City of Westminster, Maryland

Westminster Water Supply Capacity Management Plan

FINAL

October 2016

Executive summary

The City of Westminster, located in Carroll County, Maryland, herein referred to as the City, developed a Water Supply Capacity Management Plan (WSCMP) in 2006 showing that the City had an existing “Drought of Record Water Deficit”. In order to address this deficit, the City met with the Maryland Department of the Environment (MDE) and entered into Agreement No. 998. In accordance with the Agreement, the City completed an updated WSCMP in 2008. The 2008 WSCMP included several recommendations to address the limitations of the water supply, several of which were implemented. The 2014 WSCMP analyzed data from 2008 through 2012 and showed that the current water supply would cause the City to fall back into a “Drought of Record Water Deficit” before 2020.

Since the previous 2014 WSCMP, the City has performed capital projects to increase the water supply, updated several withdrawal permits, and changed its water allocation policy to a capped maximum per year. Further, the City has continued to limit the approval of plats based on water supply availability, implemented water conservation programs, performed water audits, updated water metering and billing systems, and implemented regulations to allow water restrictions in the event of a drought. Therefore, an updated WSCMP has been completed to reflect current conditions.

The purpose of the WSCMP is to:

- Determine the reliable capacity of the existing water system components including ground water and surface water supplies.
- Quantify existing and projected future water demands.
- Determine water supply surplus or “drought of record water deficit”.

Water Production

The City maintains two water systems: Cranberry system and Wakefield Valley system. The two systems can be integrated, but are typically operated separately. The water for these two systems currently consists of 13 groundwater wells, 3 surface water intakes, 1 raw water reservoir, 2 water treatment plants (WTPs), and 1 clear water reservoir. The distribution systems have 4 elevated storage tanks and 2 booster pump stations. In 2015, the City was required to take over the Bramble Hills System from the County which is a small satellite water system that has its own well. Because the Bramble Hills System has only been included in the City system since 2015 and the data surrounding it is limited, it will not be included in detailed calculations and tables throughout the report. The total average daily water production for 2015 was 2.669 mgd, and the projected drought demand was 2.9359 mgd. Therefore there is approximately 0.3651 mgd of unallocated reliable water capacity. The total water produced from 2013 to 2015 in the Cranberry, Wakefield, and Bramble Hills systems is summarized in Table ES-1.

Table ES-1 Average Daily Water Production

Year	Cranberry System Average Daily Production[1] (MGD)	Wakefield Valley Average Daily Production[2] (MGD)	Bramble Hills System Average Daily Production[3] (MGD)	Total Average Daily Production (MGD)
2013	2.538	0.176	-	2.714
2014	2.373	0.205	-	2.578
2015	2.481	0.187	0.001	2.669

Notes:

1. Cranberry daily production includes all water produced from the Cranberry WTP, Carfaro WTP (Well No. 7), Wells Nos. 3, 4, 5, 6, 8, 9, 10, and 11 and all backwash water required to operate the WTPs and the DE filters.
2. Wakefield Valley production includes all water produced from Wells No. 1 and No. 2 including all backwash water required to operate the DE filters.
3. Bramble Hills System was not connected to the City system in 2013 and 2014.

Existing and Future Water Demand

The 2014 WSCMP projected future water demands based on the average water usage on a per-connection basis. Since the 2014 WSCMP, the City has adopted a new policy that allocates water by an annual allocation maximum of 0.0588 MGD. Refer to Appendix G for more information on the new water allocation policy. Although independent from the future water demand, the City of Westminster Planning Department developed the population projections for future growth and development of the residential connections. The build-out development for the residential connections is projected to be complete in the year 2053.

As a result of Agreement 998 with MDE, the City controls the water allocations and prioritizes new water allocations based on Resolution R08-3 and the new water allocation policy (Resolution R15-2). Figure ES-1 and Table ES-2 summarize the projected build-out water demand for the residential and non-residential development.

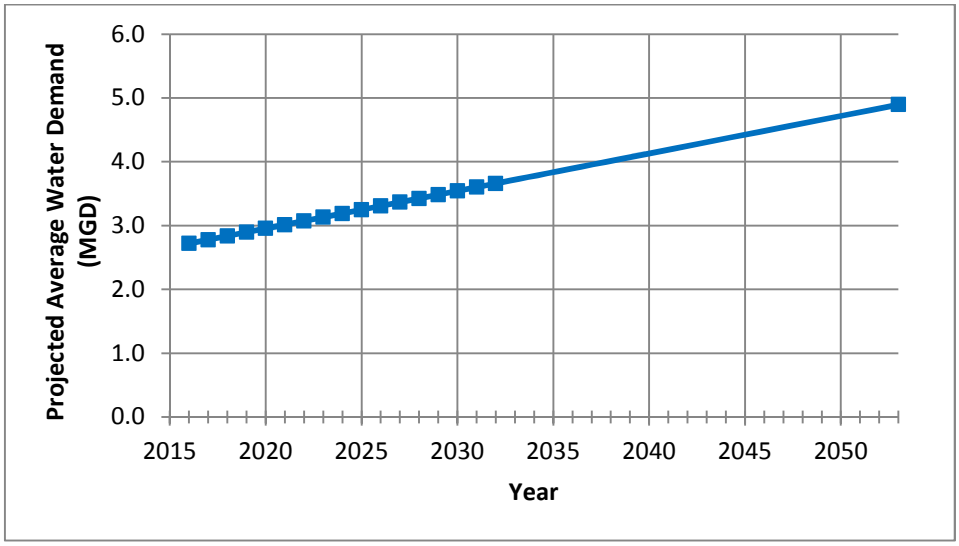

Figure ES-1 Projected Build-Out Water Demand

Table ES-2 Projected Water Demand

Year	Total Water Demand (MGD)[1]
2016	2.719[2]
2017	2.778
2018	2.837
2019	2.895
2020	2.954
2021	3.013
2022	3.072
2023	3.131
2024	3.189
2025	3.248
2026	3.307
2027	3.366
2028	3.425
2029	3.483
2030	3.542
2031	3.601
2032	3.660
2053	4.895

Notes:

1. Based on the newly adopted City allocation policy which allocates a maximum of 0.0588 MGD Increase per year. Table ES-2 displays the maximum increase each year. It is likely that the actual demand will be lower. Refer to Appendix G for a summary of the City of Westminster's new allocation policy.
2. Calculated using the *Guidance for Preparing Water Supply Capacity Management Plans* document written by the MDE. The Average Daily Demand was calculated for the last 5 years (2011-2015) and 0.0588 MGD was added to the value to represent the projected demand in 2016 based on the new allocation policy.

Water Availability for Drought of Record Conditions

The WSCMP Guidance Document requires that the reliable capacity of the surface water and ground water supplies be calculated. The reliable capacity of the surface water was calculated using an updated flow mass analysis (FMA) for the "drought of record". The FMA was updated to reflect the addition of Medford Quarry water supply. Upon completion of the 2008 WSCMP, the ground water withdrawal permits were adjusted to reflect the reliable capacity. Table ES-3 summarizes the reliable water supply capacities and the flow mass analysis for the surface water using the permit required flow-by conditions.

Table ES-3 Reliable Groundwater and Surface Water Supply

Well No.	Name	Reliable Capacity (MGD)
1&2	Wakefield Valley	0.293
3	County Maintenance Building	0.100
4	Airport (Air Business Center)	0.086
5	Krider's Church Road	0.230
6	South Center Street	0.095
7	Carfaro	0.233
8	Vo-Tech	0.119
9&10	Koontz Property	0.095
11	Roop's Mill	0.120
N/A	Koontz Creamery[1]	0.500
N/A	Total Production Wells	1.371
N/A	Little Pipe Creek Intake, Gesell Well, and Greenvale Mews Well	0.330
N/A	Cranberry Surface Water Intakes and Reservoir	1.600
	Total Reliable Capacity	**3.301**

Note:

1. The Koontz Creamery Well is used to augment a tributary of the Patapsco River during low flow periods to maintain stream flow requirements and is not considered a production well.

As shown in Table ES-3, the City of Westminster has a total reliable capacity of 3.301 MGD during the "drought of record". As shown in Figure ES-2 and Table ES-4, the City will have a slight water surplus under the "drought of record" due to the completion of new wells and increased permitting. Additional water supplies will be required in year 2021 if the maximum allocated water amount of 0.0588 MGD is allocated each year.

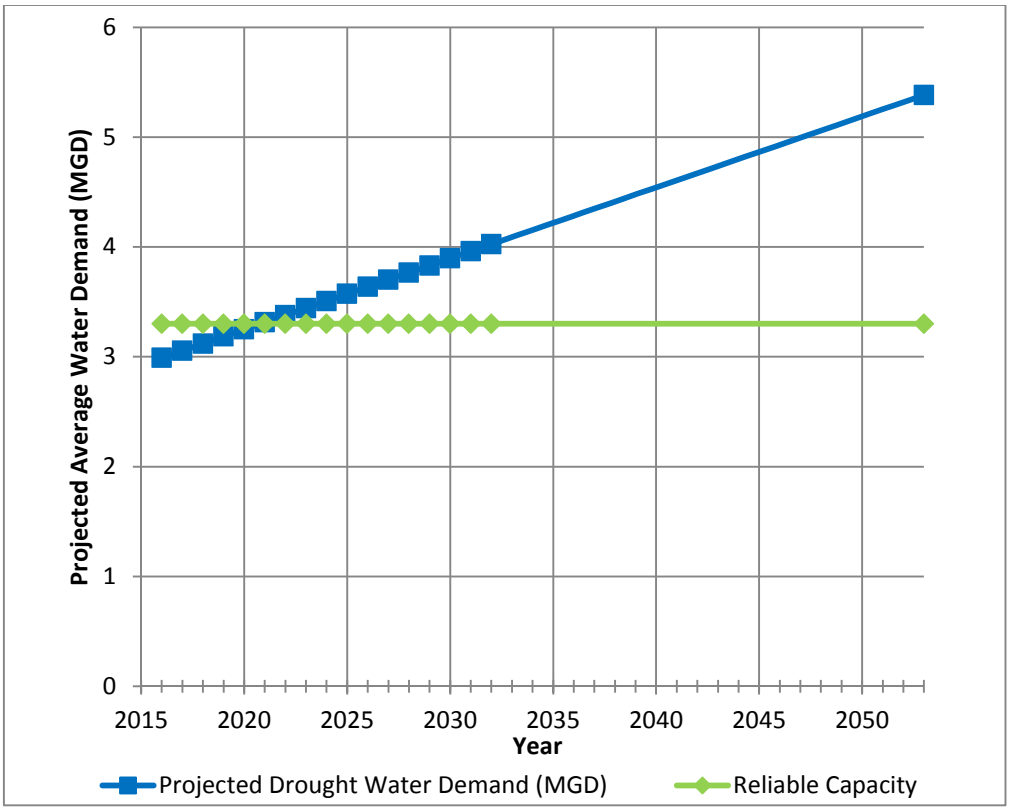

Figure ES-2 Projected Drought Water Demand and Reliable Capacity

Table ES-4 Reliable Capacity and Projected Drought Water Demand

Year	Average Water Demand (MGD)	Projected Drought Water Demand[1] (MGD)	Reliable Capacity (MGD)	Drought of Record Water Surplus or Deficit[2] (MGD)
2016	2.719	2.9909	3.301	0.3101
2017	2.7778	3.05558	3.301	0.24542
2018	2.8366	3.12026	3.301	0.18074
2019	2.8954	3.18494	3.301	0.11606
2020	2.9542	3.24962	3.301	0.05138
2021	3.013	3.3143	3.301	-0.0133
2022	3.0718	3.37898	3.301	-0.07798
2023	3.1306	3.44366	3.301	-0.14266
2024	3.1894	3.50834	3.301	-0.20734
2025	3.2482	3.57302	3.301	-0.27202
2026	3.307	3.6377	3.301	-0.3367
2027	3.3658	3.70238	3.301	-0.40138
2028	3.4246	3.76706	3.301	-0.46606
2029	3.4834	3.83174	3.301	-0.53074
2030	3.5422	3.89642	3.301	-0.59542

Year	Average Water Demand (MGD)	Projected Drought Water Demand[1] (MGD)	Reliable Capacity (MGD)	Drought of Record Water Surplus or Deficit[2] (MGD)
2031	3.601	3.9611	3.301	-0.6601
2032	3.6598	4.02578	3.301	-0.72478
2053	4.8946	5.38406	3.301	-2.08306

Notes:

1. Based on the newly adopted City allocation policy which allocates a maximum of 0.0588 MGD Increase per year. The projected water demand during drought conditions assumes that residential customer usage will be 10% higher than in a typical year.
2. Drought of Record Water Deficit = Water Demand (MGD) – Reliable Capacity (MGD).

Recommendations

Despite the reliable capacity increases since the 2014 WSCMP study, the City of Westminster is projected to fall into a drought of water deficit as early as 2021. The City should continue to evaluate additional short-term solutions with the goal of implementing a long-term solution in order to address the projected "Drought of Record Water Deficit". Solutions for addressing the water supply and water demand are summarized in the following sections.

Water Demand

As a result of the 2008 Water Supply Capacity Management Plan and Agreement A-998, the City initiated several programs to manage water demand increases. The City should continue to pursue these on-going programs:

- Continue to analyze Unaccounted for Water and perform Water Audits: The goal is to reduce the unaccounted for water from approximately 20% to a range of 10-15%. The City implemented a new accounting system in 2008 to improve monitoring of water usage. The City has completed annual Water Audits since the 2008 WSCMP.
- Continue with Leak Detection Program: In addition to using an outside firm to monitor the water distribution system for leaks, the City purchased leak detection equipment to allow for more frequent in-house monitoring of the distribution system.
- Continue to Implement Water Conservation Initiatives: The City participated in the Carroll County Water Resources Coordinating Council and Environmental Advisory Committee to develop a County-wide Community Education Plan which was adopted by the Carroll County Board of County Commissioners in February 2008. A County-wide Joint Resolution was adopted declaring April to October as a Voluntary Water Conservation Stage. Modifications to the County Plumbing Code were adopted which encourage the use of water conservation equipment and fixtures. A modification to the County Landscaping Manual to encourage landscaping installations that foster the principles of xeriscaping was also adopted.
- Re-examine the Issuance of Building Permits: The City currently limits the number of annual building permits per development to 40. The City will evaluate the historical and projected development and determine whether a lower annual allowance would be appropriate.
- Zoning Ordinances and Project Phasing: The City will review the existing zoning ordinance to better estimate for the projected development.

Water Supply

Future Solutions

Four long term solutions that could provide the City the necessary water supply to meet the estimated build-out water demand are as follows:

- Big Pipe Creek: The use of Big Pipe Creek at Union Mills has been in the Carroll County Master Plan since the 1960s. Big Pipe Creek has a significantly larger watershed than the existing Cranberry intake, which results in a substantial increased baseline stream flow when compared to the existing Cranberry Branch water supply. The initial plan to utilize Big Pipe Creek involved the construction of the raw water intake, off-line reservoir, raw water pump station and raw water main to transfer water into the existing water system.
- Hyde's Quarry: Hyde's Quarry is located within a 60.15 acre parcel owned by the Commissioners of Carrol County. The quarry itself is approximately 8.3 acres in size with no obvious tributaries adding to or draining from the quarry. Preliminary testing/monitoring of Hyde's Quarry has shown promise for significant withdrawals without deleterious effects on nearby water resources.
- Purchase of Finished Water from City of Baltimore: The City of Baltimore has a large water supply and treatment system. An agreement could be developed to allow the City of Westminster to purchase water from the City of Baltimore.
- Purchase of Finished Water from a Private Pennsylvania Water System: A Private Pennsylvania Water System has a large water supply and treatment system. An agreement could be developed to allow the City of Westminster to purchase water from this private supplier.
- Continue to encourage commercial water users to practice water reuse. Although some commercial users are currently reusing water, increasing the amount of water reuse would be advantageous for reducing future water demand.

The advantages and disadvantages of the more notable long term solution are summarized in Table ES-5.

Table ES-5 Long Term Solutions Advantages and Disadvantages

Big Pipe Creek	Hydes Quarry	Purchase of Finished Water
Advantages: • Identified as future reservoir site by City, County and MDE in 1960s • Largest untapped water source within close proximity of the City (Approx. 12 mi. from City) • Staged Implementation option • Provides ability to meet minimum stream flow requirements at Cranberry Gauge Station • Identified as future reservoir site by City, County and MDE in 1960's • Consistent with State's Smart Growth Initiative City owned infrastructure	**Advantages:** • Withdrawal of 600,000 GPD observed during testing without deleterious effects on nearby water resources • 1.35 MGD withdrawal achievable for a limited amount of time • Owned by the Commissioners of Carrol County • Currently recommend a surface water annual average appropriation of 400,000 gallons per day (GPD) and max daily withdrawal of 800,000 GPD	**Advantages:** • Reduced infrastructure required with construction of raw water main and pump station for conveying water from Reisterstown • Potential reduction in MDE permitting requirements • Potential reduction in operational complexity • Wells become back-up supply • Provides ability to meet minimum stream flow requirements at Cranberry Gauge Station

Big Pipe Creek	Hydes Quarry	Purchase of Finished Water
Disadvantages: • Extended permitting process • Substantial capital cost for raw water main and raw water storage reservoir • Requires cooperative effort between City, Carroll County and MDE	**Disadvantages:** • Results of testing are not necessarily indicative of anticipated yields under summertime or drought conditions • Further testing/monitoring recommended	**Disadvantages:** • Reliance on the an outside source for finished water with significant reduction in operational control • Potential political ramifications • Substantial capital and operating costs for purchase of finished water • Potential for disinfection by-product formation due to long travel time for finished water • Requires cooperative effort between City of Westminster, Carroll County, MDE and the water supplier

Future Water Supply and Demand

The City should continue to pursue several short-term and long-term alternatives to eliminate the projected future “drought of record water deficit”. Due to recent projects including, Roops Mill, Gesell Well, Little Pipe Creek, Greenvale Mews Well, Medford Quarry Emergency Water Supply, and increased withdrawal permits, the City has resolved the “drought of record water surplus” in the short-term. However, based on proposed growth projections, a “drought of record water deficit” is anticipated under build-out demand conditions. The implementation of one or more of the long-term solutions could significantly increase the time before the City is projected to fall back into a “drought of record water deficit.”

