1.87
  8                        10.25        15.64        2.01
  8                        10.50        22.37        2.15
  8                        11.0         41.10        2.42
  8                        12.0         93.48        3.03
  9 ENDTBL
  6 RUNOFF 1 001        4 0.0184       94.          0.286        1 1   1   1
  6 RESVOR 2    01 4    5 6.0                                    1 1 1 1   1
    ENDATA
  7 INCREM 6              0.1
  7 COMPUT 7 001       01 0.0          1.98         1.0          1 2  01  02
    ENDCMP 1
  7 COMPUT 7 001       01 0.0          3.34         1.0          1 2  01  10
    ENDCMP 1
  7 COMPUT 7 001       01 0.0          3.63         1.0          1 2  01  15
    ENDCMP 1
  7 COMPUT 7 001       01 0.0          4.01         1.0          1 2  01  25
    ENDCMP 1
  7 COMPUT 7 001       01 0.0          4.50         1.0          1 2  01  50
    ENDCMP 1
  7 COMPUT 7 001       01 0.0          4.98         1.0          1 2  01  99
    ENDCMP 1
    ENDJOB 2
0*******************************END OF 80-80 LIST*******************************
```

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1


 TR20 XEQ 06-12-01  15:12        RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 2                          JOB  1   PASS   1
      REV PC 09/83(.2)           2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS                             PAGE   1


 EXECUTIVE CONTROL OPERATION INCREM                                                                    RECORD ID
+                                  MAIN TIME INCREMENT =   .10 HOURS

 EXECUTIVE CONTROL OPERATION COMPUT                                                                    RECORD ID
+                                  FROM XSECTION   1
+                                                TO STRUCTURE  1
         STARTING TIME =   .00     RAIN DEPTH =  1.98     RAIN DURATION=  1.00     RAIN TABLE NO.= 1     ANT. MDIST. COND= 2
         ALTERNATE NO.= 1          STORM NO.= 2     MAIN TIME INCREMENT =   .10 HOURS


 OPERATION RUNOFF   CROSS SECTION   1
           OUTPUT HYDROGRAPH=  4
           AREA=     .02 SQ MI    INPUT RUNOFF CURVE= 94.     TIME OF CONCENTRATION=   .29 HOURS
           INTERNAL HYDROGRAPH TIME INCREMENT=  .0381 HOURS

           PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
              10.01                          7.46                        (RUNOFF)

 TIME(HRS)          FIRST HYDROGRAPH POINT =   .00 HOURS      TIME INCREMENT =  .10 HOURS      DRAINAGE AREA =    .02 SQ.MI.
    3.00   DISCHG      .00     .00     .00     .00     .00     .00     .00     .00     .01     .01
    4.00   DISCHG      .02     .03     .03     .04     .05     .05     .06     .07     .08     .08
    5.00   DISCHG      .09     .10     .11     .12     .12     .13     .14     .15     .16     .17
    6.00   DISCHG      .18     .18     .19     .20     .21     .21     .22     .24     .26     .27
    7.00   DISCHG      .28     .29     .31     .33     .34     .35     .37     .39     .41     .43
    8.00   DISCHG      .44     .46     .52     .56     .59     .61     .65     .76     .85     .91
    9.00   DISCHG      .94    1.01    1.18    1.33    1.41    1.47    2.16    4.15    5.94    6.90
   10.00   DISCHG     7.45    7.14    5.36    3.84    3.18    2.90    2.66    2.23    1.90    1.75
   11.00   DISCHG     1.70    1.63    1.48    1.36    1.30    1.28    1.26    1.20    1.15    1.13
   12.00   DISCHG     1.12    1.10    1.06    1.02    1.01    1.00     .99     .96     .94     .93
   13.00   DISCHG      .92     .91     .88     .86     .85     .84     .83     .80     .78     .77
   14.00   DISCHG      .76     .76     .74     .73     .72     .72     .72     .70     .69     .68
   15.00   DISCHG      .68     .68     .68     .68     .68     .68     .68     .66     .65     .65
   16.00   DISCHG      .64     .64     .62     .61     .60     .60     .60     .58     .57     .56
   17.00   DISCHG      .56     .56     .56     .56     .56     .56     .56     .54     .53     .52
   18.00   DISCHG      .52     .51     .50     .49     .48     .48     .48     .50     .51     .52
   19.00   DISCHG      .52     .51     .50     .49     .48     .48     .47     .46     .44     .44
   20.00   DISCHG      .44     .44     .44     .44     .44     .44     .44     .44     .44     .44
   21.00   DISCHG      .44     .44     .44     .44     .44     .44     .43     .42     .40     .40
   22.00   DISCHG      .39     .39     .39     .39     .39     .39     .39     .39     .39     .39
   23.00   DISCHG      .39     .39     .39     .39     .39     .39     .39     .37     .36     .36
   24.00   DISCHG      .35     .31     .18     .08     .03     .01     .01     .00

   RUNOFF VOLUME ABOVE BASEFLOW =  1.38 WATERSHED INCHES,     16.35 CFS-HRS,     1.35 ACRE-FEET;   BASEFLOW =    .00 CFS


 OPERATION RESVOR   STRUCTURE  1
           INPUT HYDROGRAPH= 4     OUTPUT HYDROGRAPH= 5
           SURFACE ELEVATION=    6.00

           PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
              10.87                          1.80                         7.11
1


 TR20 XEQ 06-12-01  15:12        RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 2                          JOB  1   PASS   1
      REV PC 09/83(.2)           2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS                             PAGE   2


 TIME(HRS)          FIRST HYDROGRAPH POINT =   .00 HOURS      TIME INCREMENT =  .10 HOURS      DRAINAGE AREA =    .02 SQ.MI.
    4.00   DISCHG      .00     .00     .00     .00     .00     .01     .01     .01     .01     .01
    4.00     ELEV     5.00    5.00    5.00    5.00    5.00    6.00    6.00    6.01    6.01    6.01
    5.00   DISCHG      .01     .02     .02     .02     .03     .03     .03     .03     .04     .04
    5.00     ELEV     6.01    6.01    6.01    6.01    6.02    6.02    6.02    6.02    6.03    6.03
    6.00   DISCHG      .05     .05     .05     .06     .06     .07     .07     .08     .08     .09
    6.00     ELEV     6.03    6.03    6.04    6.04    6.04    6.04    6.05    6.05    6.05    6.06
    7.00   DISCHG      .09     .10     .10     .11     .12     .12     .13     .14     .14     .15
    7.00     ELEV     6.06    6.06    6.07    6.07    6.08    6.08    6.09    6.09    6.10    6.10
    8.00   DISCHG      .16     .17     .18     .19     .20     .21     .22     .24     .25     .27
    8.00     ELEV     6.11    6.11    6.12    6.13    6.13    6.14    6.15    6.16    6.17    6.18
    9.00   DISCHG      .29     .31     .33     .36     .39     .42     .46     .54     .67     .88
    9.00     ELEV     6.19    6.21    6.22    6.24    6.26    6.28    6.31    6.36    6.45    6.56
   10.00   DISCHG     1.16    1.40    1.55    1.64    1.70    1.74    1.77    1.79    1.80    1.80
```

10.00	ELEV	6.69	6.81	6.91	6.97	7.02	7.05	7.08	7.10	7.11	7.11
11.00	DISCHG	1.80	1.80	1.79	1.78	1.76	1.75	1.73	1.72	1.70	1.68
11.00	ELEV	7.10	7.10	7.09	7.08	7.07	7.06	7.05	7.03	7.02	7.00
12.00	DISCHG	1.67	1.65	1.63	1.61	1.59	1.58	1.56	1.54	1.52	1.50
12.00	ELEV	6.99	6.98	6.97	6.96	6.94	6.93	6.92	6.91	6.90	6.88
13.00	DISCHG	1.49	1.47	1.45	1.43	1.41	1.40	1.38	1.36	1.34	1.33
13.00	ELEV	6.87	6.86	6.85	6.84	6.83	6.81	6.80	6.79	6.78	6.77
14.00	DISCHG	1.31	1.29	1.27	1.24	1.22	1.20	1.18	1.16	1.13	1.11
14.00	ELEV	6.76	6.75	6.73	6.72	6.71	6.70	6.69	6.68	6.67	6.67
15.00	DISCHG	1.10	1.08	1.06	1.04	1.03	1.01	1.00	.98	.97	.95
15.00	ELEV	6.66	6.65	6.64	6.63	6.63	6.62	6.61	6.61	6.60	6.59
16.00	DISCHG	.94	.93	.91	.90	.89	.87	.86	.85	.84	.83
16.00	ELEV	6.59	6.58	6.57	6.57	6.56	6.56	6.55	6.55	6.54	6.53
17.00	DISCHG	.81	.80	.79	.78	.77	.76	.75	.75	.74	.73
17.00	ELEV	6.53	6.52	6.52	6.51	6.51	6.51	6.50	6.50	6.49	6.49
18.00	DISCHG	.73	.72	.72	.71	.70	.70	.69	.68	.68	.67
18.00	ELEV	6.49	6.48	6.48	6.47	6.47	6.46	6.46	6.46	6.45	6.45
19.00	DISCHG	.67	.66	.66	.66	.65	.65	.64	.64	.63	.62
19.00	ELEV	6.45	6.44	6.44	6.44	6.43	6.43	6.43	6.42	6.42	6.42
20.00	DISCHG	.62	.61	.61	.60	.60	.59	.59	.58	.58	.58
20.00	ELEV	6.41	6.41	6.41	6.40	6.40	6.40	6.39	6.39	6.39	6.38
21.00	DISCHG	.57	.57	.56	.56	.56	.55	.55	.55	.54	.54
21.00	ELEV	6.38	6.38	6.38	6.37	6.37	6.37	6.37	6.36	6.36	6.36
22.00	DISCHG	.53	.53	.53	.52	.52	.51	.51	.51	.50	.50
22.00	ELEV	6.36	6.35	6.35	6.35	6.35	6.34	6.34	6.34	6.34	6.33
23.00	DISCHG	.50	.50	.49	.49	.49	.48	.48	.48	.48	.47
23.00	ELEV	6.33	6.33	6.33	6.33	6.32	6.32	6.32	6.32	6.32	6.31
24.00	DISCHG	.47	.46	.46	.45	.44	.42	.41	.40	.39	.38
24.00	ELEV	6.31	6.31	6.31	6.30	6.29	6.28	6.28	6.27	6.26	6.25
25.00	DISCHG	.37	.36	.35	.34	.33	.32	.31	.30	.29	.28
25.00	ELEV	6.24	6.24	6.23	6.22	6.22	6.21	6.20	6.20	6.19	6.19
26.00	DISCHG	.27	.27	.26	.25	.24	.24	.23	.22	.22	.21
26.00	ELEV	6.18	6.18	6.17	6.17	6.16	6.16	6.15	6.15	6.14	6.14
27.00	DISCHG	.20	.20	.19	.19	.18	.18	.17	.17	.16	.16

