GENESEE GENERATING STATION UNITS 4 AND 5 WATER CONSUMPTION AND EFFLUENT DISCHARGE CHARACTERIZATION REPORT

B&V PROJECT NO. 180144
B&V FILE NO. 41.0812 REV. 0

ISSUED FOR PERMIT APPLICATION

PREPARED FOR

Capital Power

19 SEPTEMBER 2013

BLACK & VEATCH
Building a world of difference.®

Table of Contents

1.0 Objective

This data and information is being provided to support the Project Water Impact Assessment being conducted by Others for permitting purposes.

Based on the Project Block Diagram depicted on Drawing 180144-DN-0001 (Rev 0) and the water mass balance diagram 180144-WMB-1 (Rev 0), the major sources of project-related environmental water emissions are expected to include the following.

- Heat Recovery Steam Generator (HRSG) Blowdown
- Gas Turbine (GT) Air Inlet Evaporative Cooling Blowdown
- Project Drains through the Oil/Water Separator
- Water Treatment Wastewater
    - Filter backwash
    - Reverse osmosis reject
    - Mixed bed regenerant waste

1.1.1 Water Supply

Water supply for the Project is from the existing Genesee site cooling pond. The water mass balance and effluent discharge characterization were created using the cooling pond water quality data. (Attachment 1)

1.1.2 Water Effluent

Water effluent for the Project will be discharged to the Genesee site existing settling pond. The water flows and constituents indicated within this report are limited to the impact to the Genesee site from Genesee Generating Station Units 4 and 5.

2.0 Summary

The effluent discharge characterization is shown on the spreadsheet in Appendix A.

The Project water flow rates for the supply, use, evaporation, and effluent are depicted on the water mass balance diagram 180144-WMB-1 (Rev 0) in Appendix B.

3.0 Methodology and Analysis

The Project water flow rates for the supply, use, evaporation, and effluent are based upon the following:

1. HRSG Steam Cycle Makeup as 2% of Steam Turbine Flow with one third being lost as steam and two thirds being discharged as boiler blowdown.
2. GT Air Inlet Evaporative Cooling is based on Mitsubishi Power Systems data. Blowdown rate is based on 10 cycles of concentration in the evaporative cooler.
3. Project Drains through the Oil/Water Separator based on typical 2x1 Combined Cycle Power Plant B&V in-house data.
4. Filter backwash is based on backwashing the filters once per day.
5. Reverse osmosis reject is based on 75 percent recovery, traditional with fresh water sources.
6. The mixed bed regenerant waste is based on regenerating the resin once per week.
7. The boiler quench water flow is based on cooling the boiler blowdown to 140 ˚F.

Appendix A. Water Effluent Characterization Spreadsheet

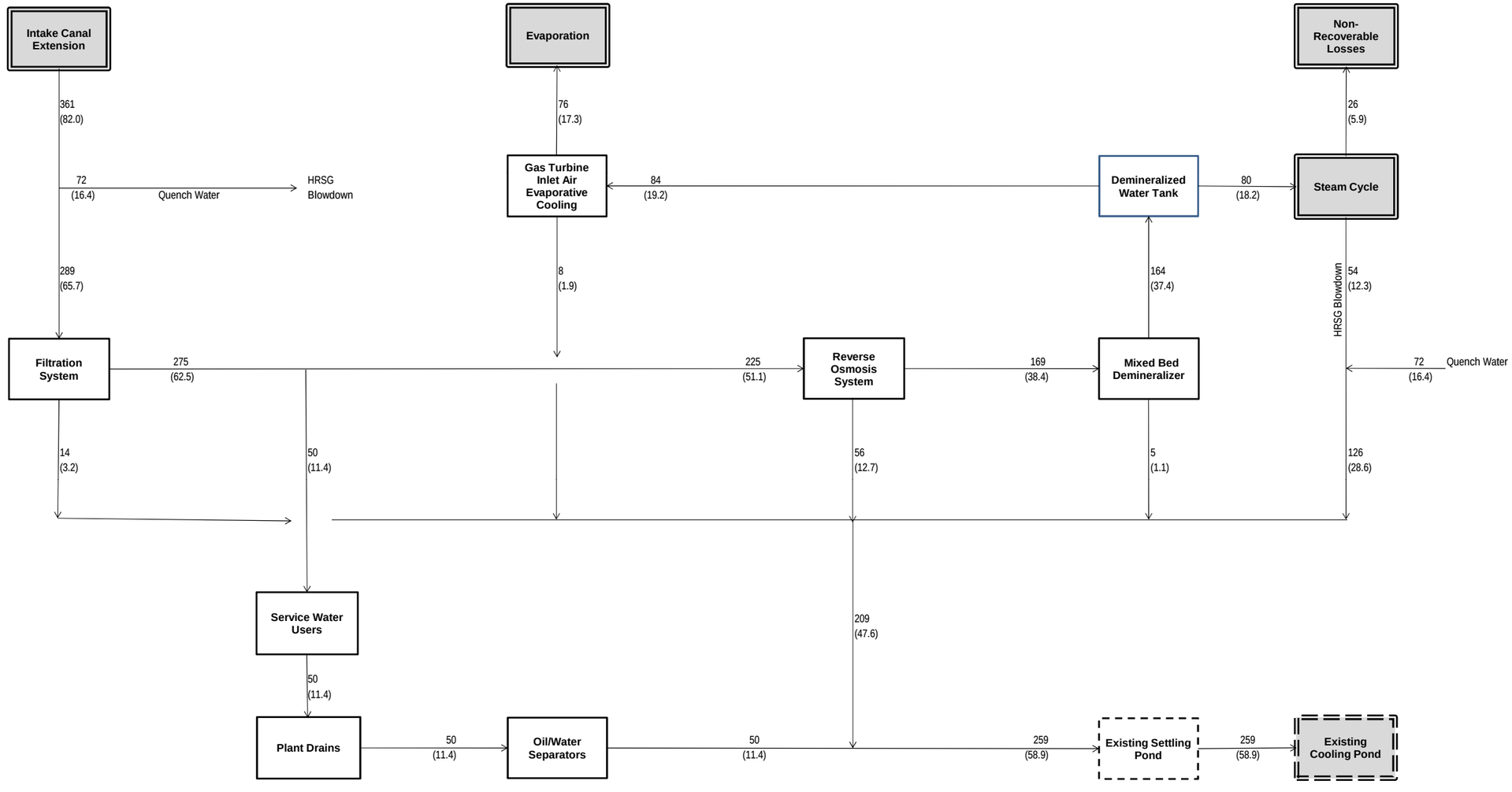
CAPITAL POWER
GENESEE GENERATING STATION UNITS 4 AND 5
PRELIMINARY WATER CONSUMPTION AND EFFLUENT DISCHARGE CHARACTERIZATION