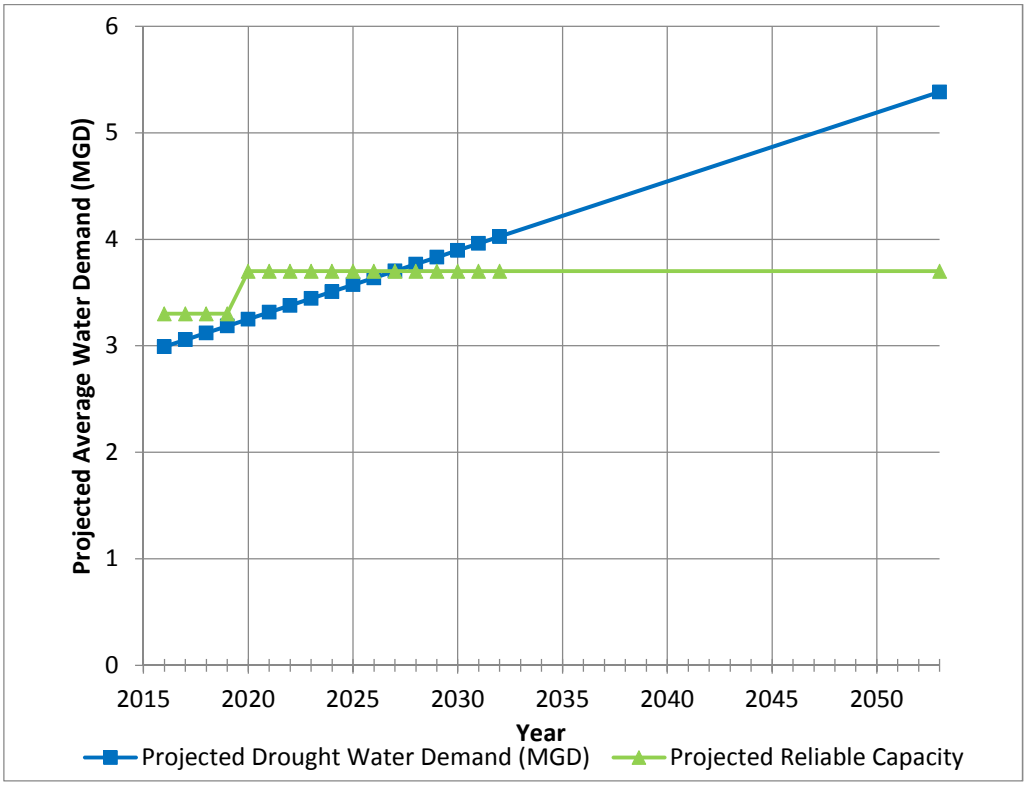

Figure ES-3 Projected Water Demand and Reliable Capacity

Note: The Projected Reliable Capacity increase is based on the Hydes Quarry Project being completed by 2020. This would result in a 0.4 MGD increase to the reliable capacity based on the recommended average annual surface water appropriation presented in the Hydrogeological Evaluation of Hyde's Quarry conducted by the City of Westminster.

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1. Introduction

1.1 Background

The City of Westminster, located in Carroll County, Maryland, herein referred to as the City, developed a Water Supply Capacity Management Plan (WSCMP) in August 2006. The results of the August 2006 WSCMP indicated that the City had an existing "Drought of Record Water Deficit". Upon completion of the WSCMP and following meetings with the Maryland Department of the Environment (MDE), the City entered into Agreement No. 998. Based on the requirements in Agreement No. 998, the City completed an Updated Water Supply Capacity Management Plan in 2008 in accordance with the 2006 MDE Water Supply Capacity Management Plan Guidance Document.

Since completion of the 2008 WSCMP, the City has pursued several actions to increase the available water supply and to mitigate increasing demands on the existing system. Further, following the last WSCMP (2014), the City has received increased permitting for existing wells in Wakefield Valley, adopted a new water allocation policy, and continues to make progress on the Gesell Well. For the sake of this study, ongoing projects are assumed to be complete in calendar year 2016. In accordance with Agreement No. 998 and the 2008 WSCMP, the City has limited the approval of plats based on water supply availability, implemented water conservation programs, performed water audits, updated water metering and billing systems, and implemented regulations to allow water restrictions in the event of a drought.

1.2 Purpose

The City of Westminster owns and operates water supply, treatment, storage, and distribution systems that serve the City and areas beyond the City boundaries within Carroll County. The projected growth includes development within the City and planned service areas in central Carroll County. The goal of the WSCMP is to develop the reliable capacity for the City of Westminster's water system. The WSCMP will aid the City in outlining the need for additional water supplies to meet existing and future water demand.

The WSCMP consists of the following components:

- Evaluation of the existing water system capacity including water supply storage, treatment, pumping, and storage capacities.
- Evaluation of the water demand from existing residential, industrial, and commercial users.
- Estimation of the allocated water demand from approved or planned but undeveloped subdivisions.
- Estimation of the build-out water demand for the City's water system.
- Estimation of the excess water system capacity available for allocation above and beyond the existing and allocated water demand.
- Identification of any water system deficits in supply, treatment, pumping or storage capacities.

2. Existing Facilities

The City of Westminster's water supply system is comprised of 13 water supply wells(one additional well with the inclusion of the Bramble Hills System Well), one augmentation well, three surface water sources, an emergency surface water supply, an emergency ground water supply, and a 121.8-million gallon (MG) raw water reservoir. The City's treatment and storage system consists of two surface water treatment plants (WTPs), two booster pump stations, one clear water reservoir, and four finished water storage tanks. Although the City operates one large water system, the City manages and operates two sub-systems: Wakefield Valley System and Cranberry System. The Wakefield Valley system includes two wells (Well No. 1 and Well No. 2) and a water storage tank and the remaining assets are included in the Cranberry system.

The Wakefield Valley Wells No. 1 and No. 2 were originally an independent water distribution system but have been connected by a valve with the City's Cranberry water distribution system. The valve connecting the two systems is normally closed; however, the systems can be used to supplement each other, if necessary. The Cranberry distribution system operates with a higher pressure; therefore, water enters the Wakefield Valley distribution system through a pressure reducing valve. The Wakefield Valley well pumps can be used to augment the water supply in the Cranberry distribution system. The operation of the City's existing facilities is described in more detail in the following sections.

2.1 Water Supply

The City's water supply system consists of ground water and surface water sources which are described in the following sections. The locations of the water supply facilities discussed in the following sections are shown on Figure 1.

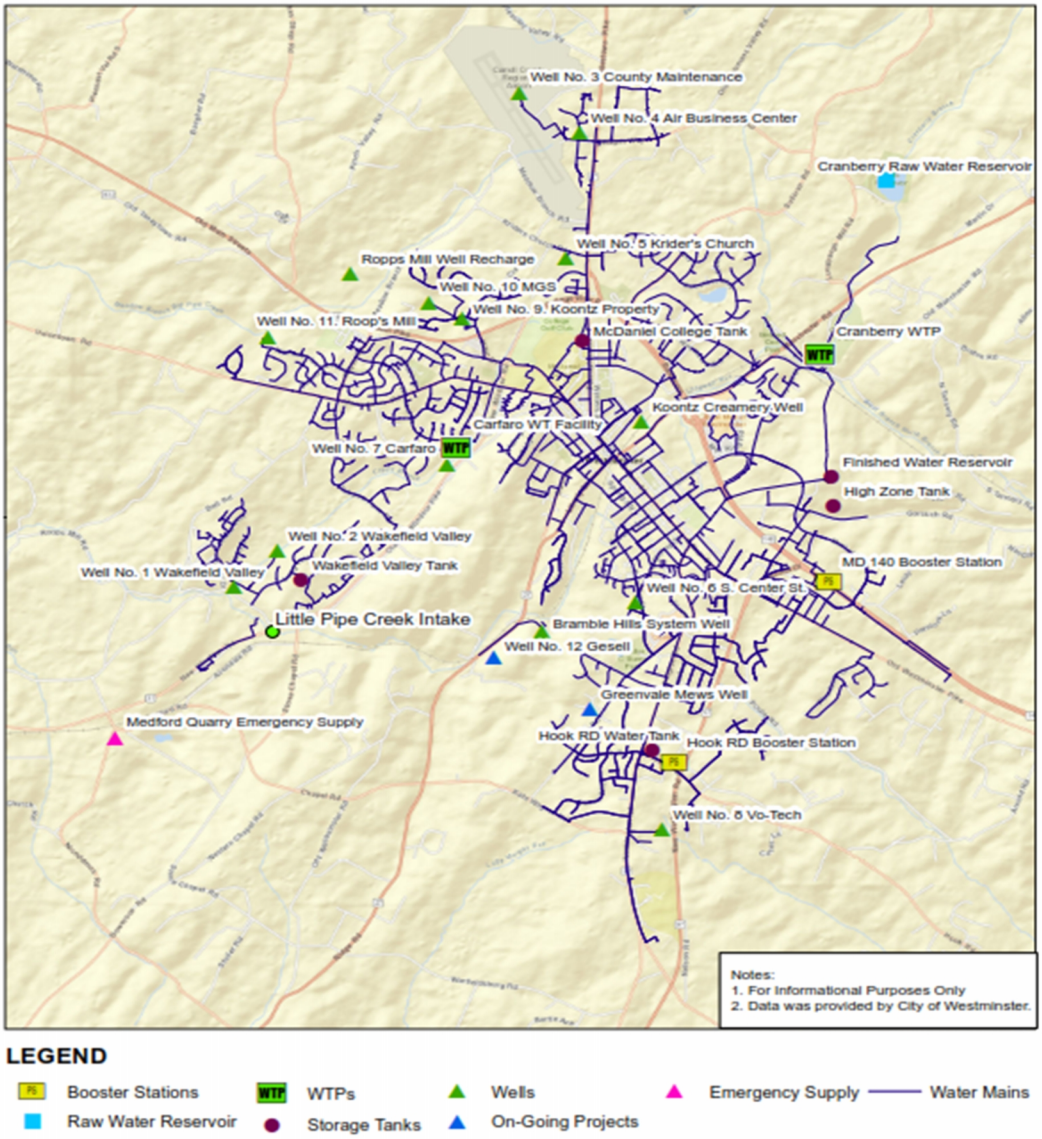

Figure 1 City of Westminster Water System Facilities Location Map

2.1.1 Ground Water Supply

The City has appropriation permits for 13 water supply wells located throughout the City (one additional well with the inclusion of the Bramble Hills System Well). In addition, the City owns and operates the Koontz Creamery well that is used to augment an unnamed tributary of the Patapsco River. The operation of the Koontz Creamery well is discussed in more detail in Section 2.1.2. Table 1 summarizes the permitted capacities of the existing wells. The operation and production of the wells are explained in more detail in the following sections.

Table 1 Permitted Well Withdrawal Capacities

Well No.	Source	Annual Average Permitted Withdrawal (MGD)
1 & 2	Wakefield Valley	0.293
3	County Maintenance Building	0.100
4	Airport (Air Business Center)	0.086
5	Krider's Church Road	0.230
6	South Center Street	0.095
7	Carfaro	0.233
8	Vo-Tech	0.119
9 & 10	Koontz Property	0.095
11	Roop's Mill	0.120
12	Gesell[1]	0.1375
N/A	Greenvale Mews[1]	0.027
N/A	Koontz Creamery[2]	0.500

Notes:

1. The Gesell, Greenvale Mews Well, and Little Pipe Creek intake are all supplementary to each other. Their combined annual average permitted withdrawal is 0.330 MGD.
2. Koontz Creamery well is used to augment an unnamed tributary of the Patapsco River during low flow periods to maintain low flow stream requirements. At this time, the Koontz Creamery well cannot be used as a drinking water supply well.

2.1.2 Surface Water Supply and Storage

The City of Westminster has three surface water sources, one emergency water supply, and one augmentation well to supplement the surface water to meet flow-by requirements during lower flow periods. Two surface water intakes are located on tributaries that feed the Patapsco River. One surface water intake is located on Cranberry Branch, which is a tributary of the West Branch of the Patapsco River. Approximately 7,500-feet of 30-inch transmission line are used to convey water by gravity from Cranberry Branch into a raceway and to the Cranberry WTP for treatment (See Section 2.2).

The second surface water intake is located on a tributary of the West Branch of the Patapsco River known as Hull Creek. A small surface water impoundment and an infiltration gallery are located in Bennett Cerf Park. Raw water flows by gravity through a transmission line to the Cranberry WTP for treatment. The third surface water intake is Little Pipe Creek.

The City also owns and operates the Cranberry Reservoir which is a 121.8-MG raw water reservoir located along Cranberry Branch north of Lucabaugh Mill Road. The water in the Cranberry Branch Reservoir is used when low flow conditions result in inadequate surface water supply from Cranberry Branch and Hull Creek. In 2011, a solar-powered mixer was installed in the reservoir to address stratification and mitigate algal growth. Raw water from the reservoir flows by gravity through the 30-inch transmission main to the Cranberry WTP. During periods of higher stream flow, a raw water pump, 600 gpm (0.864 million gallons per day (MGD)), is used to pump water from Cranberry Branch into the Cranberry Reservoir.

The City maintains Water Appropriation and a Use Permit that governs the withdrawal from the two surface water intakes from the Patapsco River. The permit allows an annual daily average

withdrawal of 2.0 MGD and a withdrawal of 3.0 MGD during the month of maximum use from the two surface water sources. Minimum stream flow requirements of 0.3 cfs (0.19 MGD) below the intake on Cranberry Branch and 0.55 cfs (0.36 MGD) in the West Branch must be maintained in order to withdraw water.

The Koontz Creamery well was purchased by the City in 1974 to meet the City's increasing water demand; however, the ground water supply to the Koontz Creamery well is contaminated with hydrocarbons and; therefore, is not directly connected to the City's potable water system. Due to the increased withdrawal from Cranberry Branch and Hull Creek, MDE permitted the augmentation of the river flow with pumped water from the Koontz Creamery well through a state-approved discharge permit. The mixing, dilution, and aeration of the Koontz Creamery well water dissipates the hydrocarbons. The City maintains Water Appropriation and a Use Permit that allows a water withdrawal of an annual average of 0.5 MGD and daily average of 0.75 MGD for the month of maximum use. The water from the Koontz Creamery well is pumped into an unnamed tributary of West Branch to augment the flow in the West Branch Basin when the flow at the gage station is less than 0.85 cfs (0.549 MGD) and continues to augment flow until the stream flow exceeds 1.62 cfs (1.05 MGD). The Koontz Creamery Well Preliminary Engineering Report Evaluation / Concept Design was finalized in January 2008. The recommendation included in the Report was to operate the well continuously and limit withdrawals during low-flow conditions to maintain flow-by requirements. This recommendation would require a permit modification to eliminate the low-flow augmentation limitation. Approval and implementation of the recommendations would increase the reliable capacity from the surface water system.

The City also has a water appropriation and use permit for surface water withdrawal from Little Pipe Creek. The City is authorized to withdraw a daily average of 0.165 MGD on a yearly basis and a maximum daily withdrawal of 1.1 MGD. The permit became effective on August 1, 2011. The Little Pipe Creek permit is a joint permit with the Gesell and Greenvale Mews well permits. Any source may utilize the entire combined permitted amount (0.330 MGD). The flow-by conditions of the permit require that a continuous flow-by of at least 1.5 cfs (0.969 MGD) be maintained downstream of the intake from July 1st to November 30th. From December 30th to June 30th, a continuous flow-by of at least 3.0 cfs (1.94 MGD) downstream of the intake is required.

In addition, there is a permit that defines the conditions for an emergency withdrawal during a City water supply emergency (drought conditions). The City may withdraw water, via an emergency pump, from the West Branch of the Patapsco River at the Cranberry WTP when low flow conditions exist provided the withdrawal is authorized in writing by the Administration (Maryland Department of the Environment) and water use restrictions have been instituted within the Westminster service area. Two emergency pumps, 600 gpm each (0.86 MGD), are available to transfer water from the West Branch to the Cranberry WTP. Additionally, all water withdrawn from the West Branch must be returned by pumping the Koontz Creamery well.

Table 2 Permitted Well Withdrawal Capacities

Location Name	Permit Number	Annual Average Permitted Withdrawal (MGD)
Cranberry Branch & West Branch	CL1957S002(09)	1.838
Little Pipe Creek[(1)]	CL2006S025(01)	0.165

Note:
1. The Gesell, Greenvale Mews Well, and Little Pipe Creek intake are all supplementary to each other. Their combined annual average permitted withdrawal is 0.330 MGD.

2.1.3 Medford Quarry Emergency Water Supply

The Medford Quarry is located in Carroll County on approximately 397 acres generally bounded by Stone Chapel Road and Maryland Route 31. Ground water percolates into the quarry in excess of the quarry's needs. In June 2005, the City signed an agreement which provides the City access to excess ground water that enters the quarry. MDE approved the agreement, which provides the City raw water to serve the existing water customers. The Medford Quarry pump station and pipeline project was completed in 2009 and is operational. However, the permit has been updated recently due to recommendations from the 2014 WSCMP. The Water Appropriation and Use Permit No. CL2002S042(03) allows the use of Medford Quarry as an emergency water supply. The permitted withdrawal limitations are 0.482 MGD on an average daily basis, and 0.750 MGD on a maximum daily basis.

2.1.4 Permitted Raw Water Source Summary

The City has several ground water and surface water sources to provide raw water to the City's treatment plants or distribution systems. Table 3 summarizes the existing permitted capacity of the various sources which represent the annual average permitted capacity during average rainfall conditions. The reliable capacity under drought conditions is discussed in Section 4.

Table 3 Permitted Raw Water Sources

Source	Annual Average Permitted Withdrawal (MGD)
Wakefield Well Nos. 1 & 2	0.293
Cranberry System Wells No. 3 – No. 11	1.078
Little Pipe Creek, Well No. 12 Gesell, and Greenvale Mews Well (1)	0.330
Cranberry System Surface Water Sources(2)	1.838
Total Sources	3.539
Koontz Creamery(3)	0.500
Medford Quarry Emergency Supply(4)	0.480

Notes:

1. The Gesell, Greenvale Mews Well, and Little Pipe Creek intake are all supplemental to each other. Their combined annual average permitted withdrawal is 0.330 MGD.
2. The Total Sources value was calculated by summing Wakefield Well No. 1 & 2, Cranberry System Wells No. 3 – No. 11, Little Pipe Creek, Gesell Well, and Greenvale Mews Well, and Cranberry System Surface Water Sources.
3. Koontz Creamery well is used to augment a tributary of the Patapsco River during low flow periods to maintain low flow stream requirements. At this time, Koontz Creamery cannot be used as a drinking water supply.
4. The Medford Quarry Emergency Supply can only be used during emergency conditions.