1

TR20 XEQ 06-12-01 15:12 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 2 JOB 1 PASS 1
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 3

27.00	ELEV	6.14	6.13	6.13	6.12	6.12	6.12	6.11	6.11	6.11	6.10
28.00	DISCHG	.15	.15	.14	.14	.13	.13	.13	.12	.12	.12
28.00	ELEV	6.10	6.10	6.10	6.09	6.09	6.09	6.08	6.08	6.08	6.08
29.00	DISCHG	.11	.11	.11	.10	.10	.10	.09	.09	.09	.09
29.00	ELEV	6.08	6.07	6.07	6.07	6.07	6.06	6.06	6.06	6.06	6.06

RUNOFF VOLUME ABOVE BASEFLOW = 1.35 WATERSHED INCHES, 16.05 CFS-HRS, 1.33 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
\+ COMPUTATIONS COMPLETED FOR PASS 1

1

TR20 XEQ 06-12-01 15:12 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 2 JOB 1 PASS 2
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 4

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID
\+ FROM XSECTION 1
\+ TO STRUCTURE 1
STARTING TIME = .00 RAIN DEPTH = 3.34 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.=10 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 4
AREA= .02 SQ MI INPUT RUNOFF CURVE= 94. TIME OF CONCENTRATION= .29 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0381 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET) (RUNOFF)
10.00	14.44	

TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS			TIME INCREMENT = .10 HOURS			DRAINAGE AREA = .02 SQ.MI.		
2.00	DISCHG	.00	.00	.00	.00	.01	.02	.03	.05	.06	.08
3.00	DISCHG	.09	.11	.12	.13	.14	.16	.17	.19	.21	.22
4.00	DISCHG	.24	.25	.26	.27	.28	.29	.31	.33	.35	.37
5.00	DISCHG	.38	.39	.42	.44	.45	.47	.48	.51	.53	.55

6.00	DISCHG	.56	.57	.59	.60	.61	.62	.64	.68	.72	.74
7.00	DISCHG	.76	.78	.83	.87	.89	.91	.94	.99	1.03	1.06
8.00	DISCHG	1 07	1 12	1.24	1.33	1.38	1.41	1.51	1.74	1.93	2.03
9.00	DISCHG	2.09	2.23	2.58	2.87	3.01	3.11	4.50	8.48	11.93	13.59
10.00	DISCHG	14.44	13.65	10.17	7.23	5.95	5.39	4.93	4.12	3.50	3.23
11.00	DISCHG	3.12	2.99	2.70	2.48	2.38	2.34	2.29	2.18	2.09	2.05
12.00	DISCHG	2.04	2.00	1.92	1.85	1.83	1.81	1.79	1.74	1.69	1.67
13.00	DISCHG	1.67	1.64	1.59	1.54	1.53	1.52	1.50	1.44	1.40	1.38
14.00	DISCHG	1.37	1.36	1.33	1.31	1.30	1.29	1.28	1.25	1.23	1.22
15.00	DISCHG	1.22	1.22	1.22	1.22	1.22	1 22	1.21	1.18	1.16	1.15
16.00	DISCHG	1.15	1.14	1.11	1.09	1.08	1.07	1.06	1.03	1.01	1 00
17.00	DISCHG	1.00	.99	.99	.99	.99	.99	.98	.96	93	.93
18.00	DISCHG	.92	.91	.88	.86	.85	.85	.85	.88	90	.91
19.00	DISCHG	.92	.91	.88	.86	.85	.85	.84	.81	.78	.77
20.00	DISCHG	.77	.77	.77	.77	.77	.77	.77	.77	.77	.77
21.00	DISCHG	.77	.77	.77	.77	.77	.77	.76	.73	.71	.70
22.00	DISCHG	.70	.69	.69	.69	.69	.69	.69	.69	.69	.69
23.00	DISCHG	.69	.69	.69	.69	.69	.69	.68	.66	.63	.62
24.00	DISCHG	.62	.54	.32	.14	.06	.02	.01	.00		

RUNOFF VOLUME ABOVE BASEFLOW = 2.68 WATERSHED INCHES, 31.81 CFS-HRS, 2.63 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 1
INPUT HYDROGRAPH= 4 OUTPUT HYDROGRAPH= 5
SURFACE ELEVATION= 6.00

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
10.44	5.79	8.22

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .02 SQ.MI.
1

2.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
2.00	ELEV	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00
3.00	DISCHG	.01	.01	.01	.02	.02	.02	.03	.03	.04	.04
3.00	ELEV	6.01	6.01	6.01	6.01	6.01	6.02	6.02	6.02	6.03	6.03
4.00	DISCHG	.05	.05	.06	.07	.07	.08	.08	.09	.10	.11
4.00	ELEV	6.03	6.04	6.04	6.04	6.05	6.05	6.06	6.06	6.07	6.07
5.00	DISCHG	.11	.12	.13	.14	.15	.16	.17	.18	.19	20
5.00	ELEV	6.08	6.08	6.09	6.09	6.10	6.10	6.11	6.12	6.12	6.13
6.00	DISCHG	.21	.22	.23	.24	.25	.26	.27	.28	.29	.31
6.00	ELEV	6.14	6.14	6.15	6.16	6.17	6.17	6.18	6.19	6.20	6 20
7.00	DISCHG	.32	.33	.35	.36	.38	.39	.41	.42	.44	.46
7.00	ELEV	6.21	6.22	6.23	6.24	6.25	6.26	6.27	6.28	6.29	6.30
8.00	DISCHG	.47	.49	.51	.54	.56	.58	.61	.64	.67	.71
8.00	ELEV	6.32	6.33	6.34	6.36	6.37	6.39	6.41	6.43	6.45	6.47
9.00	DISCHG	.75	.81	.88	.97	1.05	1.14	1.26	1.43	1.71	2.05
9.00	ELEV	6.50	6.53	6.56	6.60	6.64	6.68	6.73	6.84	7.02	7.32
10.00	DISCHG	2.39	2.68	4.55	5.52	5.76	5.74	5.61	5.36	5.00	4.62
10.00	ELEV	7.65	7.96	8.13	8.20	8.22	8.22	8.21	8.19	8.16	8.14
11.00	DISCHG	4.28	4.00	3.73	3.46	3.22	3.02	2.86	2.71	2.70	2.68
11.00	ELEV	8.11	8.09	8.07	8.05	8.04	8.02	8.01	8.00	7.98	7.97
12.00	DISCHG	2.67	2.65	2.63	2.61	2.60	2.58	2.56	2.54	2.52	2.50
12.00	ELEV	7.95	7.93	7.91	7.89	7.87	7.85	7.83	7.81	7.79	7.76
13.00	DISCHG	2.48	2.46	2.44	2.42	2.39	2.37	2.35	2.33	2.31	2.28
13.00	ELEV	7.74	7.72	7.70	7.67	7.65	7.62	7.60	7.58	7.55	7.53
14.00	DISCHG	2.26	2.23	2.21	2.18	2.15	2.12	2.10	2.07	2.05	2.02
14.00	ELEV	7.50	7.48	7.45	7.43	7.41	7.38	7.36	7.34	7.32	7.29
15.00	DISCHG	1.99	1.97	1.95	1.92	1.90	1.88	1.86	1.84	1.82	1.80
15.00	ELEV	7.27	7.25	7.23	7.21	7.19	7.17	7.15	7.14	7.12	7.10
16.00	DISCHG	1.78	1.76	1.74	1.72	1.70	1.68	1.66	1.64	1.62	1.60
16.00	ELEV	7.08	7.07	7.05	7.03	7.01	7.00	6.99	6.97	6.96	6.95
17.00	DISCHG	1.58	1.56	1.55	1.53	1.51	1.50	1.48	1.47	1.45	1.43
17.00	ELEV	6.94	6.92	6.91	6.90	6.89	6.88	6.87	6.86	6.85	6.84
18.00	DISCHG	1.42	1.40	1.39	1.37	1.35	1.34	1 32	1.31	1.29	1.28
18.00	ELEV	6.83	6.82	6.81	6.80	6.79	6.78	6.77	6.76	6.75	6.74
19.00	DISCHG	1.26	1.25	1.23	1.21	1.20	1.18	1.17	1.15	1.14	1.12
19.00	ELEV	6.73	6.73	6.72	6.71	6.70	6.70	6.69	6.68	6.68	6.67
20.00	DISCHG	1.11	1.09	1.08	1.06	1.05	1.04	1.02	1.01	1.00	.99
20.00	ELEV	6.66	6.65	6.65	6.64	6.64	6.63	6.62	6.62	6.61	6.61
21.00	DISCHG	.98	.97	.96	.95	.95	.94	.93	.92	.91	.90
21.00	ELEV	6.61	6.60	6.60	6.59	6.59	6.59	6.58	6.58	6.57	6.57
22.00	DISCHG	.90	.89	.88	.87	.86	.85	.85	.84	.83	.83
22.00	ELEV	6.57	6.56	6.56	6.55	6.55	6.55	6.54	6.54	6.54	6.54
23.00	DISCHG	.82	.82	.81	.80	.80	.80	.79	.79	.78	.77
23.00	ELEV	6.53	6.53	6.53	6.52	6.52	6.52	6.52	6.52	6.51	6.51
24.00	DISCHG	.77	.76	.75	.73	.71	.69	.67	.65	.63	.62
24.00	ELEV	6.51	6.50	6.50	6.49	6.47	6.46	6.45	6.44	6.42	6.41