	Raw Water	Filter Backwash	Service Water	RO Inlet	RO Effluent	RO Reject	MB Effluent	Mixed Bed Waste	HRSG Blowdown	Quenched Blowdown	Evap Cooler BD	Oil/water Separator	Effluent (Note 1)	
Flow (gpm)	289	14	275	225	169	56	164	5	54	126	8	50	255	**Flow (gpm)**
Ca (2.50 as CaCO3)	130	130	130	130	1.30	517	0	44	0	74	0	130	181	**Ca (2.50 as CaCO3)**
Mg (4.11 as CaCO3)	82	82	82	82	0.82	327	0	28	0	47	0	82	114	**Mg (4.11 as CaCO3)**
Na (2.17 as CaCO3)	74	74	74	74	0.74	293	0.003	6281	3	43	0	74	224	**Na (2.17 as CaCO3)**
K (1.28 as CaCO3)	6	6	6	6	0.06	25	0	2	0	4	0	6	9	**K (1.28 as CaCO3)**
Cations (as CaCO3)	292	292	292	292	2.92	1163	0	6355	3.0	168.4	0	292	527	**Cations (as CaCO3)**
M-Alk (as Ca CO_3)	260	260	260	260	2.60	1034	0	88	0	149	0	260	361	**M-Alk (as Ca CO_3)**
HCO3 (0.82 as CaCO3)	213	213.2	213.2	213	2.13	848	0	72	0	122	0	213	296	**HCO3 (0.82 as CaCO3)**
CO3 (1.67 as CaCO3)	0	0	0	0	0.00	0	0	0	0	0	0	0	0	**CO3 (1.67 as CaCO3)**
OH (2.94 as CaCO3)	0	0	0	0	0.00	0	0	0	0	0	0	0	0	**OH (2.94 as CaCO3)**
P (as CaCO3)	0	0.01	0.01	0	0.00	0	0	0	3	1	0	0	1	**P (as CaCO3)**
SO4 (1.04 as CaCO3)	82	82.16	82.16	82	0.82	327	0	6280	0	47	0	82	235	**SO4 (1.04 as CaCO3)**
Cl (1.41 as CaCO3)	8	8.46	8.46	8	0.08	34	0	3	0	5	0	8	12	**Cl (1.41 as CaCO3)**
NO3 (0.81 as CaCO3)	0.00	0	0	0	0.00	0	0	0	0	0	0	0	0	**NO3 (0.81 as CaCO3)**
CO2 (1.14 as CaCO3)	0.0	0	0	0	0.00	0	0	0	0	0	0	0	0	**CO2 (1.14 as CaCO3)**
SiO2 (0.83 as CaCO3)	37.5	37.5	37.5	38	0.38	149	0.01	13	0	21	0	38	52	**SiO2 (0.83 as CaCO3)**
Anions (as CaCO3)	304	304	304	304	3.04	1209	0	6355	3	175	0	304	543	**Anions (as CaCO3)**
pH	8.1	8.1	8.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	8	**pH**
Cond., umhos/cm (calc	532.0	532	532	532	10	2040	0.1	10000	10	308	0	513	910	**Cond., umhos/cm (calc)**
TDS (calculated), mg/L	345	345	345	345	5	1366	0	9064	3	287	0	501	724	**TDS (calculated), mg/L**
TSS, mg/L	100	2064	0	0	0	0	0	0	0	57	0	10	141	**TSS, mg/L**
Turbidity, NTU	0.00	0	0	0.00	0.00	0.00	0.00	0.00	1.00	57	25.00	10.00	30	**Turbidity, NTU**
Total hardness, mg/L	212.2	212.2	212.2	212.20	2.12	844.06	0	71.72	0	121	0.00	212.20	295	**Total hardness, mg/L**
Carbonate hardness, m	212	212	212	212.00	2.12	843.27	0	71.66	0	121	0.00	212.00	295	**Carbonate hardness, mg/L**
Noncarbonate hardnes	0	0	0	0.00	0.00	0.00	0	0.00	0	0	0.00	0.00	0	**Noncarbonate hardness, mg/L**
Color, mg/L	15	15	15	15.00	0.15	59.67	0	5.07	0	9	0.00	15.00	21	**Color, mg/L**
Fe, mg/L	0.2	0.2	0.2	0.20	0.0020	0.80	0	0.07	0	0	0.00	0.20	0	**Fe, mg/L**
Mn, mg/L	0.1	0.1	0.1	0.10	0.0010	0.40	0	0.03	0	0	0.000	0.100	0	**Mn, mg/L**
Lead, mg/L	0.001	0.001	0.001	0.00	0.0000	0.00	0	0.00	0	0	0.000	0.0010	0	**Lead, mg/L**
Zn, mg/L	0.04	0.04	0.04	0.04	0.0004	0.16	0	0.01	0	0	0.00	0.04	0	**Zn, mg/L**
Hg, mg/L	0	0	0	0.00	0.0000	0.00	0	0.00	0	0	0.00	0.00	0	**Hg, mg/L**
Chromium, mg/L	0.003	0.003	0.003	0.00	0.0000	0.01	0	0.00	0	0	0.00	0.00	0	**Chromium, mg/L**
Cd, mg/L	0	0	0	0	0	0	0	0	0	0	0	0	0	**Cd, mg/L**
Arsenic, mg/L	0.007	0.007	0.007	0.007	0.00007	0.027844	0	0.002366	0	0.004	0	0.007	0	**Arsenic, mg/L**
Cu, mg/L	0.003	0.003	0.003	0.003	0.00003	0.011933	0	0.001014	0	0.001714	0	0.003	0	**Cu, mg/L**
Flouride (mg/L)	0.35	0.35	0.35	0.35	0.0035	1.392188	0	0.1183	0	0.2	0	0.35	0	**Flouride (mg/L)**
Ammonia Nitrogen (mg	0.13	0.13	0.13	0.13	0.0013	0.517098	0	0.04394	0	0.074286	0	0.13	0	**Ammonia Nitrogen (mg/L)**
Temperature, Deg C														**Temperature, Deg C**