2.2 Water Treatment Capacity

The City owns and operates two surface water treatment plants. The Cranberry WTP treats surface water from two tributaries of the Patapsco River, Cranberry Branch, and Hull Creek. The City also has a permit for surface water withdrawal from Little Pipe Creek, which will be treated by the Cranberry WTP when placed into service. The Carfaro WTP treats ground water from Well No. 7, which is under the influence of surface water. In addition, the ground water from the remaining wells receives treatment prior to distribution into the water system. The capacities of the treatment plants and wells are discussed in the following sections.

2.2.1 Ground Water Treatment

The Wakefield Valley Wells No. 1 and No. 2 and Well No. 5 (Kriders Church Road) are treated with diatomaceous earth (DE) filters prior to distribution. The DE filters require periodic backwashing; therefore, treated water pumped from the wells is used to backwash the DE filters. Ground water from each of the City's water supply wells undergoes fluoridation and disinfection prior to entering the water distribution system.

2.2.2 Cranberry WTP

The Cranberry WTP is located at 401 Lucabaugh Mill RoadThe treatment process consists of lime and coagulant addition followed by chlorination and fluoridation. The Cranberry WTP consists of a submerged membrane filtration plant. The upgrade was performed in order to provide compliance with the future Long Term 2 Enhanced Surface Water Treatment Rule (LT2 rule), which requires increased protection against microbial pathogens including cryptosporidium. The Cranberry WTP is rated at 2.75 MGD as currently outfitted. Capacity becomes 3.5 MGD with the addition of 144 modules in the operating cells and 5.0 MGD with use of the fourth cell.

The finished water from the Cranberry WTP is pumped into the distribution system via four high service pumps. The capacity of the high service pumps is 1000 gpm (1.44 MGD) each. The operation of two service pumps provides enough capacity for normal operation.

Sludge generated from the Cranberry WTP enters the sewage collection system and is sent to the Westminster Wastewater Treatment Plant (WWTP) for treatment and disposal. Table 4 summarizes the annual average daily flow of sludge to the WWTP.

Table 4 Annual Average Daily Flow of Cranberry WTP Sludge to WWTP

Year	Sludge to WWTP (gpd)[1]
2013	3,752
2014	2,834
2015	9,233

Note:
1. Based on a monthly volume of sludge delivered to the WWTP. Data is included in Appendix B.

2.2.3 Carfaro WTP

The Carfaro WTP located on Windsor Drive has a treatment capacity of 0.5 MGD. Well No. 7 (Carfaro Well) supplies ground water to the treatment plant. The treatment process consists of the addition of a coagulant, followed by clarification, filtration, disinfection, and fluoridation.

2.2.4 Treatment Plant Capacity Summary

Table 5 summarizes the available treatment capacity for the existing two treatment plants and the ground water treatment. The ground water treatment includes filtration, disinfection, and fluoridation.

Table 5 Treatment Plant Capacity

Source	Capacity (MGD)
Cranberry WTP[1]	2.750
Carfaro WTP (Well No. 7)[2]	0.500
Diatomaceous Earth Filters Wells No. 1 & No. 2[3]	0.720

Source	Capacity (MGD)
Diatomaceous Earth Filters Well No. 5	0.230
Nitrate Removal, Fluoridation and Disinfection Well No. 8	0.119
Fluoridation and Disinfection (Wells No. 3, 4, 6, 9, 10, & 11)	0.600

Notes:
1. The permitted surface water withdrawal from the intakes is 1.838 MGD.
2. Permitted withdrawal capacity for the Carfaro Well No. 7 is 0.233 MGD.
3. Under normal operating conditions, the Wakefield Valley Wells No. 1 & No. 2 are operated as a separate water system even though it can be interconnected with the larger distribution system.
4. Wells 1, 2, 5, and 7 are GWUDI wells.

2.2.5 Booster Pump Station

The City maintains the Hook Road Booster Station and the High Zone Tank Booster Station. Table 6 summarizes the capacity of the pumps at both stations. At the Hook Road Booster Station, the small pump is used to maintain the pressure in the distribution system. The larger pumps will be called to operate as the pressure in the system drops. The High Zone Tank Booster Pump Station pumps are used to fill and maintain an adequate water level in the High Zone Tank.

Table 6 Hook Road and High Zone Booster Pump Stations

Pump Number	Pump Capacity (gpm)	Pump Operation
Hook Road Booster Pump Station		
1	55	Variable Speed
2	250	Variable Speed
3	250	Variable Speed
4	400	Variable Speed
High Zone Tank Booster Pump Station		
3 Pumps	500 gpm, each	Variable Speed

2.2.6 Finished Water Storage Capacity

The City has one clear water reservoir and four above grade storage tanks used for finished water storage. Table 7 summarizes the type, location, and capacity of each finished water storage unit.

Table 7 Finished Water Storage Capacity

Storage Type	Location	Capacity (MG)
Clear Water Reservoir	Gorsuch Road	0.9
Water Tank	Hook Road	1.5
Elevated Water Tank	McDaniel College Campus	0.5
High Zone Water Tank	Gorsuch Road	2
Water Tank[(1)]	Sawgrass Court	2
Total Storage		6.9

Note:
1. The Sawgrass Court Water Tank serves the Wakefield Valley System.

2.3 Historical Water Production

The following sections present the historical (January 2013 through December 2015) source water withdrawal rates from the surface water and ground water sources. In addition, the production, treatment, and distribution of the finished water are presented. The monthly historical water withdrawal, treatment, and pumping quantities are included in Appendix B.

The City's WTPs and several of the ground water wells require backwash water to operate the treatment systems. Backwash water is finished water required to clean the filtration system and increases the amount of finished water required. Although backwash water must be treated, it is used at the facility and does not enter the distribution system. Produced water is defined as the total amount of treated water produced by the facility and includes any internal water usage and backwash water as described. Water delivered to the distribution system is defined as water pumped into the system and used by the City's customers.

2.3.1 Surface Water Sources

The surface water sources that supply the Cranberry WTP include Hull Creek, Cranberry Branch, and water from the Cranberry Reservoir. In addition, under drought conditions, water can be withdrawn from West Branch of the Patapsco River using the City's emergency pump. Table 8 presents the annual average raw water from each of the sources. As described in Section 2.1.2, the emergency pump can only be used when the stream flow, measured at the stream gauge station, is below the required minimum flow.

Table 8 Annual Average Monthly Withdrawal from Surface Raw Water

Year	Hull Creek (MG/month)	Cranberry Branch (MG/month)(1)	Cranberry Reservoir (MG/month)	Total (MG/month)
2013	23.04	18.47	7.42	48.93
2014	20.26	19.84	5.68	45.78
2015	18.29	21.07	7.67	47.04

Note:
1. Emergency Pump located at the Cranberry WTP that withdrawals water from the West Branch of the Patapsco River during water supply emergencies.

2.3.2 Wakefield Valley Wells

Although the Wakefield Valley Wells No. 1 and No. 2 can be integrated with the Cranberry distribution system (as described in Section 2.1) they are typically monitored as a separate supply and distribution system. Ground water from the Wakefield Valley wells is treated by DE filters prior to chemical treatment and distribution. The water required for backwashing the DE filters is taken from the finished water treated by the Wakefield Valley system. Table 9 summarizes the annual average daily water produced and delivered by the Wakefield Valley wells.

Table 9 Wakefield Valley Wells No. 1 and No. 2 Annual Average Water Production and Water Delivered to the Distribution System

Year	Produced Water (MG/month)	Backwash Water (MG/month)	Delivered Water[1] (MG/month)	Average Daily Delivered (MGD)
2013	5.331	0.001	5.330	0.175
2014	6.240	0.001	6.239	0.205
2015	5.681	0.003	5.678	0.187

Note:
1. Delivered Water (MG/month) = Produced Water (MG/month) – Backwash Water (MG/month)

2.3.3 Cranberry System Wells

Wells No. 3, 4, 6, 8, 9, 10, and 11 do not have filtration systems and are not associated with a treatment plant. After disinfection and/or fluoridation, the water is transferred into the distribution system. Table 10 summarizes the annual average daily production from the Wells No. 3, 4, 6, 8, 9, 10, and 11.

Table 10 Annual Average Daily Water Production from Wells No. 3, 4, 6, 8, 9, 10, and 11

Year	Well No. 3 (MGD)	Well No. 4 (MGD)	Well No. 6 (MGD)	Well No. 8 (MGD)	Well Nos. 9 & 10 (MGD)	Well No. 11 (MGD)	Total (MGD)
2013	0.077	0.045	0.086	0.129	0.106	0.117	0.560
2014	0.072	0.070	0.099	0.059	0.087	0.112	0.498
2015	0.085	0.060	0.090	0.066	0.064	0.104	0.469

Similar to the Wakefield Valley wells, Well No. 5 (located on Kriders Church) is treated with a DE filter; therefore, finished water is required to backwash the filters. Table 11 summarizes the water production and delivery from Well No. 5. Well No. 7 feeds the Carfaro WTP and is discussed in Section 2.3.4.

Table 11 Well No. 5 Annual Average Water Production and Water Delivered to the Distribution System

Year	Produced Water (MG/month)	Backwash Water (MG/month)	Delivered Water[1] (MG/month)	Average Daily Delivered (MGD)
2013	6.397	0.001	6.396	0.211
2014	6.551	0.001	6.550	0.216
2015	7.311	0.002	7.309	0.241

Note:
1. Delivered Water (MG/month) = Produced Water (MG/month) – Backwash Water (MG/month)

2.3.4 Carfaro WTP (Well No. 7)

As discussed in Section 2.2.3, the Carfaro WTP provides treatment for ground water under the influence of surface water pumped from Well No. 7. Table 12 provides a summary of the annual average water production and the annual average daily flow delivered into the distribution system for the Carfaro WTP.

Table 12 Carfaro WTP Water Production

Year	Produced Water (MG/month)	Backwash Water (MG/month)	Delivered Water[1] (MG/month)	Average Daily Produced (MGD)	Average Daily Delivered (MGD)
2013	4.746	0.293	4.453	0.156	0.146
2014	4.807	0.265	4.542	0.158	0.149
2015	4.298	0.355	3.943	0.141	0.130

Note:
1. Delivered Water (MG/month) = Produced Water (MG/month) – Backwash Water (MG/month)

2.3.5 Cranberry System Wells Total Water Production

As described in Sections 2.3.3 and 2.3.4, there are a total of nine wells that provided ground water to the Cranberry water system from January 2013 to December 2015. Figure 2 summarizes the annual average daily water delivered to the distribution system from each of the Cranberry system wells.

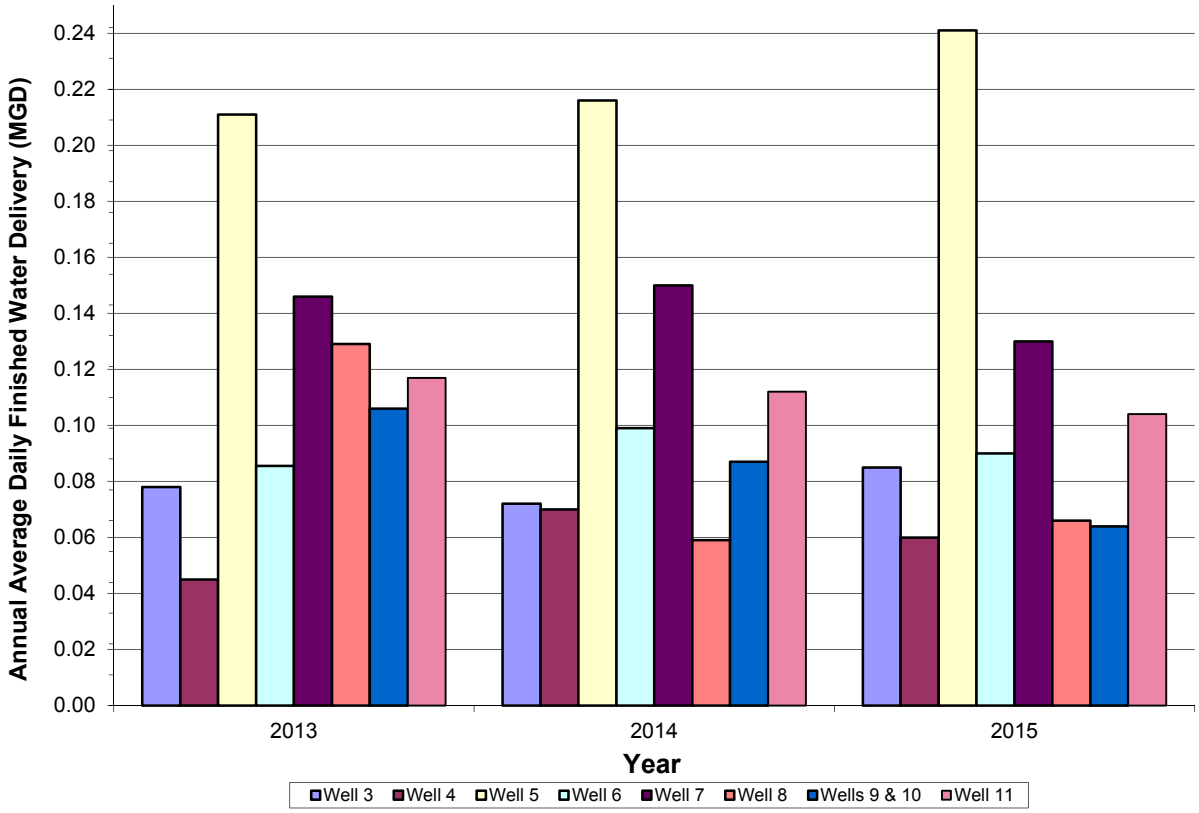

Figure 2 Cranberry System Wells Annual Average Daily Finished Water Delivery

Notes:
1. Well 8 was out of service during 2014 and 2015 for upgrades.
2. Wells 9 & 10 were down for repairs and piping replacement during 2015.

2.3.6 Cranberry WTP

As discussed in Section 2.2.2, the Cranberry WTP provides treatment for surface water from several raw water sources. The Cranberry WTP uses a portion of the finished water for backwash water for the filtration system. The finished water delivered to the distribution system and the filter backwash water are metered separately at the WTP. Table 13 summarizes the monthly water production from the treatment plant which includes the finished water and filter backwash water. The water distributed to the customers is also summarized in Table 13.

Table 13 Cranberry WTP Annual Average Water Production and Water Delivered to the Distribution System

Year	Water Delivered (MG/month)	Filter Backwater Water (MG/month)	Total Water Produced[1] (MG/month)
2013	48.812	0.200	49.011
2014	45.747	0.179	45.927
2015	46.869	0.345	47.214

Note:
1. Produced Water (MG/month) = Water Delivered + Filter Backwash Water.

2.3.7 Total Water Production and Distribution

As discussed previously, the two WTPs, Well No. 5, and the Wakefield Valley wells all require backwash water. The use requirements for backwash water increase the amount of finished water required by the City's water system. Consequently, the total amount of water produced by the City's water system is greater than that delivered into the distribution system for the consumers, which is typical. The total water production, for all the City's water supplies, was calculated monthly by adding the total water produced in million gallons (MG) for each of the following sources:

- Cranberry WTP Raw Water
- Well No. 3
- Well No. 4
- Well No. 5 + Well No. 5 Backwash Water
- Well No. 6
- Well No. 7 + Well No. 7 Backwash Water
- Well No. 8
- Well Nos. 9 & 10
- Well No. 11
- Wakefield Well No. 1
- Wakefield Well No. 2
- Wakefield Backwash Water
- Bramble Hills System Well

The average daily production (MGD) was calculated by dividing the total water produced (MG) by the average number of days per month. Table 14 summarizes the annual average daily water production for the Cranberry and Wakefield Valley water systems.

Table 14 Average Daily Water Production

Year	Cranberry System Average Daily Production(1) (MGD)	Wakefield Valley Average Daily Production(2) (MGD)	Bramble Hills System Average Daily Production(3) (MGD)	Total Average Daily Production (MGD)
2013	2.538	0.176	-	2.714
2014	2.373	0.205	-	2.578
2015	2.481	0.187	0.001	2.669

Notes:
1. Cranberry daily production includes all water produced from the Cranberry WTP, Carfaro WTP (Well No. 7), Wells Nos. 3, 4, 5, 6, 8, 9, 10, and 11 and all backwash water required to operate the WTPs and the DE filters.
2. Wakefield Valley production includes all water produced from Wells No. 1 and No. 2 including all backwash water required to operate the DE filters.
3. Bramble Hills System was not connected to the City system in 2013 and 2014. Because the Bramble Hills System has only been included in the City system since 2015 and the data surrounding it is limited, it will not be included in detailed calculations and tables in the report.

Table 15 summarizes the average monthly water delivered into the distribution system from the Cranberry and Wakefield Valley Water systems. The delivered water does not include backwash water required to produce the drinking water. In addition, Table 15 shows the average daily water delivered to the distribution system based on the monthly delivered quantities, and summarizes the annual average daily water delivered into the Cranberry and Wakefield Valley water systems. The Bramble Hills System is not included in calculations going forward since it has only been a part of the City system since 2015 and there is limited data surrounding it.

Table 15 Water Delivered to the Distribution System

Year	Cranberry System Average Water Delivered to the Distribution System (MGD)	Wakefield Valley System Average Water Delivered to the Distribution System (MGD)	Total Water Delivered to the Distribution System (MGD)
2013	2.531	0.175	2.706
2014	2.367	0.205	2.572
2015	2.470	0.187	2.656

2.4 Unaccounted For Water

The City has historically had a significant quantity of unaccounted for water in the distribution system. Unaccounted for water typically includes un-metered water associated with leaks, fire flow, flushing, and un-metered connections as well as unaccounted for water from un-calibrated water meters. As described in Section 2.3.7, the total water produced by the WTPs and the wells includes all backwash water necessary to operate the filtration systems and the treatment plant. The unaccounted for water is determined as the water delivered into the distribution system that is not sold to the customers. Tables 15 and 16 summarize the total water delivered into the distribution system, the water sold to the consumers and the percent of unaccounted for water for the entire water system, including both Cranberry and Wakefield. The average unaccounted for water for the entire system from 2013 to 2015 was 20%.