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   25.00     DISCHG        .60       .58       .56       .55       53        .52       .50       .49       .47       .46
   25.00       ELEV       6.40      6.39      6.38      6.36      6.35      6.34      6.33      6.32      6.31      6.31
   26.00     DISCHG        .45       .43       .42       .41       .40       .38       .37       .36       .35       .34
1


 TR20 XEQ 06-12-01  15:12        RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 2                                  JOB  1   PASS   2
      REV PC 09/83(.2)           2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS                                 PAGE   6

   26.00       ELEV       6.30      6.29      6.28      6.27      6.26      6.26      6.25      6.24      6.23      6.23
   27.00     DISCHG        .33       .32       .31       .30       .29       .29       .28       .27       .26       .25
   27.00       ELEV       6.22      6.21      6.21      6.20      6.20      6.19      6.19      6.18      6.17      6.17
   28.00     DISCHG        .25       .24       .23       .23       .22       .21       .21       .20       .19       .19
   28.00       ELEV       6.16      6.16      6.15      6.15      6.15      6.14      6.14      6.13      6.13      6.13
   29.00     DISCHG        .18       .18       .17       .17       .16       .16       .15       .15       .14       .14
   29.00       ELEV       6.12      6.12      6.12      6.11      6.11      6.11      6.10      6.10      6.10      6.09

   RUNOFF VOLUME ABOVE BASEFLOW =  2.64 WATERSHED INCHES,      31.30 CFS-HRS,      2.59 ACRE-FEET;   BASEFLOW =     .00 CFS

 EXECUTIVE CONTROL OPERATION ENDCHP                                                                          RECORD ID
+                                 COMPUTATIONS COMPLETED FOR PASS   2


1


 TR20 XEQ 06-12-01  15:12        RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 2                                  JOB  1   PASS   3
      REV PC 09/83(.2)           2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS                                 PAGE   7


 EXECUTIVE CONTROL OPERATION COMPUT                                                                          RECORD ID
+                                 FROM XSECTION   1
+                                                   TO STRUCTURE  1
        STARTING TIME =    .00    RAIN DEPTH =  3.63    RAIN DURATION=  1.00    RAIN TABLE NO.= 1    ANT. MOIST. COND= 2
        ALTERNATE NO.= 1          STORM NO.=15    MAIN TIME INCREMENT =   .10 HOURS


 OPERATION RUNOFF   CROSS SECTION   1
           OUTPUT HYDROGRAPH=  4
           AREA=     .02 SQ MI   INPUT RUNOFF CURVE= 94.    TIME OF CONCENTRATION=    .29 HOURS
           INTERNAL HYDROGRAPH TIME INCREMENT=  .0381 HOURS

           PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
              10.00                         15.92                       (RUNOFF)

TIME(HRS)          FIRST HYDROGRAPH POINT =    .00 HOURS      TIME INCREMENT =  .10 HOURS      DRAINAGE AREA =    .02 SQ.MI.
   2.00     DISCHG        .00       .00       .01       .02       .03       .05       .07       .08       .10       .12
   3.00     DISCHG        .13       .15       .16       .18       .19       .20       .22       .24       .26       .28
   4.00     DISCHG        .29       .31       .32       .33       .34       .36       .37       .40       .42       .44
   5.00     DISCHG        .45       .47       .49       .52       .54       .55       .57       .60       .62       .64
   6.00     DISCHG        .65       .67       .68       .69       .70       .71       .73       .78       .82       .85
   7.00     DISCHG        .87       .89       .95       .99      1.02      1.04      1.06      1.12      1.17      1.20
   8.00     DISCHG       1.22      1.27      1.40      1.50      1.56      1.59      1.70      1.95      2.17      2.28
   9.00     DISCHG       2.34      2.50      2.88      3.20      3.36      3.47      5.00      9.41     13.20     15.01
  10.00     DISCHG      15.92     15.03     11.19      7.94      6.53      5.92      5.40      4.52      3.84      3.54
  11.00     DISCHG       3.42      3.27      2.96      2.72      2.61      2.57      2.51      2.39      2.29      2.25
  12.00     DISCHG       2.23      2.19      2.10      2.03      2.00      1.99      1.96      1.90      1.85      1.83
  13.00     DISCHG       1.82      1.80      1.74      1.69      1.67      1.66      1.64      1.58      1.53      1.51
  14.00     DISCHG       1.50      1.48      1.45      1.43      1.42      1.41      1.40      1.37      1.35      1.34
  15.00     DISCHG       1.33      1.33      1.33      1.33      1.33      1.33      1.32      1.29      1.27      1.26
  16.00     DISCHG       1.25      1.24      1.21      1.19      1.17      1.17      1.16      1.13      1.10      1.09
  17.00     DISCHG       1.09      1.09      1.09      1.09      1.09      1.09      1.08      1.05      1.02      1.01
  18.00     DISCHG       1.01       .99       .96       .94       .93       .92       .93       .96       .99      1.00
  19.00     DISCHG       1.00       .99       .96       .94       .93       .92       .91       .88       .86       .85
  20.00     DISCHG        .84       .84       .84       .84       .84       .84       .84       .84       .84       .84
  21.00     DISCHG        .84       .84       .84       .84       .84       .84       .83       .80       .77       .76
  22.00     DISCHG        .76       .76       .76       .76       .76       .76       .76       .76       .76       .76
  23.00     DISCHG        .76       .76       .76       .76       .76       .76       .75       .72       .69       .68
  24.00     DISCHG        .67       .59       .35       .15       .06       .03       .01       .00

   RUNOFF VOLUME ABOVE BASEFLOW =  2.96 WATERSHED INCHES,      35.16 CFS-HRS,      2.91 ACRE-FEET;   BASEFLOW =     .00 CFS

OPERATION RESVOR   STRUCTURE  1
           INPUT HYDROGRAPH= 4     OUTPUT HYDROGRAPH= 5
           SURFACE ELEVATION=    6.00

           PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
              10.35                         7.34                        8.34
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TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .02 SQ.MI.

1

TR20 XEQ 06-12-01 15:12 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 2 JOB 1 PASS 3
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 8