Note 1: Effluent does not include sanitary treatment effluent.

B&V Project # 180144
B&V File # 41.0812 REV. 0
19-Sep-13

Appendix B. Water Mass Balance



PRELIMINARY

NOTES
1. ALL NON-PARENTHESIS FLOWS ARE IN GALLONS PER MINUTE - GPM.
2. ALL PARENTHESIS FLOWS ARE IN CUBIC METERS PER HOUR - CMH.
3. ALL FLOW RATES ARE PROJECT BASIS.
4. THIS DRAWING IS PRELIMINARY AND SUBJECT TO FINAL MHI DESIGN DATA.

WATER BALANCE DESIGN INFORMATION			
FUEL	NATURAL GAS	CONDENSER COOLING	WET - ONCE THRU
NET PLANT OUTPUT (MW)	TBD	COOLING POND CYCLES	N/A
DRY BULB TEMP (C)	35.3	LOAD FACTOR	100%
RELATIVE HUMIDITY	55%		
DAY	MAX SUMMER		
HEAT BALANCE CASE	TBD		

DRAWING INFORMATION			
ENG:	SAB	B&V PROJECT	180144
DWG:	SAB	DRAWING NO.	WMB
CHK:	JRD	WMB CASE	1
		REVISION	0
		DATE	19-Sep-2013
		FILE	41.0812

CAPITAL POWER
GENESEE GENERATING STATION
UNITS 4 AND 5

PRELIMINARY WATER BALANCE

MHI 501J

BLACK & VEATCH
Building a world of difference.