Table 16 Overall Unaccounted for Water

Year	Delivered Flow (mgd)	Sold Water (mgd)	Unaccounted For Water (mgd)	Unaccounted for Water (%)
2013	2.706	1.990	0.716	26%
2014	2.572	2.132	0.440	17%
2015	2.374	1.949	0.407	17%
Average	2.551	2.024	0.521	20%

2.5 Westminster Wastewater Treatment Plant

The Westminster WWTP has been serving the City of Westminster, MD since 1973. The most recent major plant upgrade was completed in 1998, when the activated sludge process was converted to a biological nutrient removal (BNR) process. The plant was upgraded to provide anaerobic, anoxic, and aerobic treatment to provide nitrogen and phosphorus removal. The design for the Enhanced Nutrient Removal (ENR) project is in progress and construction is scheduled to begin in 2017. The facility, which discharges to Little Pipe Creek, is rated for an average daily flow of 5 MGD. Table 17 summarizes the average daily flow to the WWTP from 2013-2015. A Wastewater Capacity Management Plan (WWCMP) was submitted to the MDE in November 2012 to address the special condition of the discharge permit. Refer to the WWCMP for additional details.

Table 17 Westminster Wastewater Treatment Plant

Year	Wastewater Flow (MGD)
2013	4.790
2014	5.387
2015	4.851

2.6 Power Supply

The Cranberry WTP has a diesel generator which supplies complete back-up power for all components of the water treatment plant. The Hook Road booster station is also equipped with an emergency generator to power the booster station in the event of a power outage. The Hook Road booster station is necessary to provide fire flow to the high zone area of the water distribution system. The City has a portable generator that can be used as a back-up power source for the other system facilities.

2.7 Fire Flow

The City's insurance provider completes an evaluation of the City's fire flow capabilities. The information is provided to the local fire departments.

3. Water Demand

The City serves residential, commercial, and industrial users within the City boundaries as well as portions of Carroll County. The following sections summarize the historical, current and projected water demands for the water supply system.

3.1 Existing Population and Water Connection Summary

3.1.1 Population Served

Although census data can provide the historical population for the City and for Carroll County, the City must estimate the Carroll County population served by the City's water system because only a portion of Carroll County is served by the City's water system. The City of Westminster's Planning Department provided the population estimates for several years which are included in Table 18.

Table 18 Population Served by the City's Water System

Year	Total Population Served[1]
2013	28,945
2014	29,077
2015	29,139

Note:
1. Data provided by the City of Westminster Planning Department.

3.1.2 Water System Connections

As discussed previously, the City provides water to City and County residential and non-residential customers. Table 19 summarizes the residential and non-residential connections for the entire water system from 2013-2015.

Table 19 Total Westminster Water Connections

Year	Residential Connections	Non-Residential Connections	Total Connections[1]
2013	8,455	1,033	9,488
2014	8,589	1,028	9,617
2015	8,692	1,026	9,718

Note:
1. Data provided by the City of Westminster Finance Department.

3.2 Existing and Historical Water Usage

As discussed in Section 2.4 and summarized in Table 16, the City has a significant quantity of unaccounted for water in the Cranberry system. In addition to the unaccounted for water, the backwash water required at the treatment plants and wells is not included in the quantity sold to the customers but is necessary for water production. The water usage per capita and per connection are shown based on the amount of water sold and the amount of total water produced which includes unaccounted for water and backwash water.

3.2.1 Water Usage Per Capita

The City's water system serves residential customers within the City's boundaries as well as customers in portions of Carroll County. The population served by the City's water system, provided by the City of Westminster's Planning Department, is summarized in Table 18. Table 20 summarizes the water usage per capita based on the total water sold and the total water produced by the Cranberry and Wakefield systems.

Table 20 Water Usage per Capita in Cranberry and Wakefield Systems

Year	Water Quantity (MGD)	Total Population Served[1]	Water Usage Per Capita (gpd/capita)[4]
Sold Water[2]			
2013	1.99	28,945	68.8
2014	2.13	29,077	73.3
2015	1.96	29,139	67.3
Total Delivered[2,3]			
2013	2.71	28,945	93.5
2014	2.57	29,077	88.5
2015	2.66	29,139	91.2

Notes:
1. Based on data provide by the City of Westminster Finance and Planning Departments.
2. Historical data is provided in Appendices B and C.
3. Based on the total water delivered as shown in Table 15.
4. Water Usage Per Capita = Water Quantity (MGD) * 1,000,000 gal/MG / Total Population Served

3.2.2 Residential Connection Water Usage

The water usage per residential connection was also determined. The City of Westminster Finance and Planning Departments provided the water usage for the Cranberry and Wakefield Valley systems for the residential, industrial and commercial users. The actual water usage for the past three years was used to determine the average residential water usage per connection.

At times the Wakefield Valley system supplies the Cranberry system with finished water; therefore, the water usage was evaluated based on the City's entire water system. The residential water usage data provided by the City was used to determine the total amount of water sold to all residential customers. Table 21 summarizes the historical water usage associated with the residential connections.

Table 21 Overall Residential Water Usage Per Residential Connection

Year	Water Quantity (MGD)	Residential Connections[1]	Water Usage Per Connections (gpd/Connection)[3,4]
Total Residential Sold Water[2]			
2013	1.24	8,455	147
2014	1.20	8,589	140
2015	1.19	8,692	137
Total Residential Produced Water[2]			
2013	1.64	8,455	194

Year	Water Quantity (MGD)	Residential Connections[1]	Water Usage Per Connections (gpd/Connection)[3,4]
2014	1.46	8,589	169
2015	1.56	8,692	180
Average			**181**

Notes:

1. Based on data provided by the City of Westminster Finance and Planning Departments and includes City residential connections including the Wakefield Valley connections and the County residential connections.
2. The historical data is presented in Appendices B and C.
3. Based on data provided by monthly water production reports and includes all water delivered to the distribution system and all backwash water required for treatment. Residential Total Water Produced = Total Water Produced * (Residential Sold / Total Sold). The historical data is presented in Appendices B and C.
4. Water Usage Per Connection = Water Quantity (MGD) * 1,000,000 gal/MG / Residential Connections

The overall average water usage requirement for residential connections from 2013 to 2015 was calculated based on the estimated residential water produced from both the Cranberry and Wakefield Valley systems.

3.2.3 Industrial and Commercial Water Usage

Section 3.2.2 summarizes the water usage associated with the residential connections for the Wakefield Valley and Cranberry systems. The remaining water sold or produced by the systems is associated with the industrial and commercial users (non-residential users). Table 22 summarizes the estimated average water usage for the Wakefield Valley and Cranberry non-residential connections.

Table 22 Overall Non-Residential Water Usage

Year	Water Quantity (MGD)	Non-Residential Connections[1]	Water Usage Per Connections (gpd/Connection)[3]
Non-Residential Sold Water[2]			
2013	0.75	1,033	725
2014	0.93	1,028	902
2015	0.77	1,026	746
Non-Residential Produced Water[2]			
2013	0.99	1,033	955
2014	1.12	1,028	1,091
2015	1.00	1,026	979

Notes:

1. Based on data provided by the City of Westminster Finance and Planning Departments and includes all commercial and industrial connections. The historical data is presented in Appendices B and C.
2. Based on data provided by monthly water production reports including backwash water and station water. Industrial and Commercial Total Produced Water = Total Water Produced * (Industrial & Commercial Sold / Total Sold). The historical data is presented in Appendix C.
3. Water Usage Per Connection = Water Quantity (MGD) * 1,000,000 gal/MG / Connections

3.3 Growth Projections

3.3.1 Residential and Non-Residential Growth Rates

The Year 2013 through Year 2015 City and County residential connections provided by the City of Westminster Planning Department were used to determine the rate of growth for overall increase in residential and non-residential connections. Table 23 indicates the number of new residential and non-residential connections to the system.

Table 23 Historical Change in Residential and Non-Residential Connections

Year	New Residential Connections	New Non-Residential Connections	Overall New Connections
2013	159	-151	8
2014	134	-5	129
2015	103	-2	101
Annual Average	132	-53	79

3.3.2 Projected Growth

The City of Westminster Planning Department has developed the projected build-out schedule for the residential connections based on historical growth trends, number of issued building permits, planned and projected developments and current zoning. Table 24 shows all the projected growth for the City residential connections and the County residential connections through build-out conditions (year 2053).

The City's future water demand is dependent upon the residential, commercial, and industrial growth within the City boundaries and additional service area within Carroll County. Based upon the data provided by the City's Planning Department, the following summarizes the data available and the basis for determining the projected water demands:

- Build-out period for residential connections = 37 years
- Planning number for population projections = 2.6 persons per household, from the City of Westminster Planning Department
- Existing estimated non-residential development = 1,859 acres
- Total available area for non-residential growth = 526 acres
- Assumed build-out period for commercial and industrial development = 20 years

Table 24 Residential Build-Out Projections

City Project Name	Potential Future Units	2016	2017	2018	2019	2020	2021	2022
Roops Mill - Phase I	84	30	24					
Roops Mill - Phase II	109			30	30	30	19	
Bolton Hill - Phase I	15							
Bolton Hill Phases II-IV	133	30	40	33				
Griswold Property	17			10	7			
Naganna Property	225		30	30	30	30	30	5
Vacant/Subdividable Parcels	900	10	10	10	10	10	10	10
Lots on Private Wells			1	1	1	1	1	1
New City Connections:	**1483**	**70**	**105**	**114**	**78**	**71**	**60**	**16**
Running Total of New City Connections:		**70**	**175**	**289**	**367**	**438**	**498**	**514**
County Project Name								
Doerr/Kaufmann	3	3						
Windy Hills Farms	33	10	18					
Fields at Pheasant Run	7		7					
Christopher's Place	2		2					
McLaughlin Meadows	2		2					
Sophie's Choice	20		5	15				
Westminster Bond	10		10					
Vacant/Subdividable Parcels	1500	10	10	10	10	10	10	10
Lots on Private Wells	450	3	5	5	5	5	5	10
New County Connections*	**2027**	**26**	**59**	**30**	**15**	**15**	**15**	**20**
Running Total of New Co. Connections:		**26**	**85**	**115**	**130**	**145**	**160**	**180**
Total Development for Westminster Water System								
Total New Connections	**3510**	**96**	**164**	**144**	**93**	**86**	**75**	**36**
Running Total All Connections:		**96**	**260**	**404**	**497**	**583**	**658**	**694**

City Project Name	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2053
Roops Mill - Phase I											
Roops Mill - Phase II											
Bolton Hill - Phase I											
Bolton Hill Phases II-IV											
Griswold Property											
Naganna Property											
Vacant/Subdividable Parcels	50	50	50	50	50	50	50	50	50	50	320
Lots on Private Wells											
New City Connections:	50	50	50	50	50	50	50	50	50	50	320
Running Total of New City Connections:	564	614	664	714	764	814	864	914	964	1014	1334
County Project Name											
Doerr/Kaufmann											
Windy Hills Farms											
Fields at Pheasant Run											
Christopher's Place											
McLaughlin Meadows											
Sophie's Choice											
Westminster Bond											
Vacant/Subdividable Parcels	10	50	50	50	50	50	50	50	50	50	970
Lots on Private Wells	10	10	10	10	20	20	20	20	20	30	236
New County Connections*	20	60	60	60	70	70	70	70	70	80	1206
Running Total of New Co. Connections:	200	260	320	380	450	520	590	660	730	810	2016
Total Development for Westminster Water System											
Total New Connections	70	110	110	110	120	120	120	120	120	130	1526
Running Total All Connections:	764	874	984	1094	1214	1334	1454	1574	1694	1824	3350

Table 25 summarizes the estimated increase in residential connections and the industrial and commercial development from 2016 through build-out (2053).

Table 25 Residential and Non-Residential Projected Build-Out

Year	New Connections(1)	Running Total All Connections	New Non-Residential Development (acres)(2)	Total Non-Residential Development (acres)(3)
2016	170	170	26.3	1917
2017	184	354	26.3	1944
2018	145	499	26.3	1970
2019	86	585	26.3	1996
2020	86	671	26.3	2022
2021	75	746	26.3	2049
2022	36	782	26.3	2075
2023	70	852	26.3	2101
2024	110	962	26.3	2128
2025	110	1072	26.3	2154
2026	110	1182	26.3	2180
2027	120	1302	26.3	2207
2028	120	1422	26.3	2233
2029	120	1542	26.3	2259
2030	120	1662	26.3	2285
2031	120	1782	26.3	2312
2032	130	1912	26.3	2338
2053	1526	3438		2338

Notes:

1. Projections provided by the City of Westminster Planning Department.
2. As described in Section 3.3.2, an existing non-residential development area of 1,859 acres is assumed, with a constant growth rate through 2032.
3. 2016 values for growth are estimated based on previously anticipated growth projections as shown in Table 24.

3.4 Future Water Demand

In the 2014 WSCMP the City's future water demand was estimated based on the number of residential connections and the available land for industrial and commercial development. The following summarizes the 2014 WSCMP basis for estimating the City's build-out water demands, under average rainfall conditions:

- Residential water usage = 181 gpd/residential connection
- Industrial and Commercial estimated usage = 800 gpd/acre as provided by the City of Westminster Planning Department

Since the 2014 WSCMP, the City has adopted a new water allocation policy where future water demand is capped by an annual allocation maximum of 0.0588 MGD. This new policy is the basis for future water use projections in this WSCMP. Refer to Appendix G for more information on the City's new water allocation policy.

3.4.1 Build Out Water Demand

The City's 40-year estimated build-out demand associated with residential, commercial, and industrial connections is based on the City's new water allocation policy described in Section 3.4 and Appendix G. Figure 3 and Table 26 present the projected increase in water demand for the City's build-out period.

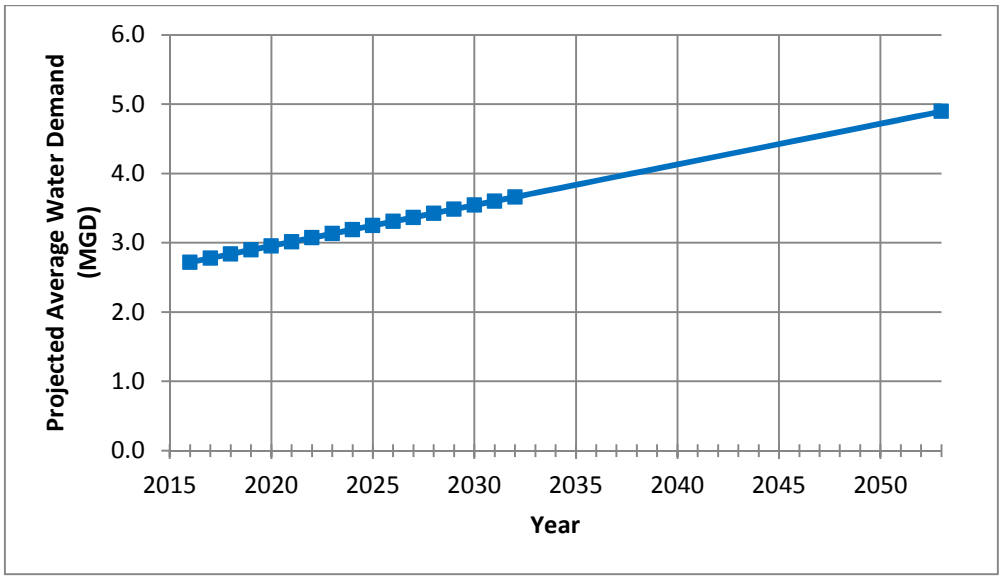

Figure 3 Projected Build-out Water Demand

Table 26 Projected Water Demand

Year	Total Water Demand (MGD)[1]
2016	2.719[2]
2017	2.778
2018	2.837
2019	2.895
2020	2.954
2021	3.013
2022	3.072
2023	3.131
2024	3.189
2025	3.248
2026	3.307
2027	3.366
2028	3.425
2029	3.483
2030	3.542
2031	3.601
2032	3.660
2053	4.895

Notes:

1. Based on the newly adopted City allocation policy which allocates a maximum of 0.0588 MGD Increase per year. Table ES-2 displays the maximum increase each year. It is likely that the actual demand will be lower. Refer to Appendix G for a summary of the City of Westminster's new allocation policy.
2. Calculated using the MDE's *Guidance for Preparing Water Supply Capacity Management Plans* document. The Average Daily Demand was calculated for the last 5 years (2011-2015) and 0.0588 MGD was added to the value to represent the projected demand in 2016 based on the new allocation policy.

4. Water Supply Capacity

The City has both surface water and ground water sources that contribute to the overall water supply. The reliable capacity of the sources has been developed and is discussed in the following sections.

4.1 Reliable Capacity

4.1.1 Distribution and Storage Capacity

The adequacy of the distribution system and storage to serve the existing demands was evaluated to verify whether the existing facilities would be a limiting factor. A summary of the recommended storage for the Wakefield Valley and Cranberry distribution systems as well as the current system adequacy is shown in Tables 27 through 30. The recommended storage was calculated based on the needed fire flow based on the most recent ISO study and the average daily demand per the Ten States' *Recommended Standards for Water Works* 2007 Edition.

Table 27 Cranberry Distribution System Recommended Storage

Storage Component	Value	Units
Fire Flow Rate(1)	4,500	gpm
Fire Flow Duration(2)	4	Hours
Fire Flow Storage	1.08	MG
Average Daily Demand(3)	2.444	MGD
Storage for Average Daily Demand	2.444	MG
Total Recommended Storage	3.524	MG

Notes:
1. Fire Flow Rate is the highest needed fire flow from the ISO study dated 2004.
2. Fire Flow duration is from the ISO study dated 2004.
3. The average daily demand is taken from the 2012 water production data on an annual basis.

Table 28 Cranberry Distribution System Current Storage Adequacy

Parameter	Volume
Available Storage (Existing)	4.900 MG
Recommended Storage(1) (Existing)	3.524 MG
Surplus Storage(2)	1.376 MG

Notes:
1. Refer to Table 27 for calculation of recommended storage.
2. Surplus Storage = Available Storage – Recommended Storage

Table 29 Wakefield Valley System Recommended Storage

Storage Component	Value	Units
Fire Flow Rate(1)	7,000	GPM
Fire Flow Duration(2)	4	Hours
Fire Flow Storage	1.68	MG
Average Day Demand(3)	0.182	MG
Average Day Storage	0.182	MG
Total Recommended Storage	1.862	MG

Notes:
1. Fire Flow Rate is the highest needed fire flow from the ISO study dated 2004.
2. Fire Flow duration is from the ISO study dated 2004.
3. The average daily demand is taken from the 2012 water production data on an annual basis.