2.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.01	.01	.01
2.00	ELEV	5.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.01	6.01
3.00	DISCHG	.01	.02	.02	.03	.03	.04	.04	.05	.05	.06
3.00	ELEV	6.01	6.01	6.01	6.02	6.02	6.02	6.03	6.03	6.03	6.04
4.00	DISCHG	.07	.07	.08	.09	.09	.10	.11	.12	.13	.13
4.00	ELEV	6.04	6.05	6.05	6.06	6.06	6.07	6.07	6.08	6.08	6.09
5.00	DISCHG	.14	.15	.16	.17	.18	.19	.20	.21	.23	.24
5.00	ELEV	6.10	6.10	6.11	6.11	6.12	6.13	6.14	6.14	6.15	6.16
6.00	DISCHG	.25	.26	.27	.29	.30	.31	.32	.33	.35	.36
6.00	ELEV	6.17	6.17	6.18	6.19	6.20	6.21	6.21	6.22	6.23	6.24
7.00	DISCHG	.38	.39	.41	.42	.44	.46	.47	.49	51	.53
7.00	ELEV	6.25	6.26	6.27	6.28	6.29	6.30	6.32	6.33	6.34	6.35
8.00	DISCHG	.55	.57	.59	.62	.64	.67	.70	.73	.78	.85
8.00	ELEV	6.37	6.38	6.39	6.41	6.43	6.45	6.47	6.49	6.51	6.54
9.00	DISCHG	.91	.98	1.05	1.14	1.24	1.32	1.41	1.59	1.90	2.28
9.00	ELEV	6.57	6.60	6.64	6.68	6.72	6.77	6.82	6.94	7.19	7.52
10.00	DISCHG	2.60	4.65	6.60	7.25	7.25	7.02	6.72	6.33	5.84	5.34
10.00	ELEV	7.88	8.14	8.28	8.33	8.33	8.31	8.29	8.26	8.22	8.19
11.00	DISCHG	4.91	4.54	4.21	3.89	3.61	3.37	3.18	3.01	2.85	2.72
11.00	ELEV	8.16	8.13	8.11	8.08	8.06	8.05	8.03	8.02	8.01	8.00
12.00	DISCHG	2.70	2.69	2.67	2.66	2.64	2.63	2.61	2.59	2.58	2.56
12.00	ELEV	7.99	7.97	7.96	7.94	7.93	7.91	7.89	7.87	7.85	7.83
13.00	DISCHG	2.54	2.52	2.50	2.49	2.47	2.45	2.43	2.41	2.39	2.36
13.00	ELEV	7.81	7.79	7.77	7.75	7.73	7 71	7.68	7.66	7.64	7.62
14.00	DISCHG	2.34	2.32	2.30	2.28	2.26	2.23	2.21	2.18	2.15	2.13
14.00	ELEV	7.59	7.57	7 55	7.52	7.50	7.48	7.45	7.43	7.41	7.39
15.00	DISCHG	2.10	2.08	2.06	2.03	2.01	1.99	1.97	1.95	1.93	1.91
15.00	ELEV	7.37	7.34	7.32	7.30	7.29	7.27	7.25	7.23	7.21	7.19
16.00	DISCHG	1.89	1.87	1.85	1.82	1.80	1.78	1.77	1.75	1.73	1.71
16.00	ELEV	7.18	7.16	7.14	7.12	7.11	7.09	7.07	7.06	7.04	7.02
17.00	DISCHG	1.69	1.67	1.65	1.63	1.62	1.60	1.58	1.57	1.55	1.53
17.00	ELEV	7.01	6.99	6.98	6.97	6.96	6.95	6.94	6.93	6.91	6.90
18.00	DISCHG	1.52	1.50	1.49	1.47	1.45	1.44	1.42	1.41	1.39	1.38
18.00	ELEV	6.89	6.88	6.87	6.86	6.85	6.84	6.83	6.82	6.81	6.80
19.00	DISCHG	1.37	1.36	1.34	1.33	1.32	1.31	1.29	1.28	1.26	1.24
19.00	ELEV	6.79	6.79	6.78	6.77	6.76	6.76	6.75	6.74	6.73	6.72
20.00	DISCHG	1.22	1.21	1.19	1.17	1.16	1.14	1.13	1.12	1.11	1.09
20.00	ELEV	6.71	6.71	6.70	6.69	6.69	6.68	6.67	6.67	6.66	6.66
21.00	DISCHG	1.08	1.07	1.06	1.05	1.04	1.03	1.02	1.01	1.00	.99
21.00	ELEV	6.65	6.65	6.64	6.64	6.63	6.63	6.62	6.62	6.62	6.61
22.00	DISCHG	.98	.97	.96	.95	.95	.94	.93	.92	.91	.91
22.00	ELEV	6.61	6.60	6.60	6.59	6.59	6.59	6.58	6.58	6.57	6.57
23.00	DISCHG	.90	.89	.89	.88	.88	.87	.87	.86	.85	.85
23.00	ELEV	6.57	6.57	6.56	6.56	6.56	6.56	6.55	6.55	6.55	6.54
24.00	DISCHG	.84	.83	.81	.79	.76	.73	.71	.69	.67	.65
24.00	ELEV	6.54	6.54	6.53	6.52	6.50	6.49	6.48	6.46	6.45	6.44
25.00	DISCHG	.63	.62	.60	.58	.56	.55	.53	.52	.50	.49
25.00	ELEV	6.42	6.41	6.40	6.39	6.38	6.36	6.35	6.34	6.33	6.32
26.00	DISCHG	.47	.46	.45	.43	.42	.41	.40	.38	.37	.36

1

TR20 XEQ 06-12-01 15:12 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 2 JOB 1 PASS 3
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 9

26.00	ELEV	6.31	6.31	6.30	6.29	6.28	6.27	6.26	6.26	6.25	6.24
27.00	DISCHG	.35	.34	.33	.32	.31	.30	.29	.29	.28	.27
27.00	ELEV	6.23	6.23	6.22	6.21	6.21	6.20	6.20	6.19	6.18	6.18
28.00	DISCHG	.26	.25	.25	.24	.23	.23	.22	.21	.21	.20
28.00	ELEV	6.17	6.17	6.16	6.16	6.15	6.15	6.15	6.14	6.14	6.13
29.00	DISCHG	.19	.19	.18	.18	.17	.17	.16	.16	.15	.15
29.00	ELEV	6.13	6.13	6.12	6.12	6.12	6.11	6.11	6.11	6.10	6.10

RUNOFF VOLUME ABOVE BASEFLOW = 2.92 WATERSHED INCHES, 34.65 CFS-HRS, 2.86 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCNP RECORD ID

+ COMPUTATIONS COMPLETED FOR PASS 3

1

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID
+ FROM XSECTION 1
+ TO STRUCTURE 1
STARTING TIME = .00 RAIN DEPTH = 4.01 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.=25 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 4
AREA= .02 SQ MI INPUT RUNOFF CURVE= 94. TIME OF CONCENTRATION= .29 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0381 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET) (RUNOFF)
10.00	17.86	

TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS				TIME INCREMENT = .10 HOURS				DRAINAGE AREA = .02 SQ.MI.	
2.00	DISCHG	.00	.02	.03	.05	.07	.09	.11	.13	.15	.17
3.00	DISCHG	.19	.21	.22	.24	.25	.27	.29	.31	.34	.35
4.00	DISCHG	.37	.39	.40	.41	.43	.44	.46	.49	.51	.53
5.00	DISCHG	.55	.57	.60	.62	.64	.66	.68	.71	.74	.76
6.00	DISCHG	.78	.79	.80	.81	.83	.84	.86	.92	.96	.99
7.00	DISCHG	1.01	1.04	1.10	1.15	1.18	1.20	1.24	1.30	1.35	1.38
8.00	DISCHG	1.40	1.46	1.61	1.73	1.79	1.83	1.95	2.24	2.48	2.60
9.00	DISCHG	2.67	2.85	3.28	3.64	3.81	3.93	5.66	10.63	14.88	16.88
10.00	DISCHG	17.86	16.83	12.52	8.88	7.30	6.61	6.03	5.04	4.28	3.94
11.00	DISCHG	3.81	3.65	3.30	3.03	2.91	2.86	2.79	2.66	2.55	2.50
12.00	DISCHG	2.48	2.44	2.34	2.26	2.22	2.21	2.18	2.11	2.06	2.04
13.00	DISCHG	2.03	2.00	1.93	1.88	1.86	1.85	1.82	1.75	1.70	1.67
14.00	DISCHG	1.66	1.65	1.61	1.59	1.58	1.57	1.56	1.52	1.50	1.49
15.00	DISCHG	1.48	1.48	1.48	1.48	1.48	1.48	1.47	1.43	1.41	1.40
16.00	DISCHG	1.39	1.38	1.34	1.32	1.30	1.30	1.29	1.25	1.22	1.21
17.00	DISCHG	1.21	1.21	1.21	1.20	1.20	1.20	1.19	1.16	1.13	1.12
18.00	DISCHG	1.12	1.10	1.07	1.04	1.03	1.02	1.03	1.07	1.09	1.11
19.00	DISCHG	1.11	1.10	1.07	1.04	1.03	1.03	1.01	.98	.95	.94
20.00	DISCHG	.93	.93	.93	.93	.93	.93	.93	.93	.93	.93
21.00	DISCHG	.93	.93	.93	.93	.93	.93	.92	.89	.86	.85
22.00	DISCHG	.84	.84	.84	.84	.84	.84	.84	.84	.84	.84
23.00	DISCHG	.84	.84	.84	.84	.84	.84	.83	.79	.77	.75
24.00	DISCHG	.75	.66	.39	.17	.07	.03	.01	.00		

RUNOFF VOLUME ABOVE BASEFLOW = 3.33 WATERSHED INCHES, 39.57 CFS-HRS, 3.27 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 1
INPUT HYDROGRAPH= 4 OUTPUT HYDROGRAPH= 5
SURFACE ELEVATION= 6.00

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
10.31	9.29	8.48

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .02 SQ.MI.
1

2.00	DISCHG	.00	.00	.00	.00	.00	.01	.01	.01	.02	.02
2.00	ELEV	5.00	5.00	5.00	5.00	5.00	6.00	6.01	6.01	6.01	6.01
3.00	DISCHG	.03	.03	.04	.04	.05	.05	.06	.07	.07	.08
3.00	ELEV	6.02	6.02	6.02	6.03	6.03	6.04	6.04	6.04	6.05	6.05
4.00	DISCHG	.09	.10	.11	.12	.12	.13	.14	.15	.16	.17
4.00	ELEV	6.06	6.07	6.07	6.08	6.08	6.09	6.10	6.10	6.11	6.12
5.00	DISCHG	.18	.19	.21	.22	.23	.24	.25	.27	.28	.29
5.00	ELEV	6.12	6.13	6.14	6.15	6.15	6.16	6.17	6.18	6.19	6.20
6.00	DISCHG	.31	.32	.34	.35	.36	.38	.39	.41	.42	.44
6.00	ELEV	6.21	6.21	6.22	6.23	6.24	6.25	6.26	6.27	6.28	6.29
7.00	DISCHG	.45	.47	.49	.51	.53	.54	.56	.58	.61	.63
7.00	ELEV	6.30	6.31	6.33	6.34	6.35	6.36	6.38	6.39	6.40	6.42
8.00	DISCHG	.65	.67	.70	.73	.76	.81	.86	.91	.97	1.04
8.00	ELEV	6.43	6.45	6.47	6.48	6.50	6.53	6.55	6.57	6.60	6.63
9.00	DISCHG	1.11	1.19	1.27	1.35	1.42	1.50	1.60	1.80	2.15	2.51
9.00	ELEV	6.67	6.70	6.74	6.78	6.83	6.88	6.95	7.11	7.40	7.78
10.00	DISCHG	4.25	7.24	8.89	9.29	9.02	8.57	8.07	7.51	6.88	6.27
10.00	ELEV	8.11	8.33	8.45	8.48	8.46	8.43	8.39	8.35	8.30	8.25
11.00	DISCHG	5.71	5.25	4.84	4.45	4.11	3.82	3.59	3.39	3.21	3.05