Table 30 Wakefield Valley Current Storage Adequacy

Parameter	Volume
Available Storage (Existing)	2.000 MG
Recommended Storage(1) (Existing)	1.862 MG
Surplus Storage(2)	0.138 MG

Notes:
1. Refer to Table 28 for calculation of recommended storage.
2. Surplus Storage = Available Storage – Recommended Storage

Both the Cranberry and the Wakefield Valley storage capacities are adequate for the current conditions, and are not a limiting factor in the ability of the water system to serve its customers under existing conditions.

4.1.2 Ground Water Reliable Capacity

The ground water reliable capacity was determined for drought conditions. Table 31 summarizes the reliable capacity of the production and augmentation wells. Some wells are limited by the allowable annual average permitted withdrawal, whereas others are impacted by drought conditions and cannot produce the full permitted capacity under drought, based on discussions with MDE and the City. The limiting factor was determined and used as the basis for the reliable capacity under drought conditions.

The Gesell and Greenvale Mews wells are supplemental to the Little Pipe Creek surface water source. The reliable capacity of these wells is calculated separately in Section 4.1.3 with the surface water reliable capacity.

Table 31 Reliable Well Withdrawal Capacity

Well No	Name	Reliable Capacity (MGD)(1)
1 & 2	Wakefield Valley	0.293
3	County Maintenance Building	0.100
4	Airport (Air Business Center)	0.086
5	Krider's Church Road	0.230
6	South Center Street	0.095
7	Carfaro	0.233

Well No	Name	Reliable Capacity (MGD)[1]
8	Vo-Tech	0.119
9 & 10	Koontz Property	0.095
11	Roop's Mill	0.120
	Total Production Wells	**1.371**
N/A	Koontz Creamery[2]	0.500
	Total Augmentation Well	0.500

Notes:
1. The Gesell and Greenvale Mews wells are not included in the total reliable capacity for groundwater, as they are supplemental to the Little Pipe Creek Surface intake as discussed in Section 4.1.3
2. The Koontz Creamery Well is used to augment a tributary of the Patapsco River during low flow periods to maintain low flow stream requirements.

4.1.3 Surface Water Reliable Capacity

Little Pipe Creek Surface Water

The Little Pipe Creek Intake is permitted together with the Gesell and Greenvale Mews Wells and any combination of the three sources can be utilized to supply the permitted capacity. The reliable capacity during drought conditions is equal to the total permitted capacity. These sources are currently permitted, and anticipated to be online in 2016.

Table 32 Reliable Capacity for Little Pipe Creek Intake

Source Name	Reliable Capacity (MGD)
Little Pipe Creek Intake	0.165
Gesell Well	0.1375
Greenvale Mews Well	0.027
Total Reliable Capacity[1]	0.330

Note:
1. Any combination of the surface water intake and wells can be used to produce the total permitted capacity.

Cranberry Surface Water

A flow mass analysis (FMA) was completed for the 2012 WSCMP to determine the reliable capacity of the City's existing surface water resources that supply the Cranberry Reservoir. Figure 4 shows a schematic of Cranberry's two surface water intakes (Cranberry Branch and Hull Creek), raw water reservoir, Cranberry WTP, Medford Quarry Emergency Water Supply, and Koontz Creamery augmentation well. Koontz Creamery augmentation well can be used to increase the flow during periods of low-flow; however, at the recommendation of MDE during the 2008 WSCMP, Koontz Creamery well was not included in the surface water reliability determination.

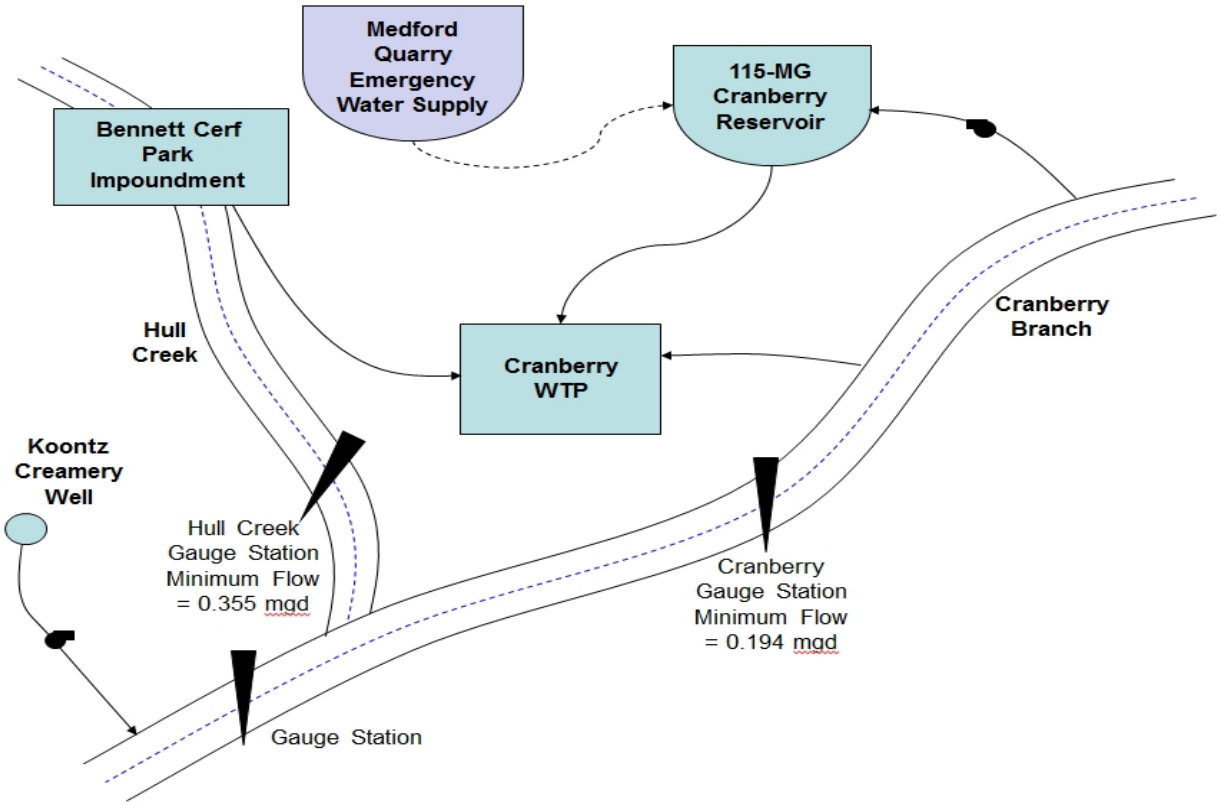

Figure 4 Surface Water Resources for Cranberry System

The MDE Guidance Document Water Supply Capacity Management Plans (2006) requires that the surface water reliability be determined during the "drought of record." The "drought of record" for the surface water analysis is 1964 through 1966 based on an analysis of the stream flow data, which was confirmed by MDE personnel. The flow mass analysis was completed from January 1, 1964 through December 31, 1967 to show complete recovery of the reservoir (reached full capacity) after the drought period.

Daily Stream Flow Data

During the "drought of record" Cranberry Branch Gauge Station (GS) stream flow data from USGS #0158550 includes releases from the existing Cranberry Reservoir that artificially increased the daily flow data. Based on previous recommendations from MDE, the following procedure was used to determine the daily stream flow data for Cranberry Branch and Hull Creek during the "drought of record":

- The Western Run USGS Station #01583500 was used as the basis for the determining the stream flow data for Cranberry Branch and Hull Creek.
- A correlation was made between the Western Run daily stream flow data and Cranberry Branch stream flow data during a period when no diversions were affecting the Cranberry Branch stream flow (January 1, 1950 to December 31, 1957). The daily stream flow data was divided by the watershed areas, 59.8 sq. miles and 3.29 sq. miles for the Western Run and Cranberry Branch, respectively, to determine the flow per square mile. The correlation between the unit flow data is 0.87 as shown in Figure 5.

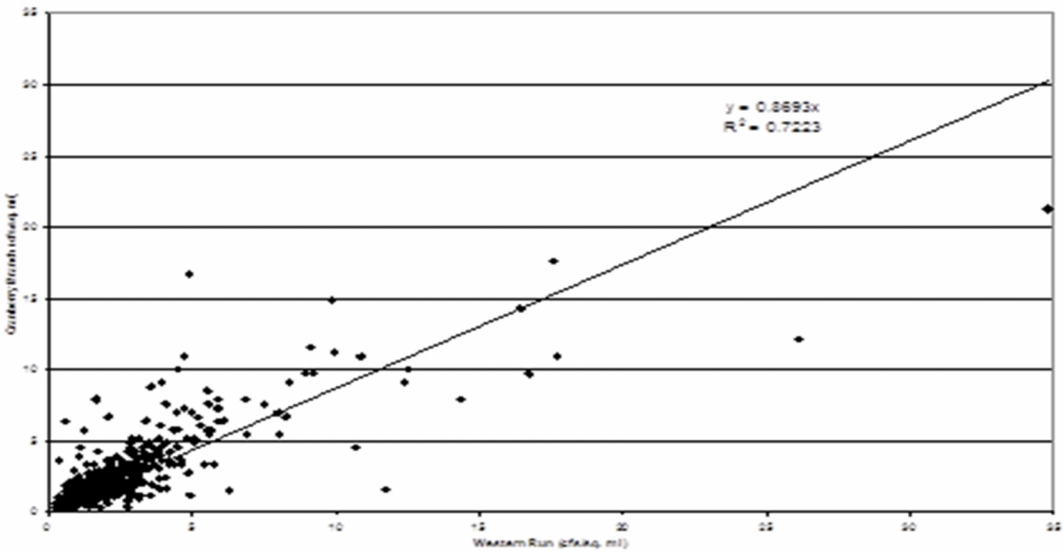

Figure 5 Stream Flow Correlation

- For the FMA, the Cranberry Branch GS daily stream flow data was determined from the following equation: Western Run GS daily flow data * (3.29 sq. miles / 59.8 sq. miles) * 0.87 correlation factor.
- MDE provided an estimated watershed area of 4.22 sq. miles for the Hull Creek Diversion. For the FMA, the Hull Creek Diversion daily stream flow data was determined from the following equation: Western Run GS daily flow data * (4.22 sq. miles / 59.8 sq. miles) * 0.87 correlation factor.

Monthly Water Usage Multipliers

The monthly water usage multipliers recommended by MDE for the 2008 WSCMP were used. It is noted that the City of Westminster does not typically see monthly multipliers as high as 1.3. The City's changes to their rate structure since the 2008 WSCMP has likely contributed to lower peak month multipliers. Table 33 summarizes the monthly multipliers used for the flow mass analysis.

Table 33 Monthly Multipliers

Month	Multiplier[1]
January	0.814
February	0.788
March	0.915
April	0.992
May	1.051
June	1.164
July	1.300
August	1.243
September	1.017
October	1.017
November	0.890
December	0.814

Note:
1. Monthly multipliers provided by MDE for the 2008 WSCMP.

Flow Mass Analysis

The goal of the FMA was to determine the surface water reliable capacity of the system that meets all flow requirements and uses the available reservoir storage capacity. A FMA was completed based on the following assumptions:

- Daily stream flow from Cranberry Branch and Hull Creek for 1964 through 1967 were calculated based on the Western Run daily stream flow data as discussed in Section 4.1.3 Cranberry Surface Water section.
- Based on the current withdrawal permit, the minimum stream flow at the Cranberry Branch Gauge Station is 0.3 cfs (0.194 MGD) at all times.
- Based on the current withdrawal permit, the minimum stream flow at the Hull Creek Gauge Station is 0.55 cfs (0.355 MGD) at all times.
- Available stream flow = Daily stream flow – minimum stream flow
- Monthly usage multipliers were included in the FMA as shown in Table 33. The annual average reliable capacity was multiplied by the monthly multipliers to include the variation in water usage throughout the year.
- Maximum reservoir volume = 121.8 MG. The reservoir volume is based on the reservoir depth and volume table provided by the previous owner of the water system. The total reservoir volume is consistent with the record drawings from the original reservoir construction.
- Reservoir is full at the start of the drought period (January 1, 1964).
- Minimum allowable reservoir volume = 11 MG
- Pan evaporation data provided by MDE (included in Appendix F) was used to determine the amount of evaporation from the reservoir. All evaporation assumed to occur evenly during the period of April through October. The pan evaporation rate was calculated by dividing the annual evaporation rate by 214 days (April 1 through October 30). A correlation was made between the available surface area and the volume of water in the reservoir. The volume of evaporation was calculated based on the evaporation rate multiplied by the available surface area.
- Daily precipitation values were used to calculate the increase in reservoir volume based on the daily rainfall. Precipitation falls over the entire reservoir; therefore, the entire reservoir surface area was used to calculate the increase in reservoir volume during precipitation events.
- Koontz Creamery augmentation well is not included in the flow mass analysis.
- No flow was provided by the emergency water supply from the Emergency Water Pumps located at the Cranberry WTP during the FMA. The flow through the West Branch is unknown during the drought and the reliable capacity of the emergency source during the drought period is unknown.
- During high flow days, the reservoir can be filled at no more than 3 MGD which is the maximum pump capacity, and the maximum day permit limitation for withdrawals from Cranberry Branch and Hull Creek.
- As discussed in Section 2.1.3, the Medford Quarry Emergency Water Supply was simulated to provide an increase of 0.5 MGD of reliable capacity which was the original intent. The

Medford Quarry flow rate used in the FMA was 0.75 MGD, with a maximum annual volume of 0.482 MGD. The FMA used a start set point of 104 MG (22.8 feet depth) in the Cranberry Reservoir, and a stop set point of 116 MG (24.3 feet depth) in the Cranberry Reservoir for operation of the emergency water supply. Refer to Section 2.1.3 and Section 5.2.1 for additional details related to the Medford Quarry Emergency Water Supply.

The results of the updated FMA are included in Appendix F. Based on the revised flow mass analysis; the reliable surface water capacity is 1.60 MGD. As shown in Figure 6, the reservoir capacity drops to approximately 12.6 million gallons during the drought period but is able to completely recover by the end of the period.

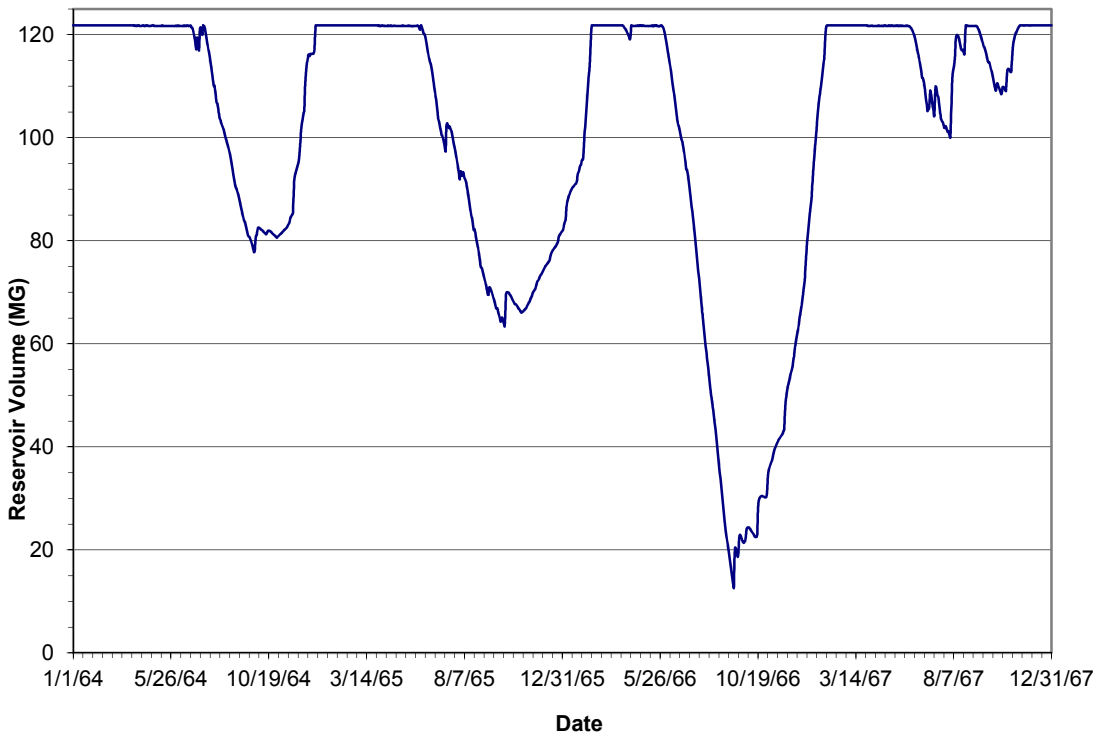

Figure 6 Flow Mass Analysis Results: Reservoir Volume During 1964 – 1967 Drought of Record

4.2 Total Reliable Capacity

Table 34 summarizes the total reliable capacity during drought conditions from all the groundwater and surface water sources in the City's system.

Table 34 Water Supply Reliable Capacity

Source	Reliable Capacity (MGD)
Groundwater Wells(1)	1.371
Little Pipe Creek and Wells(2)	0.330
Cranberry Surface Water Intakes and Reservoir(3)	1.600
Total	**3.301**

Notes:
1. Refer to Table 31 for additional details.
2. Refer to Table 32 for additional details.

4.3 Drought of Record Water Availability

As determined above, the City will have a total reliable capacity of 3.301 MGD during the "drought of record". In order to determine whether this capacity would be sufficient to supply the demand during drought conditions, the drought demand must be determined. The projected demand was determined in Section 3.3.2. However, that demand did not account for the potential increase in water consumption during drought conditions. According to the MDE Guidance Document for Water Supply Capacity Management Plans, the projected water demand during drought conditions should assume a 10% increase in residential customer demand, when compared to a typical year. Industrial and commercial demands are not adjusted, as they are not projected to increase during a drought. Based on the projected drought demand and available capacity, Table 35 and Figure 7 present the water supply availability during drought of record conditions from the current conditions to the 2053 build-out conditions.

Table 35 Existing Reliable Capacity and Projected Drought Water Demand

Year	Average Water Demand (MGD)	Projected Drought Water Demand(1) (MGD)	Reliable Capacity (MGD)	Drought of Record Water Surplus or Deficit(2) (MGD)
2016	2.719	2.9909	3.301	0.3101
2017	2.7778	3.05558	3.301	0.24542
2018	2.8366	3.12026	3.301	0.18074
2019	2.8954	3.18494	3.301	0.11606
2020	2.9542	3.24962	3.301	0.05138
2021	3.013	3.3143	3.301	-0.0133
2022	3.0718	3.37898	3.301	-0.07798
2023	3.1306	3.44366	3.301	-0.14266
2024	3.1894	3.50834	3.301	-0.20734
2025	3.2482	3.57302	3.301	-0.27202
2026	3.307	3.6377	3.301	-0.3367
2027	3.3658	3.70238	3.301	-0.40138
2028	3.4246	3.76706	3.301	-0.46606
2029	3.4834	3.83174	3.301	-0.53074
2030	3.5422	3.89642	3.301	-0.59542
2031	3.601	3.9611	3.301	-0.6601
2032	3.6598	4.02578	3.301	-0.72478
2053	4.8946	5.38406	3.301	-2.08306

Notes:

1. Based on the newly adopted City allocation policy which allocates a maximum of 0.0588 MGD Increase per year. The projected water demand during drought conditions assumes that residential customer usage will be 10% higher than in a typical year.
2. Drought of Record Water Deficit = Water Demand (MGD) – Reliable Capacity (MGD)

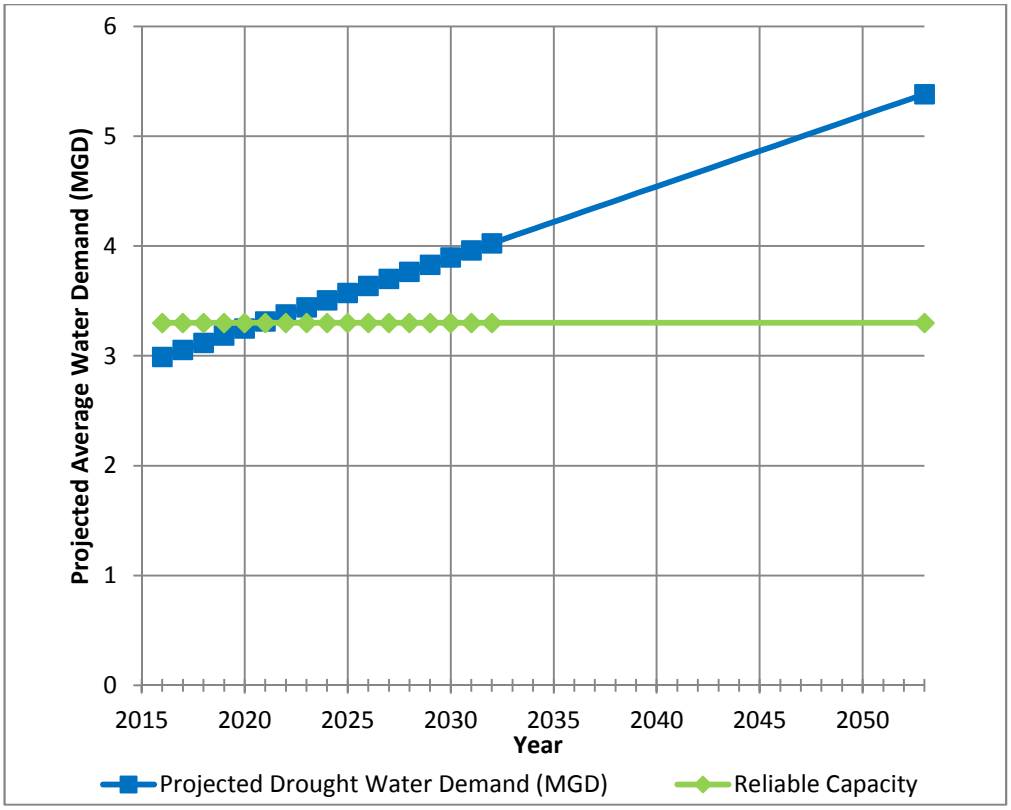

Figure 7 Projected Drought Water Demand and Reliable Capacity

5. Recommended Plan

As of January 1, 2016, there is approximately 0.3651 MGD of unallocated reliable water capacity during a drought condition. As shown in Section 4, the City will fall back into a "drought of record" water deficit in 2021 assuming that 0.0588 MGD of water is allocated per year. As a result, the City should continue to implement short term solutions and look to develop long term solutions to address the projected "Drought of Record Water Deficit" which will occur based on proposed growth projections. The short term and long term solutions for addressing the water supply and water demand are summarized in the following sections. A summary of on-going actions by the City to address water demand and water supply issues is provided.

5.1 Water Demand

In conjunction with the 2008 Water Supply Capacity Management Plan and Agreement A-998, the City initiated several programs to manage water demand increases. The City has initiated and should continue to pursue these programs which are on-going:

- The City implemented a new water rate structure as an incentive for water conservation.
- Continue to analyze Unaccounted for Water and perform Water Audits: As discussed in Section 2.4, the City has approximately 20% unaccounted for water. The goal is to reduce the unaccounted for water to a range of 10-15%. The City has implemented a new accounting system in 2008 to improve monitoring of water usage. The City has completed annual Water Audits since the 2008 WSCMP.
- Continue with Leak Detection Program: In addition to using an outside firm to monitor the water distribution system for leaks, the City purchased leak detection equipment to allow for more frequent in-house monitoring of the distribution system. The City will evaluate its leak detection frequency and continue to actively monitor the system for leaks.
- Continue to Implement Water Conservation Initiatives: The City participated in the Carroll County Water Resources Coordinating Council and Environmental Advisory Committee to develop a County-wide Community Education Plan which was adopted by the Carroll County Board of County Commissioners in February 2008. A County-wide Joint Resolution was adopted declaring April to October as a Voluntary Water Conservation Stage. Modifications to the County Plumbing Code were adopted which encourage the use of water conservation equipment and fixtures. A modification to the County Landscaping Manual to encourage landscaping installations that foster the principles of xeriscaping was also adopted.
- Re-examine the Issuance of Building Permits: The City currently limits the number of annual building permits per development to 40. The City will evaluate the historical and projected development and determine whether a lower annual allowance would be appropriate.
- Zoning Ordinances and Project Phasing: The City will review the existing zoning ordinance to better estimate for the projected development.

5.2 Water Supply

For the past 30 years, the City of Westminster has continuously searched for new water supply sources. Table 36 summarizes many of the historical investigations completed by the City.

Table 36 Historical Water Supply Investigation

Year	Water Supply Investigations and Results
1980s	R.E. Wright performed extensive hydrogeological evaluations Initial investigations indicated 12 – 14 MGD available ground water.
1985 – 2007	Drilled wells at the recommended locations with mixed success Existing Well Nos. 3 – 11 based on recommendations. Each site typically required 4 test wells prior to locating water source. Well No. 11 is in the final stages of design and permitting process. Windemere Well development in progress. Pools Meadow well site drilled; however, no water source located.
1985-1987	The use of the abandoned Hydes Quarry as a potential water source was investigated. The City was unable to obtain necessary water appropriation for the water recharging the quarry.
2002	Medford Quarry Emergency Water Source investigation. Connected Wakefield water system to main distribution system to transfer the available water from the Wakefield system to the main distribution system.
2003	Many test wells were drilled at the Hoff Nagana site at the expense of the developer. No water source located. Proposed reuse water for irrigation purposes at a golf course; however, the golf course owner was uninterested.
2004	Began Cranberry WTP upgrade to improve the reliable treatment of poorer quality stream water. The Cranberry WTP upgrade is currently under construction. Conducted an evaluation to expand the Cranberry Raw Water Reservoir by raising the water surface elevation. Began an evaluation to expand the Cranberry Raw Water Reservoir through the purchase of land. Negotiations with the existing land owner are underway.
2005	Began evaluation of Little Pipe Creek as a surface water source.
2006	Began initial evaluation of Big Pipe Creek as a potential water supply.
2007	The expansion of Cranberry Reservoir through the purchase of additional land has been deemed infeasible and an unattractive alternative. Windimere Well produced insufficient capacity for the capital investment required. Completed Preliminary Engineering Report Evaluation and Concept Design for Koontz Creamery Well to determine if it could be converted to a supply well. Carroll County purchased Hydes Quarry with an estimated volume of 175-MG. The City has entered an agreement with Carroll County to use Hydes Quarry, if feasible, as a raw water storage reservoir. The City is investigating the use of Gesell Well located on Carroll County property.
2009	The Medford Quarry Emergency Water Supply was placed in service.
2012	The Little Pipe Creek intake, Gesell Well and Greenvale Mews Well were permitted. These projects are ongoing.
2013	The City investigated the Big Pipe Creek area for new water supply wells. The investigations determined that the area was not suitable for new water sources.
2014	The City replaced the well pump for Well #3 (County Maintenance) to increase the reliable capacity, which had previously been limited by pump capacity.
2015	Hydrogeological Evaluation of Hyde's Quarry for a Prospective Municipal Water Source for the City of Westminster.

5.2.1 Future Solutions

As shown in Figure 7 and Table 35, the City will have water surplus under the "drought of record" from 2016 through 2021 due to the short term solutions implemented since the most recent WSCMP. Additional water supplies will be required in year 2021 if the maximum allowable water quantity of 0.0588 MGD is allocated per year. The following summarizes water supply solutions the City should pursue in addition to the on-going short-term programs:

- Big Pipe Creek: The use of Big Pipe Creek at Union Mills has been in the Carroll County Master Plan since the 1960s. Big Pipe Creek has a significantly larger watershed than the existing Cranberry intake, which results in a substantial increased baseline stream flow when compared to the existing Cranberry Branch water supply. The initial plan to utilize Big Pipe Creek involved the construction of the raw water intake, off-line reservoir, raw water pump station and raw water main to transfer water into the existing water system.
- Hyde's Quarry: Hyde's Quarry is located within a 60.15 acre parcel owned by the Commissioners of Carrol County. The quarry itself is approximately 8.3 acres in size with no obvious tributaries adding to or draining from the quarry. Preliminary testing/monitoring of Hyde's Quarry has shown promise for significant withdrawals without deleterious effects on nearby water resources.
- Purchase of Finished Water from City of Baltimore: The City of Baltimore has a large water supply and treatment system. An agreement could be developed to allow the City of Westminster to purchase water from the City of Baltimore.
- Purchase of Finished Water from a Private Pennsylvania Water System: A Private Pennsylvania Water System has a large water supply and treatment system. An agreement could be developed to allow the City of Westminster to purchase water from this private supplier.
- Continue to encourage commercial water users to practice water reuse. Although some commercial users are currently reusing water, increasing the amount of water reuse would be advantageous for reducing future water demand.

The advantages and disadvantages of notable solutions are summarized in Table 37.

Table 37 Future Solutions Advantages and Disadvantages

Big Pipe Creek	Hydes Quarry	Purchase of Finished Water
Advantages: • Identified as future reservoir site by City, County and MDE in 1960s • Largest untapped water source within close proximity of the City (Approx. 12 mi. from city) • Staged Implementation option • Provides ability to meet minimum stream flow requirements at Cranberry Gauge Station • Identified as future reservoir site by City, County and MDE in 1960's • Consistent with State's Smart Growth Initiative City owned infrastructure	**Advantages:** • Withdrawal of 600,000 GPD observed during testing without deleterious effects on nearby water resources • 1.35 MGD withdrawal achievable for a limited amount of time • Owned by the Commissioners of Carrol County • Currently recommend a surface water annual average appropriation of 400,000 gallons per day (GPD) and max daily withdrawal of 800,000 GPD	**Advantages:** • Reduced infrastructure required with construction of raw water main and pump station for conveying water from Reisterstown • Potential reduction in MDE permitting requirements • Potential reduction in operational complexity • Wells become back-up supply • Provides ability to meet minimum stream flow requirements at Cranberry Gauge Station

Big Pipe Creek	Hydes Quarry	Purchase of Finished Water
Disadvantages: • Extended permitting process • Substantial capital cost for raw water main and raw water storage reservoir • Requires cooperative effort between City, Carroll County and MDE	**Disadvantages:** • Results of testing are not necessarily indicative of anticipated yields under summertime or drought conditions. • Further testing/monitoring recommended	**Disadvantages:** • Reliance on the an outside source for finished water with significant reduction in operational control • Potential political ramifications • Substantial capital and operating costs for purchase of finished water • Potential for disinfection by-product formation due to long travel time for finished water • Requires cooperative effort between City of Westminster, Carroll County, MDE and the water supplier

5.2.2 Future Water Supply and Demand

Although the new permits have marginally increased the length of time the City will be in a "drought of record water" surplus, this is only a short-term solution and another "drought of record water deficit" will occur again if additional water sources aren't utilized. The implementation of one or more of the proposed long-term solutions could greatly increase the amount of time before the City will fall back into a "drought of record water deficit." Figure 8 below shows the potential increase in the reliable capacity if long term solutions are implemented prior to 2020.

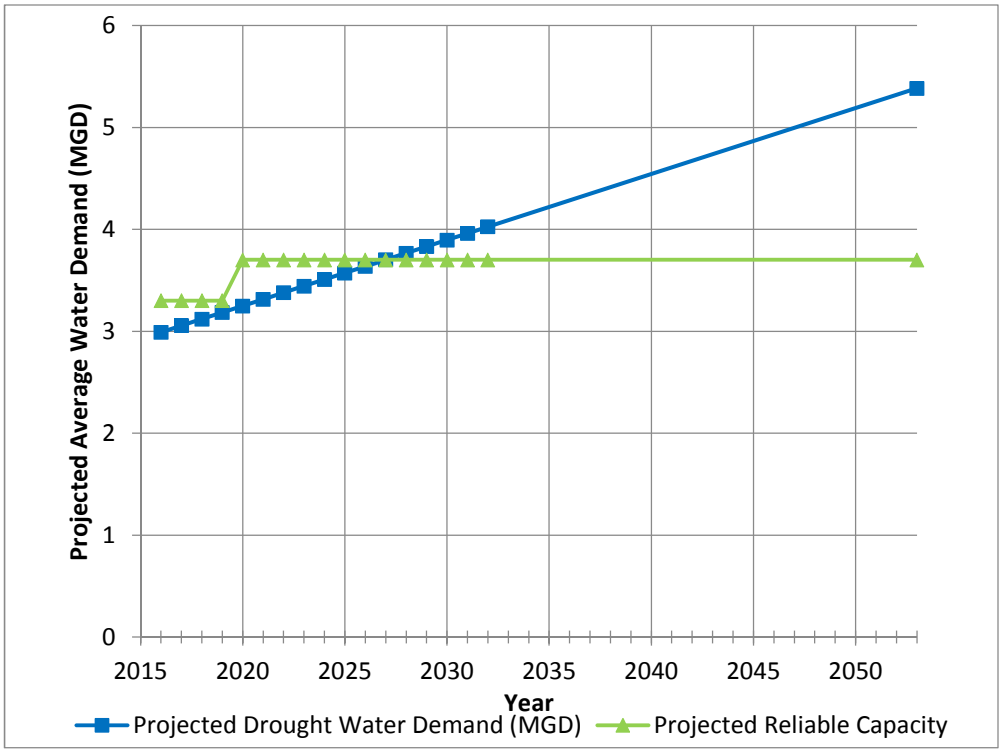

Figure 8 Projected Water Demand and Reliable Capacity

Note: The Projected Reliable Capacity increase is based on the Hydes Quarry Project being completed by 2020. This would result in a 0.4 MGD increase to the reliable capacity based on the recommended average annual surface water appropriation presented in the Hydrogeological Evaluation of Hyde's Quarry conducted by the City of Westminster.

Appendices

Appendix A - Agreement A-998

AGREEMENT NO. A-998

STATE OF MARYLAND	*	**SECRETARY OF THE**
DEPARTMENT OF THE	*	**ENVIRONMENT**
ENVIRONMENT	*	
1800 Washington Boulevard	*	**WATER MANAGEMENT**
Baltimore, Maryland 21230	*	**ADMINISTRATION**
	*	
v.		
	*	
THE MAYOR AND		
COMMON COUNCIL		
OF WESTMINSTER	*	
PO Box 710	*	
Westminster, Maryland 21158	*	
	*	

* * * * * * * * * * * * *

CONSENT ORDER

This Consent Order is entered into between the State of Maryland, Department of the Environment ("MDE" or "Department"), pursuant to the powers, duties, and responsibilities vested in and imposed upon the Secretary of the Environment by Title 1, Title 5, Subtitle 5, and Title 9, Subtitles 2 and 5 of the Environment Article, Annotated Code of Maryland, as delegated to the Director of the Water Management Administration (the "Administration") and The Mayor and Common Council of Westminster, ("City") regarding the provision of a safe and adequate water supply for the City and surrounding areas in Carroll County dependant on the City's water supply.

WHEREAS, the City owns and operates two Water Supply Systems ("Water Supply Systems") serving the City of Westminster and portions of Carroll County, Maryland. They are known as the Cranberry and Wakefield Valley Water Systems. These water systems, under drought conditions, are not sufficient to serve all existing connections and all properties that have been issued building permits. During the drought of 2002, the City enacted mandatory water restrictions, trucked in water to serve existing users and connections, and violated a condition of one of its water appropriation permits requiring the City to cease withdrawals at certain locations when stream flow is below minimum levels. As a result of this water supply inadequacy, there was a moratorium on the issuance of new building permits and approval of subdivision plats for properties that would be served by the City's water systems; and

WHEREAS, the City is taking certain measures to bridge the gap between its water supply demand during drought conditions, including utilizing water from Medford Quarry,

employing water restrictions as an interim measure, and developing plans to reduce water losses and increase water conservation. The City is also preparing a plan to appropriately manage and allocate its water resources. To address the City's long-term water needs to supply water for new growth, the City is investigating the feasibility of alternative sources and preparing a plan to bring one or more of these alternatives to fruition. The purpose of this Consent Order is to allow the City to meet its existing water needs while remedial measures are being developed and put on-line, accommodate a limited amount of interim growth and establish an effective system for managing future capacity in accordance with MDE guidelines.