11.00	ELEV	8.21	8.18	8.15	8.12	8.10	8.08	8.06	8.05	8.04	8.02
12.00	DISCHG	2.92	2.81	2.71	2.70	2.69	2.68	2.67	2.65	2.64	2.62
12.00	ELEV	8.01	8.01	8.00	7.99	7.98	7.96	7.95	7.94	7.92	7.90
13.00	DISCHG	2.61	2.60	2.58	2.56	2.55	2.53	2.51	2.49	2.48	2.46
13.00	ELEV	7.89	7.87	7.86	7.84	7.82	7.80	7.78	7.76	7.74	7.72
14.00	DISCHG	2.44	2.42	2.40	2.38	2.36	2.34	2.32	2.30	2.28	2.26
14.00	ELEV	7.70	7.68	7.65	7.63	7.61	7.59	7.57	7.55	7.53	7.50
15.00	DISCHG	2.24	2.22	2.19	2.17	2.15	2.13	2.11	2.09	2.07	2.04
15.00	ELEV	7.48	7.46	7.44	7.42	7.40	7.39	7.37	7.35	7.33	7.31
16.00	DISCHG	2.02	2.00	1.98	1.96	1.94	1.92	1.90	1.88	1.86	1.84
16.00	ELEV	7.30	7.28	7.26	7.24	7.23	7.21	7.19	7.17	7.16	7.14
17.00	DISCHG	1.82	1.80	1.78	1.77	1.75	1.73	1.71	1.70	1.68	1.66
17.00	ELEV	7.12	7.11	7.09	7.07	7.06	7.04	7.03	7.02	7.00	6.99
18.00	DISCHG	1.65	1.63	1.61	1.60	1.58	1.56	1.54	1.53	1.52	1.50
18.00	ELEV	6.98	6.97	6.96	6.94	6.93	6.92	6.91	6.90	6.89	6.88
19.00	DISCHG	1.49	1.48	1.47	1.45	1.44	1.43	1.42	1.40	1.39	1.38
19.00	ELEV	6.88	6.87	6.86	6.85	6.84	6.83	6.83	6.82	6.81	6.80
20.00	DISCHG	1.36	1.35	1.34	1.32	1.31	1.30	1.28	1.27	1.25	1.24
20.00	ELEV	6.79	6.78	6.77	6.77	6.76	6.75	6.74	6.73	6.73	6.72
21.00	DISCHG	1.22	1.21	1.20	1.19	1.17	1.16	1.15	1.14	1.13	1.12
21.00	ELEV	6.72	6.71	6.70	6.70	6.69	6.69	6.68	6.68	6.67	6.67
22.00	DISCHG	1.11	1.09	1.08	1.07	1.06	1.05	1.04	1.03	1.02	1.02
22.00	ELEV	6.66	6.66	6.65	6.65	6.64	6.64	6.63	6.63	6.62	6.62
23.00	DISCHG	1.01	1.00	.99	.99	.98	.97	.97	.96	.95	.94
23.00	ELEV	6.62	6.61	6.61	6.61	6.60	6.60	6.60	6.60	6.59	6.59
24.00	DISCHG	.94	.92	.91	.88	.85	.81	.77	.74	.72	.70
24.00	ELEV	6.58	6.58	6.57	6.56	6.54	6.53	6.51	6.50	6.48	6.47
25.00	DISCHG	.68	.66	.64	.62	.61	.59	.57	.55	.54	.52
25.00	ELEV	6.45	6.44	6.43	6.42	6.40	6.39	6.38	6.37	6.36	6.35
26.00	DISCHG	.51	.49	.48	.46	.45	.44	.42	.41	.40	.39

1

TR20 XEQ 06-12-01 15:12 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 2 JOB 1 PASS 4
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 12

26.00	ELEV	6.34	6.33	6.32	6.31	6.30	6.29	6.28	6.27	6.27	6.26
27.00	DISCHG	.38	.37	.36	.35	.34	.33	.32	.31	.30	.29
27.00	ELEV	6.25	6.24	6.24	6.23	6.22	6.22	6.21	6.20	6.20	6.19
28.00	DISCHG	.28	.27	.26	.26	.25	.24	.24	.23	.22	.22
28.00	ELEV	6.19	6.18	6.18	6.17	6.17	6.16	6.16	6.15	6.15	6.14
29.00	DISCHG	.21	.20	.20	.19	.19	.18	.18	.17	.17	.16
29.00	ELEV	6.14	6.14	6.13	6.13	6.12	6.12	6.12	6.11	6.11	6.11

RUNOFF VOLUME ABOVE BASEFLOW = 3.29 WATERSHED INCHES, 39.02 CFS-HRS, 3.22 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
\+ COMPUTATIONS COMPLETED FOR PASS 4

1

TR20 XEQ 06-12-01 15:12 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 2 JOB 1 PASS 5
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 13

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID
\+ FROM XSECTION 1
\+ TO STRUCTURE 1
STARTING TIME = .00 RAIN DEPTH = 6.50 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.=50 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 6
AREA= .02 SQ MI INPUT RUNOFF CURVE= 94. TIME OF CONCENTRATION= .29 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0381 HOURS

PEAK TIME(HRS) PEAK DISCHARGE(CFS) PEAK ELEVATION(FEET)
10.00 20.35 (RUNOFF)

TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS				TIME INCREMENT = .10 HOURS			DRAINAGE AREA =		.02 SQ.MI.
1.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.02
2.00	DISCHG	.04	.06	.08	.11	.14	.16	.18	.21	.23	.25
3.00	DISCHG	.27	.29	.31	.32	.34	.36	.38	.41	.44	.46
4.00	DISCHG	.48	.50	.51	.53	.54	.56	.58	.61	.64	.66
5.00	DISCHG	.68	.70	.74	.77	.79	.81	.83	.87	.90	.92
6.00	DISCHG	.94	.95	.97	.98	.99	1.00	1.03	1.10	1.15	1.18

7.00	DISCHG	1.20	1.24	1.31	1.36	1.40	1.42	1.46	1.53	1.59	1.62
8.00	DISCHG	1.65	1.72	1.88	2.02	2.09	2.13	2.27	2.60	2.88	3.02
9.00	DISCHG	3.09	3.30	3.79	4.20	4.40	4.53	6.51	12.19	17.02	19.27
10.00	DISCHG	20.35	19.15	14.23	10.08	8.28	7.49	6.83	5.71	4 85	4.47
11.00	DISCHG	4.31	4.13	3.74	3.43	3.29	3.23	3.16	3.00	2.88	2.83
12.00	DISCHG	2.80	2.76	2.64	2.55	2.51	2.50	2.46	2.39	2.33	2.30
13.00	DISCHG	2.29	2.26	2.18	2.12	2.10	2.08	2.05	1.98	1.92	1.89
14.00	DISCHG	1.88	1.86	1.82	1.79	1.78	1.77	1.76	1.72	1.69	1.68
15.00	DISCHG	1.67	1.67	1.67	1.67	1.67	1.67	1.66	1.62	1.59	1.57
16.00	DISCHG	1.57	1.55	1.52	1.48	1.47	1.47	1.45	1.41	1.38	1.37
17.00	DISCHG	1.36	1.36	1.36	1.36	1.36	1.36	1.35	1.31	1.28	1.26
18.00	DISCHG	1.26	1.24	1.21	1.17	1.16	1.16	1.17	1.20	1.23	1.25
19.00	DISCHG	1.25	1.24	1.21	1.18	1.16	1.16	1.14	1.10	1.07	1.06
20.00	DISCHG	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
21.00	DISCHG	1.05	1.05	1.05	1.05	1.05	1.05	1.04	1.00	.97	.95
22.00	DISCHG	.95	.95	.94	.94	.94	.94	.94	.94	.94	.94
23.00	DISCHG	.94	.94	.94	.94	.95	.94	.93	.89	.86	.85
24.00	DISCHG	.84	.74	.44	.19	.08	.03	.01	.01	.00	

RUNOFF VOLUME ABOVE BASEFLOW = 3.81 WATERSHED INCHES, 45.29 CFS-HRS, 3.74 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 1
INPUT HYDROGRAPH= 4 OUTPUT HYDROGRAPH= 5
SURFACE ELEVATION= 6.00

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
10.33	9.89	8.72

1

TR20 XEQ 06-12-01 15:12 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 2 JOB 1 PASS 5
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 14