Regulatory Scheme

WHEREAS, the General Assembly has enacted a comprehensive permitting and regulatory scheme governing the provision of safe and adequate drinking water to the citizens of Maryland; and

WHEREAS, the Secretary of the Department is charged with the responsibility for regulating the operation of Water Supply Systems in a manner that will protect the public health and comfort, and for enforcing State Laws regarding corrections to public Water Supply Systems or the operations of such systems in order to abate risks to the public health or comfort; and

WHEREAS, Title 1, Subtitle 3, of the Environment Article authorizes the Secretary of the Environment to carry out the statutes and regulations promulgated under the Article; and

WHEREAS, under Title 9, Subtitle 2, of the Environment Article, MDE is responsible for overseeing and assuring the adequacy of Water Supply Systems; and

WHEREAS, Section 9-252 of the Environment Article provides that the Secretary may require any public water system "to be operated in a manner that will protect public health and comfort" and that the Secretary "has supervision and control over the sanitary and physical condition of the waters of this State to protect public health and comfort"; and

WHEREAS, under Section 9-206 of the Environment Article, land platted for subdivision may not be sold unless a plat has been submitted to the Department or to a delegated local authority, which includes a statement of the methods, consistent with Title 9, Subtitle 5, by which the subdivision is to be supplied with water; and

WHEREAS, Section 9-222 of the Environment Article provides that, where the absence or incompleteness of a system operated by a political subdivision is prejudicial to the public

health or comfort, the Secretary may order the political subdivision to install, alter, extend, utilize, operate or complete a water supply system; and

WHEREAS, under Section 9-512(b) of the Environment Article, the local authority has the responsibility not to issue building permits unless, taking into consideration all existing and approved development in the service area, the water system is adequate to serve the proposed development; and

WHEREAS, under Section 9-512(d) of the Environment Article, a subdivision plat may not be approved unless the water supply system would be completed in time to serve the proposed development and would be adequate to serve the proposed development once completed; and

WHEREAS, an adequate water supply system is one that is capable of meeting its average demand and its maximum demand under drought conditions. A water system's capacity is determined by evaluating the ability of the sources and treatment facilities to produce water under drought conditions while taking into account the water sources, water storage, and water appropriation and use permit limits. A water system's demand is determined from past usage patterns and the characteristics of the user community, including residential, commercial and industrial use. The projection of future growth is used to establish demand for future years. Demands under drought conditions are determined for average daily annual usage, average daily usage during the month of maximum use, and maximum day.

Factual Background

WHEREAS, the City's Water Supply Systems are public water systems that are supplying water to apartments, businesses, churches, public facilities, residences and schools located within the City and portions of Carroll County, Maryland; and

WHEREAS, the City's Water Supply Systems serve a population of approximately 33,000 located in Carroll County, Maryland. The City maintains 6.9 million gallons of available storage of treated water and owns and operates a series of eleven (11) wells and stream intake structures (on Cranberry Branch and West Branch (Hull Creek)); conveyance systems; a raw water reservoir; water treatment and pumping facilities; and a distribution system that includes water mains, fire hydrants, and water meters; and

WHEREAS, pursuant to nine separate water appropriation and use permits, the City is authorized to withdraw 1.476 mgd as an annual average from the City's eleven (11) production wells. Pursuant to Water Appropriation and Use Permit CL1957S002(06), the City is authorized to withdraw 2 mgd as an annual average from Cranberry Branch and West Branch as long as the stream flow is greater than 0.3 cubic feet per second (cfs) below the intake on Cranberry Branch and greater than 0.55 cfs in the West Branch; and

WHEREAS, as reflected in Table 1 below, an analysis of the safe yield of the Water Supply Systems under drought of record conditions revealed a total capacity of 2.229 mgd as an annual average, with 1.18 mgd from the City's eleven production wells and 1.05 mgd from the two surface water sources;

Table 1: Summary of Capacity and Demand

	Drought	Non-Drought
Capacity	2.229 mgd	2.992 mgd
Demand	2.996 mgd	2.853 mgd

and

WHEREAS, the annual average drought year demand, including the demand from all permitted but not yet connected users as of December 31, 2006 is 2.996 mgd, producing an estimated average annual drought year deficit of 0.767 mgd ("Drought Year Deficit"); and

WHEREAS, the City and MDE evaluated the capacity of the City's sources to meet the average annual system demand during non-drought conditions. Well 11 was not included in this analysis as it does not have a permanent connection and would not be used during an average hydrologic year. MDE's analysis of the City's production data showed that the average year capacity under non-drought conditions, as shown in Table 1, was 2.992 mgd; and

WHEREAS, the City determined that the average year demand under non-drought conditions (equivalent to a drought year demand with water restrictions in place) including the demand from all building permits issued prior to December 31, 2006, but not yet connected to the water system, is 2.853 mgd (also shown in Table 1), which represents a surplus of 139,000 gpd under average hydrologic conditions; and

WHEREAS, in order to address their drought year water shortages, the City applied for an emergency appropriation of 1.08 mgd on any single day from Medford Quarry during 2002 and again in 2005. MDE authorized temporary emergency withdrawals of 1.08 mgd for any one

day in 2002 and 2005 via Permits CL2002S042(01) and CL2005S028(01). The annual average reported water uses were 0.15 mgd and 0.267 mgd in 2002 and 2005, respectively. In order to obtain a permanent emergency back up source of supply, the City secured an agreement with the owner of Medford Quarry in June of 2005; and

WHEREAS, after the Department completed its review of all the relevant information available and taking into account the amount of land owned by the Quarry, the Department issued a Water Appropriation and Use Permit (No. CL2002S042(02)) in June of 2006 to the City for up to 0.5 mgd from the Quarry as a maximum daily amount. The use was permitted as a back up supply to the City's other surface water withdrawals from Cranberry Run and West Branch (Hull Creek) to help address the existing deficit and not to support any new development; and

WHEREAS, in accordance with § 9-512(d) and after meeting with the Department and the City in June 2006, the Carroll County Environmental Health Department stopped signing record plats in July 2006 as the City had not demonstrated that its water system would be adequate to serve additional connections; and

WHEREAS, after reviewing the City's final Capacity Management Plan, MDE directed the Carroll County Environmental Health Department in September 2006 to no longer approve building permits that would result in a net increase in water demand on the City's water system; and.

WHEREAS, according to the City's Water Supply Capacity Management Plan, dated August 2006, the City's unaccounted for water was as high as 24% of the total water delivered from the City's water sources. Water loss could include authorized unmetered water usage, water leakage, meter errors, unauthorized use or billing errors.

Recent Actions Taken by the City to Improve System Capacity

WHEREAS, the City has taken the following steps to improve the system capacity and cover the Drought Year Deficit:

a. Secured engineering services for the design and permitting of a pipeline from Medford Quarry to Cranberry Reservoir;

b. Submitted a revised application for funding (low interest loan) to MDE to begin construction of the said pipeline and received an award of $6.5 million;

c. Made an application to withdraw 2.0 mgd as an annual average from Big Pipe Creek in May 2006;

d. Submitted in January 2007 an application to increase its appropriation from Medford Quarry to 1 mgd during the month of maximum use and 250,000 gpd as an annual average;

e. Submitted an application in December 2006 to withdraw water from Hydes Quarry as a back-up source for Little Pipe Creek. The total average annual withdrawal request for these sources is approximately 1 mgd;

f. Submitted an application in December 2006 to withdraw water from Little Pipe Creek initially as a back-up source to increase operational flexibility but then, if and when the Hydes Quarry withdrawal is permitted and connected to the Water Supply Systems, to provide an additional water source;

g. Evaluated the benefit of increasing the size of Cranberry Reservoir on the safe yield of the water system. Other sites for additional storage are also being evaluated to provide raw water storage;

h. Issued a Request for Proposal of Engineering Services to design a water treatment system for the Koontz Creamery Well. Alternatives being evaluated are direct treatment and use and pumping the well to the Cranberry Reservoir via pipeline;

i. Negotiating easements for a permanent connection for Roops Mill Well #11. Design is at 85% completion;

j. Contracted for installation of ion exchange treatment for nitrate removal at Vo-Tech well with a Spring 2007 completion date;

k. Hired staff to review water billing to determine what portion of the 24% unaccounted for water may be due to accounting and billing errors; and

l. Participated in forming a task force with the County to evaluate and implement joint solutions to the water capacity problem.

m. Drafted amendment to the City's portion of the Carroll County Water and Sewer Plan which describes the means and methods by which the City is addressing the Drought Year Deficit and what sources of additional water sources the City is considering to meet its future water needs.

NOW, THEREFORE, it is this 3rd day of April, 2007, pursuant to Sections 9-252,9-220, 9-221, 9-222, 9-268, and 9-335, **AGREED** between the Water Management Administration and the City of Westminster and **ORDERED** by the Director of the Water Management Administration that:

1. The City shall complete its technical study and meet all other regulatory requirements in support of its application to withdraw additional water from Medford Quarry and submit the completed application to MDE by November 1, 2007.

2. Within sixty (60) days of MDE's decision on the Medford Quarry application, the City shall submit to MDE a final plan and schedule to complete all phases of projects necessary to eliminate the Drought Year Deficit. If the Medford Quarry source, as permitted, does not completely satisfy the Drought Year Deficit, the City shall apply toward the deficit all demonstrated reductions in unaccounted for water due to repairing leaks until the deficit is fully addressed. If, after considering the Medford Quarry permit and reductions in water loss, other projects are needed to fully address the Drought Year Deficit, the City shall complete all water use and appropriation applications for such projects within six months of MDE's Medford Quarry decision.

3. The City shall complete its evaluation of the sources of unaccounted for water and submit a Water Loss Reduction Plan by June 30, 2007. The evaluation shall be submitted to MDE for review and comment.

   a. The evaluation shall identify the average daily quantity and percentage of unaccounted for water believed to be due to:

      i. leaks in the water distribution system;

      ii. accounting errors;

      iii. faulty/under reading customer meters or other meter errors;

      iv. unmetered usage;

      v. fire fighting;

      vi. theft; and

      vii. unknown sources;

   b. The evaluation shall justify the estimates provided in subparagraph a above. Range of estimates shall be provided as dictated by available data; and

c. The Water Loss Reduction Plan shall identify those actions necessary to achieve a goal of ten (10) percent (%) or less unaccounted for water loss by 2012. The plan shall include to a description of capital improvement projects needed to correct significant leaks in the water supply system's infrastructure. The plan shall include methods to comprehensively review the system to identify potential leaks no less than three times per year. The City shall annually submit a water audit following MDE guidelines and report on progress for implementing its plan by February 15 of each year for the preceding year.

4. By June 15, 2007, the City shall develop a Water Conservation Plan to promote the wise use of water to reduce excessive water usage. The Water Conservation Plan shall be submitted to MDE for review and comment. The Water Conservation Plan shall address the following:

a. Recommend changes to City Ordinance to promote establishing conservation measures, such as prohibiting outdoor lawn watering during certain daytime hours, establishing odd/even days for outdoor watering, granting incentives for planting new developments with drought tolerant grasses and using stormwater for outdoor watering;

b. Consider further replacement/rebate programs to promote greater use of low flow fixtures;

c. Establishing a public education and outreach campaign;

d. Conduct water audits of the largest water users; and

e. By February 15 of each year, the City shall annually report on water conservation activities.

5. MDE agrees to review and make timely comments on all plans and reports submitted by the City.

6. Upon signing this Consent Order, the City shall be granted 60,000 gpd as an annual average to allocate in accordance with an Interim Allocation Plan, which the City will develop within 30 days from the date of this Consent Order. A copy of said Interim Allocation Plan will be provided to MDE for its records.

7. MDE shall permit the City to maintain a flow-by of 0.2 cfs for Cranberry Branch and 0.37 cfs for West Branch as long as mandatory water restrictions are in place and until the project constructing the water line from Medford Quarry to the Cranberry Reservoir is complete.

The City shall conduct stream surveys/biological assessments of Cranberry Branch and West Branch in accordance with procedures contained in the 2001 Maryland Biological Stream Survey (MBSS) Sampling Manual. The surveys/assessments shall be made upstream and downstream of each intake site, with the locations proposed by the City and approved by MDE. Sampling of water quality and benthic macroinvertebrates shall be completed during the Spring Index Period (March 1 to May 1, 2007). Sampling of fish and herptofauna and evaluation of stream physical habitats shall be conducted during the Summer Index Period (June 1 to September 30). The City shall submit a comprehensive plan to conduct such monitoring by April 1, 2007 and a final report by December 31, 2007.

8. By June 30, 2007, the City shall have in place the contract(s) necessary to haul a sufficient quantity of water equal to the difference between a system demand of 2.992 mgd and a drought of record year capacity newly calculated to account for the adjustment of the flow-by for Cranberry Branch and West Branch under paragraph 7 of this Consent Order. The City shall submit the revised mass flow analysis at the lower flow-bys along with copy of contract(s) by June 30, 2007.

9. By July 1, 2007, the City shall complete all permit applications needed to make a permanent connection of Well 11. Within 30 days of receiving all permits and completing easement negotiations, the City shall advertise the project for construction. The City shall provide a schedule to MDE for the permanent connection of Well 11 and report to MDE when this well is permanently connected to the system.

10. By March 1, 2008 the City shall submit an updated Capacity Management Plan to MDE for review and approval. The Capacity Management Plan shall be consistent with MDE's Guidance Document (2006). The Capacity Management Plan shall describe in detail how the City will manage its existing and future water commitments, the criteria it will use for distributing future flow allocations, and how it will limit the issuance of building permits and approval of subdivision plats so as not to exceed the capacity of the water supply system. The City shall implement the approved plan.

11. By April 1, 2008 the City shall submit a plan and schedule to ensure that the Water Supply Systems have sufficient capacity to meet all existing demand and demand for future planned growth under drought of record conditions. The plan shall also provide for a water reserve capacity to ensure no water deficit in the future.

12. Upon MDE's approval of the City's plan and schedule, the Department will issue notice to the City allowing it to allocate the remaining 79,000 gpd (of the 139,000 gpd surplus under average hydrologic conditions) as an annual average if the following conditions are met:

a. The City has received all approvals needed to construct the emergency pipelines from Medford Quarry and is on schedule with construction of this conveyance system (*see* paragraph 2 above);

b. The City has entered into all contracts necessary to complete the connection of Well 11 and has begun construction of the connection; and

c. The City is in compliance with all other conditions of this Consent Order.

13. The City shall implement water use restrictions, both voluntary and mandatory, and shall haul water from an approved source in accordance with the City's Drought Management Plan dated July 24, 2006, until all of the projects needed to eliminate the drought year deficit and supply the 139,000 gpd authorized by this Consent Order are completed.

14. MDE reserves the right to require measures to make habitat improvements, revise flow-by conditions (see paragraph 7) or revise contract hauling requirements (see paragraph 8) based on the stream surveys and biological assessments provided under paragraph 7 of this Consent Order.

15. The City waives any right it may have to request a contested case hearing concerning the terms of this Consent Order.

16. Nothing in this Consent Order shall be construed to limit any authority of the Administration to issue any orders, enforce any applicable permits, or to take any action it deems necessary to protect the public health or comfort, or to limit any authority the Administration has or may hereafter be delegated. Any delays in meeting the requirements of this Consent Order, whether justified or not, may result in termination of this Consent Order at the discretion of the Administration. Subject to the two preceding sentences and any amendment of this Consent Order, this Consent Order shall be in effect until the City's long-term measures to ensure an adequate water supply come are completed.

17. The provisions of the Consent Order shall apply to and be binding upon the City of Westminster.

18. It is the intent of the parties that the provisions of this Consent Order are severable and that, should any provisions by declared by a court of law to be invalid or unenforceable, the other provisions shall remain in effect to the maximum extent reasonable.

19. This Consent Order shall be governed by and construed in accordance with the laws of the State of Maryland.

IT IS SO AGREED AND CONSENTED TO:

4/3/07
Date

Virginia Kearney, Acting Director
Water Management Administration

April 3, 2007
Date

The Mayor and Common Council of
Westminster by
Thomas K. Ferguson, Mayor

Approved as to form and legal sufficiency
This 30th day of March, 2007.

Adam Snyder
Assistant Attorney General

CONSENT ORDER
AMENDMENT NO. 1

This Amendment No. 1 is made this 14th day of November, 2008, by and between the State of Maryland, Department of the Environment ("MDE" or "Department"), and The Mayor and Common Council of Westminster ("City").

WHEREAS, on April 3, 2007, the MDE and the City entered into a Consent Order regarding the provision of a safe and adequate water supply for the City and surrounding areas in Carroll County dependent on the City's water supply; and

WHEREAS, a considerable period of time has passed since the signing of that Consent Order and a number of additional actions have been taken by the City and by MDE that warrant the modification of the terms of the original Consent Order; and

WHEREAS, the original purpose of the Consent Order to allow the City to meet its existing water needs while remedial measures were being developed and put online, accommodate a limited amount of interim growth and establish an effective system for managing future capacity in accordance with MOE guidelines remains the same; and

WHEREAS, the factual background contained in the Consent Order remains the same through April 3, 2007; and

WHEREAS, the City has undertaken numerous and substantial actions required pursuant to the Consent Order; and

WHEREAS, the MDE and the City have agreed to modify certain terms and conditions of the Consent Order by executing this Amendment No. 1.

NOW, THEREFORE, it is this 14th day of November, 2008, pursuant to sections 9-252, 9-220, 9-221, 9-222, 9-268, and 9-335, agreed between the Water Management Administration and the City of Westminster and ordered by the Director of the Water Management Administration, this Consent Order be amended as follows:

1. The City has completed its technical study and met all other regulatory requirements in support of its application to withdraw additional water from Medford Quarry and has submitted its completed application to MDE.

2. Item No. 2 in the Consent Order remains unchanged.

3. The City completed its evaluation of the sources of unaccounted for water and submitted its evaluation for review and approval, by MDE. That evaluation included
    a. Leaks in the water distribution system
    b. Faulty/under meter errors
    c. Unmetered usage
    d. Fire fighting
    e. Theft

    All of these areas have been examined, but more work remains. Unaccounted for water totaled about 20% of the water delivered from the City's water treatment plants in 2007. The amount of unaccounted for water equates to almost 600,000 gallons per day. The goal is to reduce this amount in half. The City routinely looks for leaks in its system. The City has also been implementing a water replacement program targeting older areas and problematic areas to reduce the number of main breaks. An antiquated accounting system has been identified as a possible source of the unaccounted for water loss and the most logical source to target initially. A new automated utility billing system has been implemented and will go "live" on or about October 31, 2008. A further evaluation of the unaccounted for water loss will be conducted after sufficient data has been collected from the new system. By March 31, 2010, a Water Loss Reduction Plan will be completed to reach MDE suggested goals in 2012. The City submitted a water audit following MDE guidelines in 2008 and will report on progress in implementing this plan by February 15 of each year for the preceding year. Annual water audits shall accompany the progress report.