TIME(HRS)		FIRST HYDROGRAPH POINT =	.00 HOURS			TIME INCREMENT =	.10 HOURS		DRAINAGE AREA =	.02 SQ.MI.	
2.00	DISCHG	.00	.00	.00	.01	.01	.01	.02	.02	.03	.04
2.00	ELEV	5.00	5.00	5.00	6.00	6.01	6.01	6.01	6.02	6.02	6.02
3.00	DISCHG	.04	.05	.06	.06	.07	.08	.09	.10	.11	.12
3.00	ELEV	6.03	6.03	6.04	6.04	6.05	6.05	6.06	6.06	6.07	6.08
4.00	DISCHG	.13	.14	.15	.16	.17	.18	.19	.20	.22	.23
4.00	ELEV	6.08	6.09	6.10	6.11	6.11	6.12	6.13	6.14	6.14	6.15
5.00	DISCHG	.24	.25	.27	.28	.30	.31	.33	.34	.36	.37
5.00	ELEV	6.16	6.17	6.18	6.19	6.20	6.21	6.22	6.23	6.24	6.25
6.00	DISCHG	.39	.40	.42	.44	.45	.47	.48	.50	.52	.54
6.00	ELEV	6.26	6.27	6.28	6.29	6.30	6.31	6.32	6.33	6.35	6.36
7.00	DISCHG	.56	.58	.60	.62	.64	.66	.69	.71	.73	.76
7.00	ELEV	6.37	6.38	6.40	6.41	6.43	6.44	6.46	6.47	6.49	6.51
8.00	DISCHG	.80	.84	.88	.93	.98	1.03	1.08	1.14	1.22	1.29
8.00	ELEV	6.52	6.54	6.56	6.58	6.61	6.63	6.65	6.68	6.71	6.75
9.00	DISCHG	1.35	1.41	1.47	1.55	1.64	1.72	1.84	2.08	2.43	3.67
9.00	ELEV	6.78	6.82	6.86	6.91	6.97	7.04	7.14	7.34	7.68	8.07
10.00	DISCHG	7.36	9.60	9.81	9.89	9.86	9.80	9.72	9.62	9.28	8.26
10.00	ELEV	8.34	8.55	8.68	8.72	8.71	8.67	8.62	8.56	8.48	8.40
11.00	DISCHG	7.40	6.70	6.08	5.50	5.00	4.60	4.27	3.99	3.75	3.54
11.00	ELEV	8.34	8.29	8.24	8.20	8.16	8.13	8.11	8.09	8.07	8.06
12.00	DISCHG	3.37	3.24	3.11	2.99	2.88	2.80	2.72	2.70	2.70	2.69
12.00	ELEV	8.05	8.04	8.03	8.02	8.01	8.01	8.00	7.99	7.98	7.97
13.00	DISCHG	2.68	2.67	2.66	2.64	2.63	2.62	2.60	2.59	2.57	2.56
13.00	ELEV	7.96	7.95	7.94	7.93	7.91	7.90	7.88	7.87	7.85	7.83
14.00	DISCHG	2.54	2.52	2.51	2.49	2.47	2.46	2.44	2.42	2.40	2.39
14.00	ELEV	7.81	7.79	7.78	7.76	7.74	7.72	7.70	7.68	7.66	7.64
15.00	DISCHG	2.37	2.35	2.34	2.32	2.30	2.29	2.27	2.26	2.24	2.21
15.00	ELEV	7.62	7.60	7.58	7.57	7.55	7.53	7.51	7.50	7.48	7.46
16.00	DISCHG	2.19	2.17	2.15	2.13	2.11	2.09	2.07	2.05	2.03	2.01
16.00	ELEV	7.44	7.43	7.41	7.39	7.37	7.36	7.34	7.32	7.30	7.29
17.00	DISCHG	1.99	1.97	1.95	1.93	1.92	1.90	1.88	1.86	1.85	1.83
17.00	ELEV	7.27	7.25	7.23	7.22	7.20	7.19	7.17	7.16	7.14	7.13
18.00	DISCHG	1.81	1.79	1.77	1.76	1.74	1.72	1.70	1.69	1.67	1.66
18.00	ELEV	7.11	7.10	7.08	7.07	7.05	7.03	7.02	7.00	6.99	6.99
19.00	DISCHG	1.64	1.63	1.62	1.61	1.59	1.58	1.57	1.55	1.54	1.52
19.00	ELEV	6.98	6.97	6.96	6.95	6.94	6.93	6.93	6.92	6.91	6.90
20.00	DISCHG	1.51	1.49	1.48	1.47	1.45	1.44	1.43	1.42	1.41	1.40
20.00	ELEV	6.89	6.88	6.87	6.86	6.85	6.84	6.84	6.83	6.82	6.81
21.00	DISCHG	1.38	1.37	1.36	1.35	1.35	1.34	1.33	1.32	1.31	1.29
21.00	ELEV	6.81	6.80	6.79	6.79	6.78	6.77	6.77	6.76	6.75	6.75
22.00	DISCHG	1.28	1.26	1.25	1.24	1.22	1.21	1.20	1.19	1.18	1.17
22.00	ELEV	6.74	6.73	6.73	6.72	6.72	6.71	6.70	6.70	6.69	6.69
23.00	DISCHG	1.16	1.15	1.14	1.13	1.12	1.11	1.11	1.10	1.09	1.08
23.00	ELEV	6.69	6.68	6.68	6.67	6.67	6.67	6.66	6.66	6.65	6.65
24.00	DISCHG	1.07	1.05	1.03	1.00	.96	.92	.88	.84	.81	.77
24.00	ELEV	6.64	6.64	6.63	6.61	6.60	6.58	6.56	6.54	6.53	6.51
25.00	DISCHG	.74	.72	.70	.68	.66	.64	.62	.60	.59	.57

1

TR20 XEQ 06-12-01 15:12 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 2 JOB 1 PASS 5
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 15

25.00	ELEV	6.49	6.48	6.47	6.45	6.44	6.43	6.41	6.40	6.39	6.38
26.00	DISCHG	.55	.54	.52	.51	.49	.48	.46	.45	.44	.42
26.00	ELEV	6.37	6.36	6.35	6.34	6.33	6.32	6.31	6.30	6.29	6.28
27.00	DISCHG	.41	.40	.39	.38	.37	.35	.34	.33	.32	.31
27.00	ELEV	6.27	6.27	6.26	6.25	6.24	6.24	6.23	6.22	6.22	6.21
28.00	DISCHG	.31	.30	.29	.28	.27	.26	.26	.25	24	.23
28.00	ELEV	6.20	6.20	6.19	6.19	6.18	6.18	6.17	6.17	6.16	6.16
29.00	DISCHG	.23	.22	.21	.21	.20	.20	.19	.19	.18	.17
29.00	ELEV	6.15	6.15	6.14	6.14	6.13	6.13	6.13	6.12	6.12	6.12

RUNOFF VOLUME ABOVE BASEFLOW = 3.76 WATERSHED INCHES, 44.67 CFS-HRS, 3.69 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
\+ COMPUTATIONS COMPLETED FOR PASS 5

1

TR20 XEQ 06-12-01 15:12 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 2 JOB 1 PASS 6
REV PC 09/83(.2) 2-, 10-, 15-, 25-, 50-, & 100-YEAR, 24-HOUR STORMS PAGE 16

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID
\+ FROM XSECTION 1
\+ TO STRUCTURE 1
STARTING TIME = .00 RAIN DEPTH = 4.98 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.=99 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 4
AREA= .02 SQ MI INPUT RUNOFF CURVE= 94. TIME OF CONCENTRATION= .29 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0381 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
10.00	22.78	(RUNOFF)
23.36	1.05	(RUNOFF)

TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS				TIME INCREMENT = .10 HOURS			DRAINAGE AREA =		.02 SQ.MI.
1.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.01	.03	.06
2.00	DISCHG	.08	.11	.14	.17	.20	.23	.26	.28	.31	.33
3.00	DISCHG	.35	.37	.39	.41	.43	.45	.47	.51	.54	.57
4.00	DISCHG	.59	.61	.62	.64	.66	.67	.70	.73	.77	.79
5.00	DISCHG	.81	.83	.87	.91	.93	.95	.98	1.02	1.06	1.08
6.00	DISCHG	1.10	1.12	1.13	1.14	1.16	1.17	1.20	1.27	1.33	1.37
7.00	DISCHG	1.39	1.43	1.51	1.57	1.61	1.64	1.68	1.76	1.82	1.86
8.00	DISCHG	1.89	1.96	2.15	2.31	2.39	2.43	2.58	2.96	3.28	3.43
9.00	DISCHG	3.51	3.74	4.29	4.75	4.97	5.12	7.33	13.71	19.12	21 60
10.00	DISCHG	22.77	21.41	15.89	11.26	9.24	8.35	7.62	6.36	5.40	4.98
11.00	DISCHG	4.80	4.60	4.16	3.81	3.66	3.60	3.52	3.34	3.21	3.14
12.00	DISCHG	3.12	3.07	2.94	2.84	2.79	2.78	2 74	2.66	2.59	2.56
13.00	DISCHG	2.55	2.51	2.43	2.36	2.33	2.32	2.28	2.20	2.13	2.10
14.00	DISCHG	2.09	2.07	2.03	1.99	1.98	1.97	1.95	1.91	1.88	1.86
15.00	DISCHG	1.86	1.85	1.85	1.85	1.85	1.85	1.84	1.80	1.76	1.75
16.00	DISCHG	1.74	1.73	1.68	1.65	1.63	1.63	1.61	1.57	1.53	1.52
17.00	DISCHG	1.51	1.51	1.51	1.51	1.51	1.51	1.49	1.45	1.42	1.40
18.00	DISCHG	1.40	1.38	1.34	1.30	1.29	1.28	1.29	1.34	1.37	1 38
19.00	DISCHG	1.39	1.38	1.34	1.30	1.29	1.28	1.27	1.22	1.19	1.17
20.00	DISCHG	1.17	1.17	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1 16
21.00	DISCHG	1.16	1.16	1.16	1.16	1.16	1.16	1.15	1.11	1.07	1.06
22.00	DISCHG	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
23.00	DISCHG	1.05	1.05	1.05	1.05	1.05	1.05	1.03	.99	.96	.94
24.00	DISCHG	.93	.82	.48	.21	.09	.04	.02	.01	.00	

RUNOFF VOLUME ABOVE BASEFLOW = 4.29 WATERSHED INCHES, 50.90 CFS-HRS, 4.21 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 1
INPUT HYDROGRAPH= 4 OUTPUT HYDROGRAPH= 5
SURFACE ELEVATION= 6.00

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)

10.35 10.34 9.00

1

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TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .02 SQ.MI.

2.00	DISCHG	.00	.01	.01	.01	.02	.03	.03	.04	.05	.05
2.00	ELEV	5.00	6.00	6.01	6.01	6.01	6.02	6.02	6.03	6.03	6.04
3.00	DISCHG	.06	.07	.08	.09	.10	.11	.12	.13	.14	.15
3.00	ELEV	6.04	6.05	6.05	6.06	6.07	6.07	6.08	6.09	6.09	6.10
4.00	DISCHG	.17	.18	.19	.20	.22	.23	.24	.26	.27	.29
4.00	ELEV	6.11	6.12	6.13	6.14	6.14	6.15	6.16	6.17	6.18	6.19
5.00	DISCHG	.30	.32	.33	.35	.37	.38	.40	.42	.43	.45
5.00	ELEV	6.20	6.21	6.22	6.23	6.24	6.25	6.27	6.28	6.29	6.30
6.00	DISCHG	.47	.49	.51	.53	.54	.56	.58	.60	.62	.64
6.00	ELEV	6.31	6.33	6.34	6.35	6.36	6.38	6.39	6.40	6.41	6.43
7.00	DISCHG	.66	.68	.71	.73	.76	.80	.84	.88	.92	.96
7.00	ELEV	6.44	6.46	6.47	6.49	6.50	6.52	6.54	6.56	6.58	6.59
8.00	DISCHG	1.00	1.04	1.09	1.14	1.19	1.24	1.30	1.35	1.40	1.46
8.00	ELEV	6.61	6.63	6.65	6.68	6.70	6.72	6.75	6.78	6.82	6.86
9.00	DISCHG	1.52	1.59	1.66	1.75	1.85	1.95	2.09	2.33	2.68	6.48
9.00	ELEV	6.90	6.94	6.99	7.06	7.15	7.23	7.35	7.58	7.96	8.27
10.00	DISCHG	9.58	9.96	10.22	10.32	10.32	10.28	10.21	10.11	9.98	9.83
10.00	ELEV	8.54	8.77	8.93	8.99	8.99	8.96	8.92	8.86	8.78	8.69
11.00	DISCHG	9.68	9.53	8.48	7.49	6.66	5.98	5.41	4.95	4.56	4.24
11.00	ELEV	8.60	8.51	8.42	8.35	8.28	8.23	8.19	8.16	8.13	8.11
12.00	DISCHG	3.98	3.78	3.60	3.43	3.29	3.17	3.08	2.99	2.90	2.83
12.00	ELEV	8.09	8.08	8.06	8.05	8.04	8.03	8.03	8.02	8.01	8.01
13.00	DISCHG	2.76	2.71	2.70	2.70	2.69	2.68	2.67	2.66	2.65	2.63
13.00	ELEV	8.00	8.00	7.99	7.98	7.98	7.97	7.96	7.94	7.93	7.92
14.00	DISCHG	2.62	2.61	2.59	2.58	2.56	2.55	2.54	2.52	2.51	2.49
14.00	ELEV	7.90	7.89	7.87	7.85	7.84	7.82	7.81	7.79	7.77	7.76
15.00	DISCHG	2.47	2.46	2.44	2.43	2.42	2.40	2.39	2.37	2.36	2.35
15.00	ELEV	7.74	7.72	7.71	7.69	7.67	7.66	7.64	7.63	7.61	7.59
16.00	DISCHG	2.33	2.32	2.30	2.29	2.27	2.25	2.23	2.21	2.19	2.17
16.00	ELEV	7.58	7.56	7.55	7.53	7.51	7.49	7.48	7.46	7.44	7.42
17.00	DISCHG	2.15	2.13	2.11	2.09	2.07	2.06	2.04	2.02	2.00	1.98
17.00	ELEV	7.41	7.39	7.37	7.35	7.34	7.32	7.31	7.29	7.28	7.26
18.00	DISCHG	1.97	1.95	1.93	1.91	1.89	1.87	1.85	1.84	1.82	1.81
18.00	ELEV	7.25	7.23	7.21	7.20	7.18	7.16	7.15	7.13	7.12	7.11
19.00	DISCHG	1.79	1.78	1.77	1.75	1.74	1.72	1.71	1.70	1.68	1.67
19.00	ELEV	7.10	7.09	7.08	7.06	7.05	7.04	7.03	7.01	7.00	6.99
20.00	DISCHG	1.65	1.63	1.62	1.61	1.59	1.58	1.57	1.55	1.54	1.53
20.00	ELEV	6.98	6.97	6.96	6.95	6.94	6.93	6.93	6.92	6.91	6.90
21.00	DISCHG	1.52	1.51	1.50	1.49	1.48	1.47	1.46	1.45	1.44	1.43
21.00	ELEV	6.89	6.89	6.88	6.87	6.87	6.86	6.85	6.85	6.84	6.83
22.00	DISCHG	1.41	1.40	1.39	1.38	1.37	1.36	1.35	1.34	1.33	1.32
22.00	ELEV	6.82	6.82	6.81	6.80	6.80	6.79	6.78	6.78	6.77	6.77
23.00	DISCHG	1.32	1.31	1.30	1.29	1.28	1.27	1.26	1.25	1.23	1.22
23.00	ELEV	6.76	6.75	6.75	6.74	6.74	6.73	6.73	6.73	6.72	6.71
24.00	DISCHG	1.21	1.19	1.17	1.13	1.09	1.04	1.00	.95	.91	.87
24.00	ELEV	6.71	6.70	6.69	6.67	6.65	6.63	6.61	6.59	6.57	6.56
25.00	DISCHG	.83	.80	.76	.73	.71	.69	.67	.65	.63	.62

1

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25.00	ELEV	6.54	6.52	6.50	6.49	6.48	6.46	6.45	6.44	6.42	6.41
26.00	DISCHG	.60	.58	.56	.55	.53	.52	.50	.49	.47	.46
26.00	ELEV	6.40	6.39	6.38	6.36	6.35	6.34	6.33	6.32	6.31	6.31
27.00	DISCHG	.44	.43	.42	.41	.40	.38	.37	.36	.35	.34
27.00	ELEV	6.30	6.29	6.28	6.27	6.26	6.26	6.25	6.24	6.23	6.23
28.00	DISCHG	.33	.32	.31	.30	.29	.29	.28	.27	.26	.25
28.00	ELEV	6.22	6.21	6.21	6.20	6.20	6.19	6.18	6.18	6.17	6.17
29.00	DISCHG	.25	.24	.23	.23	.22	.21	.21	.20	.19	.19
29.00	ELEV	6.16	6.16	6.15	6.15	6.15	6.14	6.14	6.13	6.13	6.13

RUNOFF VOLUME ABOVE BASEFLOW = 4.23 WATERSHED INCHES, 50.26 CFS-HRS, 4.15 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID

\+ COMPUTATIONS COMPLETED FOR PASS 6

EXECUTIVE CONTROL OPERATION ENDJOB RECORD ID
1

TR20 XEQ 06-12-01 15:12 RCEC POST-DEVELOPMENT RUNOFF ANALYSIS, CASE 2 JOB 1 SUMMARY
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SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 2													
XSECTION 1	RUNOFF	.02	1	2	.10	.0	1.98	24.00	1.38	---	10.01	7.46	405.6
STRUCTURE 1	RESVOR	.02	1	2	.10	.0	1.98	24.00	1.35	7.11	10.87	1.80	98.0
ALTERNATE 1 STORM 10													
XSECTION 1	RUNOFF	.02	1	2	.10	.0	3.34	24.00	2.68	---	10.00	14.44	784.8
STRUCTURE 1	RESVOR	.02	1	2	.10	.0	3.34	24.00	2.64	8.22	10.44	5.79	314.6
ALTERNATE 1 STORM 15													
XSECTION 1	RUNOFF	.02	1	2	.10	.0	3.63	24.00	2.96	---	10.00	15.92	865.4
STRUCTURE 1	RESVOR	.02	1	2	.10	.0	3.63	24.00	2.92	8.34	10.35	7.34	398.7
ALTERNATE 1 STORM 25													
XSECTION 1	RUNOFF	.02	1	2	.10	.0	4.01	24.00	3.33	---	10.00	17.86	970.6
STRUCTURE 1	RESVOR	.02	1	2	.10	.0	4.01	24.00	3.29	8.48	10.31	9.29	505.0
ALTERNATE 1 STORM 50													
XSECTION 1	RUNOFF	.02	1	2	.10	.0	4.50	24.00	3.81	---	10.00	20.35	1105.9
STRUCTURE 1	RESVOR	.02	1	2	.10	.0	4.50	24.00	3.76	8.72	10.33	9.89	537.4
ALTERNATE 1 STORM 99													
XSECTION 1	RUNOFF	.02	1	2	.10	.0	4.98	24.00	4.29	---	10.00	22.78	1237.8
STRUCTURE 1	RESVOR	.02	1	2	.10	.0	4.98	24.00	4.23	9.00	10.35	10.34	561.8

1

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SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS 2	10	15	25	50	99
0 STRUCTURE 1	.02						
ALTERNATE 1		1.80	5.79	7.34	9.29	9.89	10.34
0 XSECTION 1	.02						
ALTERNATE 1		7.46	14.44	15.92	17.86	20.35	22.78

1END OF 1 JOBS IN THIS RUN

FEMA FLOOD ZONE MAP

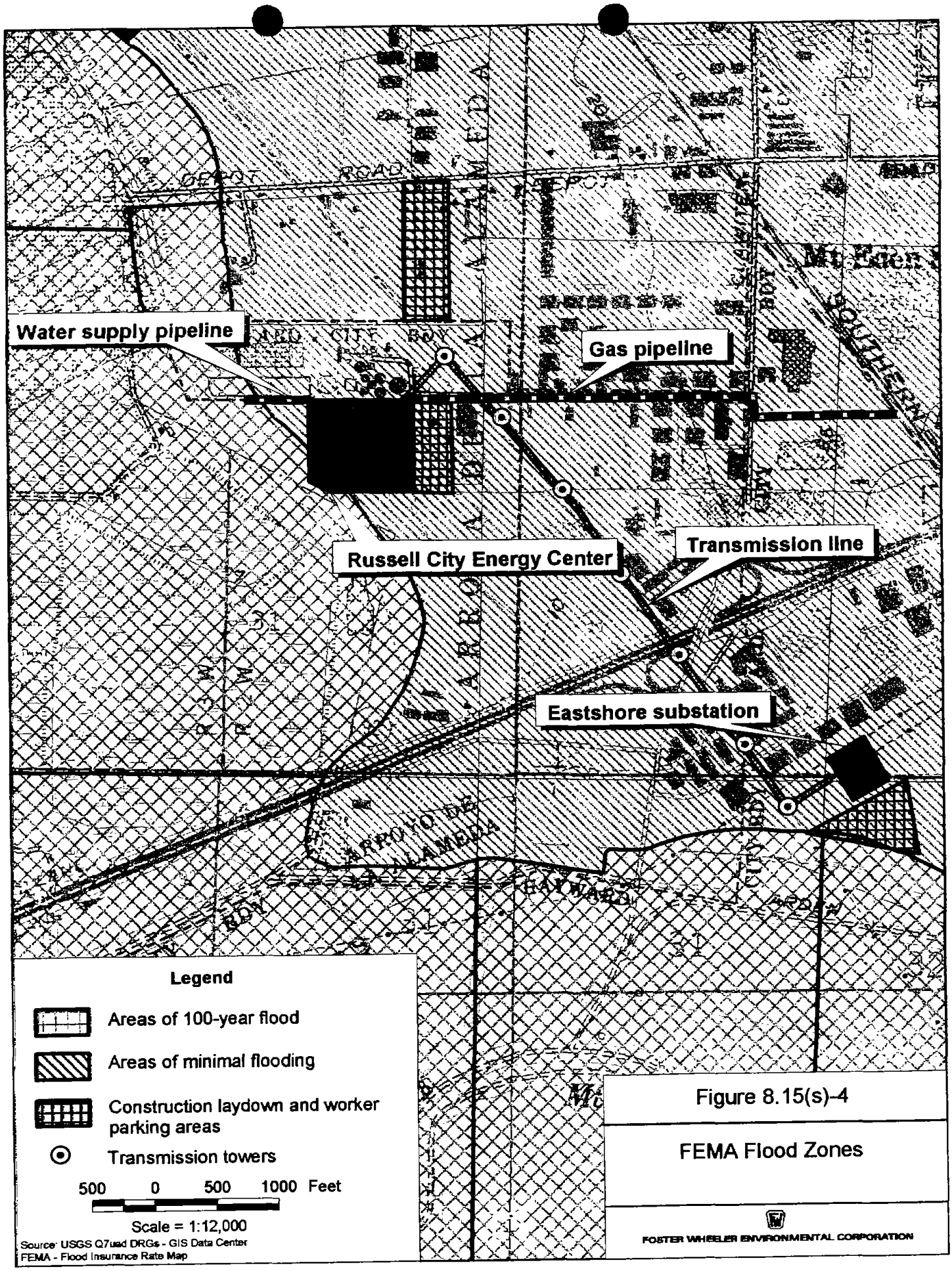


Figure 8.15(s)-4

FEMA Flood Zones

FOSTER WHEELER ENVIRONMENTAL CORPORATION

CITY SANITARY WASTEWATER

"WILL SERVE" LETTER

8.15 SOIL AND WATER RESOURCES

1. Will Serve letters (6-month processes [Appendix B (g)(14)(A)(i), §2022(b)(1)(A)]):

Substantial evidence that the project as proposed in the application will comply with all standards, ordinances, and laws applicable at the time of certification including; A list of such standards, ordinances, and laws.

Information required to make AFC conform with regulations:

Please provide LORS information pertaining to the proposed backup water supply from the Union Sanitary District (USD) wastewater treatment plant.

The "will serve" letter from the City of Hayward (Appendix 7A) does not indicate whether the City will accept sanitary wastewater. Please provide clarification regarding the aforementioned issue.

Response— See response under Water Resources, Item #10.

2. NPDES Permit/backup water supply (6-month processes [Appendix B (g)(14)(A)(i), §2022(b)(1)(B)]):

Information demonstrating that the project as proposed in the application will comply with all such standards, ordinances, and laws;

Information required to make AFC conform with regulations:

According to the SFBRWQCB, any effluent discharged beyond the headworks of a waste treatment facility is treated as a separate discharge. Because this will be the case for the RCEC project, the applicant needs to submit a complete Report of Waste Discharge (ROWD) in order for the RWQCB to issue WDRs in the form of an NPDES permit. Please provide a complete ROWD that would enable the RWQCB to initiate the permit review process. Energy Commission staff has requested a letter from the SFBRWQCB regarding the status of an ROWD submission by the Applicant.

As per Appendix B (g) (14) (A) (i), the RCEC would be treated as a separate discharge and will be handled by an NPDES permit for wastewater discharge. Provide a discussion on the aforementioned permit regarding applicability and conformance issues.

Please provide LORS information pertaining to the proposed backup water supply from the Union Sanitary District (USD) wastewater treatment plant

Response— See responses under Water Resources, Items #1, #2, and #5.

3. Changes in LORS (6-month processes [Appendix B (g)(14)(A)(i), §2022(b)(1)(C)]):

Where a standard, ordinance, or law is expected to change between the time of filing an application and certification, information from the responsible jurisdiction documenting the impending change, the schedule for enactment of the change, and whether the proposed project will comply with the changed standard, ordinance, or law.

Response—According to Ms. Gayle Tupper, Senior Source Control Inspector, City of Hayward Deptment of Public Works (510)881-7993, a local limit study is currently being performed to determine

if discharge limits (for discharges to the City's WPCF) need to be ammended. There is no information available yet as to whether there will be any changes.

Ms. Tupper is not aware of any regulatory changes that will affect EBDA discharge to the Bay. The current permit is applicable for 5 years, and therefore will not change prior to RCEC operation.

4. NPDES permit (6-month processes [Appendix B (g)(14)(A)(i), §2022(b)(2)(E)]):

If the project will result in a discharge of waste that could affect the water quality of the state, a complete report of proposed waste discharge as required by section 13260 of the Water Code. This will allow for issuance of waste discharge requirements by the appropriate regional water quality control board within 100 days after filing the application in accordance with Public Resources Code section 25550(d);

Information required to make AFC conform with regulations:

According to the SFBRWQCB, any effluent discharged beyond the headworks of a waste treatment facility is treated as a separate discharge. Because this will be the case for the RCEC project, the applicant needs to submit a complete Report of Waste Discharge (ROWD) in order for the RWQCB to issue WDRs in the form of an NPDES permit. Please provide a complete ROWD that would enable the RWQCB to initiate the permit review process. Energy Commission staff has requested a letter from the SFBRWQCB regarding the status of an ROWD submission by the Applicant.

As per Appendix B (g) (14) (A) (i), the RCEC would be treated as a separate discharge and will be handled by an NPDES permit for wastewater discharge. Provide a discussion on the aforementioned permit regarding applicability and conformance issues.

Response— See response under Water Resources, Item #1.

5. "Will serve letter" (6-month processes [Appendix B (g)(14)(A)(i), §2022(b)(5)(B)]):

A will-serve letter or similar document from each provider of water to the project, indicating each provider's willingness to provide water to the project and describing all conditions under which the water will be provided, and a discussion of all other contractual agreements with the applicant pertaining to the provision of water to the project.

Information required to make AFC conform with regulations:

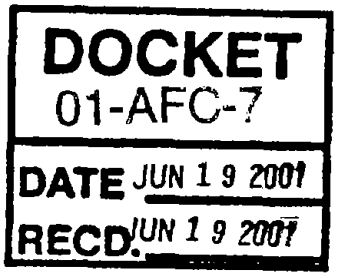
Provide a "will serve" letter from USD that accepts the Applicants proposal to use their water as backup supply.

The "will serve" letter from the City of Hayward (Appendix 7A) does not indicate whether the City will accept sanitary wastewater. Please provide clarification regarding the aforementioned issue.

Response— See response under Water Resources, Item #10.

Clean Energy for the 21st Century

Calpine Corporation



Bechtel Enterprises Holdings, Inc.

June 19, 2001

Mr. Steve Larson
Executive Director
California Energy Commission
1516 Ninth Street
Sacramento, California 95814

Subject: Russell City Energy Center Supplemental Information (01-AFC-07)

Dear Mr. Larson:

On May 22,2001, Calpine Corporation (Calpine) and Bechtel Enterprises Holdings, Inc. (Bechtel) submitted an application for Certification (AFC) for the Russell City Energy Center. Subsequently, the California Energy Commission staff notified Calpine/Bechtel on June 12, 2001 regarding the need to provide supplemental information to ensure that the AFC can be deemed data adequate for both the six-month and 12-month AFC review process.

Calpine/Bechtel staff and its consultants have reviewed the data adequacy worksheets and are including with this transmittal letter supplemental information in the following areas:

Air Quality (6-month and 12-month data adequacy)
Cultural (6-month and 12-month data adequacy)
Noise (12-month data adequacy)
Socioeconomics/Environmental Justice (12-month data adequacy)
Soils (6-month data adequacy)
Visual (6-month and 12-month data adequacy)
Water (6-month and 12-month data adequacy)

I hereby attest, under penalty of perjury, that the contents of this supplemental information are truthful and accurate to the best of my knowledge.

Dated this 19th day of June 2001.

Sincerely,
RUSSELL CITY ENERY CENTER

James Leahy
Development Manager
Calpine/Bechtel Joint Development

Attachments

CALPINE/BECHTEL JOINT DEVELOPMENT
6700 KOLL CENTER PARKWAY, SUITE 200
PLEASANTON, CALIFORNIA 94566
925-600-2000 925-600-8926 (fax)

Clean Energy for the 21st Century

Calpine Corporation

Bechtel Enterprises Holdings, Inc.

June 19, 2001

Mr. Steve Larson
Executive Director
California Energy Commission
1516 Ninth Street
Sacramento, California 95814

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RUSSELL CITY ENERY CENTER

James Leahy
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