4. The City of Westminster, in conjunction with Carroll County and the seven other municipalities in Carroll County, has developed a comprehensive Water Conservation Community Education Plan. In addition, Carroll County and the eight municipalities have executed an April to October voluntary Water Conservation Stage Resolution outlining the water conservation methods to be used by all residents of the County. This consortium is also pursuing the hiring of a staff coordinator to implement this plan. The cost of this position will be shared by the County and the eight municipalities. By February 15, 2009, the City will report on water conservation activities.

5. Item 5 in the Consent Order remains unchanged.

6. The City was granted an additional 60,000 gpd upon the execution of the Consent Order and the Interim Allocation Plan was provided to MDE for its records.

7. Item 7 in the Consent Order remains unchanged.

8. The City executed a contract to haul a sufficient quantity of water equal to the difference between a system demand and the drought of record year capacity. The City submitted this contract to MDE along with the revised mass flow analysis.

9. All permit applications for the permanent connection of Roops Mill Well #11 have been completed and the contract for the construction has been awarded. A notice to proceed was issued effective October 1, 2008. Construction will commence on or about October 17, 2008. The City will provide a construction schedule to MDE for the permanent connection of Well #11 and will report to MDE when the well is permanently connected to the City System.

10. The City has submitted an updated Water Capacity Management Plan. MDE has accepted this plan.

11. Item 11 in the Consent Order remains unchanged. The City provided a plan to improve the capacity of its water system in May of 2008. The City agrees to conduct testing of any source that is to be used to eliminate the existing drought year deficit and complete all other water use and appropriation permit application requirements prior to December 31, 2010. In addition the City is preparing the water resources element to its Comprehensive Plan. The City agrees to submit the updated Comprehensive Plan to MDE for review by October 2009. The City agrees to obtain input from Carroll County in the development of the updated Comprehensive Plan.

12. In consideration of the achievements of the City of Westminster in the development and implementation of the actions contained in this Consent Order, the Department will issue notice to the City allowing the allocation of an additional 20,000 gpd upon execution of the Consent Order Amendment #1.

13. MDE will allocate an additional 20,000 gpd when the following conditions are met:

    a. Medford Quarry pipeline construction is operational.

b. The review of the studies conducted in Item # 7 has been completed and MDE has issued the Medford Quarry permit.

14. MDE will allocate the remaining 39,000 gpd when:

    a. Roops Mill Well #11 is operational as a permanent source of supply.

    b. The City has committed funding, completed applications for all needed MDE permits, selected a contractor and established a construction schedule for bringing on-line any sources in addition to Medford Quarry and Roops Mill Well # 11, as needed to eliminate the drought year deficit.

15. The City and MDE will continue discussions on the testing protocol for the Hydes Quarry water supply for use as a back-up to Little Pipe Creek and seek final resolution prior to April of 2009. The purpose of the testing is to determine Hyde's quarry refill capacity, to quantify the contribution from Little Pipe Creek and determine the suitability of the source for its proposed use. This does not preclude consideration of Little Pipe Creek as a source of operational flexibility.

16. Item 13 in the Consent Order is renumbered as Item 16.

17. Item 14 in the Consent Order is renumbered as Item 17.

18. Item. 15 in the Consent Order is renumbered as Item 18.

19. Item 16 in the Consent Order is renumbered as Item 19.

20. Item 17 in the Consent Order is renumbered as Item 20.

21. Item 18 in the Consent Order is renumbered as Item 21.

22. Item 19 in the Consent Order is renumbered as Item 22.

23. Notwithstanding anything in the Consent Order to the contrary, the terms and conditions of this Addendum shall supersede any terms of the Consent Order in conflict herewith.

24. All other terms and provisions of the Consent Order dated April 3, 2007, by and between the parties shall remain in full force and effect except as modified herein or superseded hereby.

AGREED AND CONSENTED TO:

Water Management Administration
State of Maryland

Nov 14, 2008
Date

By: _____
Jay G. Sakai, Director

The Mayor and Common Council
of Westminster

November 3, 2008
Date

By: _____
Thomas K. Ferguson, Mayor

Approved as to form and
legal sufficiency this ~~3rd~~ 12th
day of November, 2008.

_____
Assistant Attorney General

Approved as to form and
legal sufficiency this 3rd
day of November, 2008.

_____
John B. Walsh, Jr., Esq.
City Attorney

Appendix B – Historical Water Production and Treatment Data

Table B-1: Raw Water Sources

Month	Hull Creek (MG)	Cranberry Branch (MG)	Raw Reservoir (MG)	Other (MG)	Total (MG)	Days Per Month	Hull Creek (mgd)	Cranberry Branch (mgd)	Raw Reservoir (mgd)	Other (mgd)	Total (mgd)
Jan-13	20.913	19.424	5.599	0.000	45.936	31	0.675	0.627	0.181	0.000	1.482
Feb-13	17.451	18.724	3.707	0.000	39.882	28	0.623	0.669	0.132	0.000	1.424
Mar-13	17.180	21.583	4.186	0.000	42.949	31	0.554	0.696	0.135	0.000	1.385
Apr-13	25.314	21.040	3.180	0.000	49.534	30	0.844	0.701	0.106	0.000	1.651
May-13	28.497	23.211	4.790	0.000	56.498	31	0.919	0.749	0.155	0.000	1.823
Jun-13	21.227	13.865	18.993	0.000	54.086	30	0.708	0.462	0.633	0.000	1.803
Jul-13	30.663	19.753	6.712	0.000	57.128	31	0.989	0.637	0.217	0.000	1.843
Aug-13	29.294	23.605	3.798	0.000	56.697	31	0.945	0.761	0.123	0.000	1.829
Sep-13	19.112	17.430	15.238	0.000	51.779	30	0.637	0.581	0.508	0.000	1.726
Oct-13	26.565	13.582	10.475	0.000	50.622	31	0.857	0.438	0.338	0.000	1.633
Nov-13	23.795	15.568	1.008	0.000	40.371	30	0.793	0.519	0.034	0.000	1.346
Dec-13	16.497	13.886	11.319	0.000	41.702	31	0.532	0.448	0.365	0.000	1.345
Jan-14	20.865	16.920	5.682	0.000	43.467	31	0.673	0.546	0.183	0.000	1.402
Feb-14	9.091	16.544	16.177	0.000	41.812	28	0.325	0.591	0.578	0.000	1.493
Mar-14	15.295	21.846	6.412	0.000	43.552	31	0.493	0.705	0.207	0.000	1.405
Apr-14	15.186	24.985	6.070	0.000	46.240	30	0.506	0.833	0.202	0.000	1.541
May-14	13.059	31.134	5.978	0.000	50.171	31	0.421	1.004	0.193	0.000	1.618
Jun-14	18.896	19.975	8.081	0.000	46.952	30	0.630	0.666	0.269	0.000	1.565
Jul-14	24.561	17.709	7.626	0.000	49.895	31	0.792	0.571	0.246	0.000	1.610
Aug-14	26.109	15.832	5.505	0.000	47.446	31	0.842	0.511	0.178	0.000	1.531
Sep-14	25.358	24.256	0.171	0.000	49.784	30	0.845	0.809	0.006	0.000	1.659
Oct-14	29.169	14.353	2.493	0.000	46.015	31	0.941	0.463	0.080	0.000	1.484
Nov-14	23.306	17.154	1.328	0.000	41.788	30	0.777	0.572	0.044	0.000	1.393
Dec-14	22.226	17.324	2.678	0.000	42.228	31	0.717	0.559	0.086	0.000	1.362
Jan-15	13.858	17.316	11.801	0.000	42.975	31	0.447	0.559	0.381	0.000	1.386
Feb-15	1.613	25.238	16.463	0.000	43.314	28	0.058	0.901	0.588	0.000	1.547
Mar-15	11.478	17.522	17.109	0.000	46.109	31	0.370	0.565	0.552	0.000	1.487
Apr-15	20.926	25.328	1.480	0.000	47.734	30	0.698	0.844	0.049	0.000	1.591
May-15	20.401	23.437	11.049	0.000	54.887	31	0.658	0.756	0.356	0.000	1.771
Jun-15	12.106	12.580	21.855	0.000	46.541	30	0.404	0.419	0.729	0.000	1.551
Jul-15	25.955	20.771	2.305	0.000	49.031	31	0.837	0.670	0.074	0.000	1.582
Aug-15	23.476	19.094	9.987	0.000	52.557	31	0.757	0.616	0.322	0.000	1.695
Sep-15	18.616	30.128	0.000	0.000	48.744	30	0.621	1.004	0.000	0.000	1.625
Oct-15	29.270	17.834	0.000	0.000	47.104	31	0.944	0.575	0.000	0.000	1.519
Nov-15	21.469	21.015	0.000	0.000	42.484	30	0.716	0.701	0.000	0.000	1.416
Dec-15	20.336	22.620	0.000	0.000	42.956	31	0.656	0.730	0.000	0.000	1.386
Averages											
2013	23.042	18.472	7.417	0.000	48.932	30.417	0.76	0.61	0.23	0.00	1.61
2014	20.260	19.836	5.683	0.000	45.779	30.417	0.66	0.66	0.19	0.00	1.51
2015	18.292	21.074	7.671	0.000	47.036	30.417	0.60	0.70	0.25	0.00	1.55

Table B-2: Cranberry WTP Treated Water

Month	Total Delivered (MG)	Backwash Water (MG)	Total Produced (MG)	Days Per Month	Total Delivered (mgd)	Backwash Water (mgd)	Total Produced (mgd)
Jan-13	45.707	0.213	45.920	31.000	1.474	0.007	1.510
Feb-13	39.863	0.229	40.092	28.000	1.424	0.008	1.318
Mar-13	42.745	0.174	42.919	31.000	1.379	0.006	1.411
Apr-13	48.929	0.179	49.108	30.000	1.631	0.006	1.614
May-13	55.986	0.208	56.194	31.000	1.806	0.007	1.847
Jun-13	54.232	0.138	54.370	30.000	1.808	0.005	1.787
Jul-13	57.345	0.197	57.542	31.000	1.850	0.006	1.892
Aug-13	56.808	0.135	56.943	31.000	1.833	0.004	1.872
Sep-13	51.495	0.257	51.753	30.000	1.717	0.008	1.701
Oct-13	50.439	0.134	50.573	31.000	1.627	0.004	1.662
Nov-13	40.327	0.200	40.527	30.000	1.344	0.007	1.332
Dec-13	41.861	0.336	42.196	31.000	1.350	0.011	1.387
Jan-14	43.368	0.184	43.552	31.000	1.399	0.006	1.432
Feb-14	41.713	0.188	41.901	28.000	1.490	0.006	1.377
Mar-14	43.194	0.261	43.455	31.000	1.393	0.009	1.429
Apr-14	46.123	0.168	46.291	30.000	1.537	0.006	1.522
May-14	50.303	0.160	50.462	31.000	1.623	0.005	1.659
Jun-14	47.094	0.155	47.250	30.000	1.570	0.005	1.553
Jul-14	49.914	0.146	50.060	31.000	1.610	0.005	1.646
Aug-14	47.583	0.110	47.693	31.000	1.535	0.004	1.568
Sep-14	49.600	0.180	49.780	30.000	1.653	0.006	1.636
Oct-14	45.946	0.230	46.175	31.000	1.482	0.008	1.518
Nov-14	41.975	0.225	42.200	30.000	1.399	0.007	1.387
Dec-14	42.157	0.147	42.304	31.000	1.360	0.005	1.391
Jan-15	42.731	0.243	42.974	31.000	1.378	0.008	1.413
Feb-15	43.339	0.273	43.612	28.000	1.548	0.009	1.434
Mar-15	46.282	0.456	46.737	31.000	1.493	0.015	1.536
Apr-15	47.102	0.268	47.370	30.000	1.570	0.009	1.557
May-15	54.932	0.302	55.234	31.000	1.772	0.010	1.816
Jun-15	46.928	0.410	47.338	30.000	1.564	0.013	1.556
Jul-15	49.224	0.336	49.560	31.000	1.588	0.011	1.629
Aug-15	51.902	0.334	52.236	31.000	1.674	0.011	1.717
Sep-15	48.418	0.660	49.078	30.000	1.614	0.022	1.613
Oct-15	46.792	0.382	47.173	31.000	1.509	0.013	1.551
Nov-15	41.883	0.218	42.101	30.000	1.396	0.007	1.384
Dec-15	42.896	0.257	43.153	31.000	1.384	0.008	1.419
Averages							
2013	48.81	0.20	49.01	30	1.604	0.007	1.611
2014	45.75	0.18	45.93	30	1.504	0.006	1.510
2015	46.87	0.34	47.21	30	1.541	0.011	1.552

Notes:
1. Backwash water is finished water not distributed to customers.

Table B-3: Cranberry System We Cranberry System Wells

Month	Well 3 (MG)	Well 4 (MG)	Well 5 (MG)	Well 5 Backwash Water (MG)	Well 5 To System (MG)	Well 6 (MG)	Well 7 (MG)	Well 7 Backwash Water (MG/Month)	Well 7 To System (MG)	Well 8 (MG)	Well 9 & 10 (MG)	Well 11 (MG)	Days Per Month	Well 3 (mgd)	Well 4 (mgd)	Well 5 (mgd)	Well 5 to System (mgd)	Well 6 (mgd)	Well 7 (mgd)	Well 7 to System (mgd)	Well 8 (mgd)	Well 9 & 10 (mgd)	Well 11 (mgd)
Jan-13	2.292	1.403	7.559	0.001	7.559	2.778	4.676	0.314	4.362	4.516	3.014	3.864	31	0.074	0.045	0.244	0.244	0.090	0.151	0.141	0.146	0.097	0.125
Feb-13	2.207	1.138	6.418	0.004	6.418	2.518	4.321	0.282	4.039	3.994	2.732	3.510	28	0.079	0.041	0.229	0.229	0.090	0.154	0.144	0.143	0.098	0.125
Mar-13	2.409	1.277	7.821	0.001	7.821	2.796	4.792	0.312	4.480	3.659	3.029	3.716	31	0.078	0.041	0.252	0.252	0.090	0.155	0.145	0.118	0.098	0.120
Apr-13	2.379	1.131	7.885	0.001	7.885	2.424	4.499	0.126	4.373	4.142	3.403	3.815	30	0.079	0.038	0.263	0.263	0.081	0.150	0.146	0.138	0.113	0.127
May-13	2.464	1.337	5.975	0.001	5.975	2.660	4.826	0.337	4.489	3.831	3.575	3.822	31	0.079	0.043	0.193	0.193	0.086	0.156	0.145	0.124	0.115	0.123
Jun-13	2.360	1.331	6.312	0.000	6.312	2.559	4.686	0.299	4.387	3.291	3.449	3.687	30	0.079	0.044	0.210	0.210	0.085	0.156	0.146	0.110	0.115	0.123
Jul-13	2.455	1.325	6.409	0.000	6.409	2.354	4.830	0.318	4.512	4.302	3.416	3.568	31	0.079	0.043	0.207	0.207	0.076	0.156	0.146	0.139	0.110	0.115
Aug-13	2.404	1.275	6.603	0.001	6.603	2.372	4.827	0.313	4.514	4.226	3.493	3.687	31	0.078	0.041	0.213	0.213	0.077	0.156	0.146	0.136	0.113	0.119
Sep-13	2.293	1.159	6.397	0.000	6.397	2.065	4.757	0.320	4.437	4.052	3.222	3.206	30	0.076	0.039	0.213	0.213	0.069	0.159	0.148	0.135	0.107	0.107
Oct-13	2.362	1.122	4.584	0.000	4.584	2.774	4.735	0.315	4.420	3.057	3.214	3.353	31	0.076	0.036	0.148	0.148	0.089	0.153	0.143	0.099	0.104	0.108
Nov-13	2.288	1.626	6.235	0.001	6.235	2.907	4.677	0.280	4.397	4.306	2.978	3.327	30	0.076	0.054	0.208	0.208	0.097	0.156	0.147	0.144	0.099	0.111
Dec-13	2.363	2.142	4.572	0.000	4.572	3.026	5.323	0.299	5.024	3.780	3.237	3.499	31	0.076	0.069	0.147	0.147	0.098	0.172	0.162	0.122	0.104	0.113
Jan-14	1.176	2.202	5.738	0.000	5.738	3.100	5.662	0.282	5.380	3.984	3.202	3.544	31	0.038	0.071	0.185	0.185	0.100	0.183	0.174	0.129	0.103	0.114
Feb-14	0.276	1.908	5.229	0.001	5.229	2.749	4.588	0.249	4.339	3.544	0.468	0.412	28	0.010	0.068	0.187	0.187	0.098	0.164	0.155	0.127	0.017	0.015
Mar-14	0.978	2.212	6.385	0.001	6.385	3.071	5.646	0.272	5.374	3.207	1.469	3.518	31	0.032	0.071	0.206	0.206	0.099	0.182	0.173	0.103	0.047	0.113
Apr-14	1.384	2.092	5.273	0.001	5.273	3.039	5.422	0.253	5.169	2.347	2.648	3.407	30	0.046	0.070	0.176	0.176	0.101	0.181	0.172	0.078	0.088	0.114
May-14	2.810	2.086	5.237	0.001	5.237	3.168	5.399	0.265	5.134	3.492	3.617	3.583	31	0.091	0.067	0.169	0.169	0.102	0.174	0.166	0.113	0.117	0.116
Jun-14	2.805	2.216	5.715	0.001	5.715	2.304	5.416	0.275	5.141	3.177	3.394	3.444	30	0.093	0.074	0.190	0.190	0.077	0.181	0.171	0.106	0.113	0.115
Jul-14	2.971	2.313	5.802	0.001	5.802	3.193	5.569	0.280	5.289	1.458	2.755	3.494	31	0.096	0.075	0.187	0.187	0.103	0.180	0.171	0.047	0.089	0.113
Aug-14	2.940	2.203	7.655	0.001	7.655	3.163	4.921	0.423	4.498	0.000	2.803	3.553	31	0.095	0.071	0.247	0.247	0.102	0.159	0.145	0.000	0.090	0.115
Sep-14	2.651	2.086	8.003	0.000	8.003	3.080	3.214	0.202	3.012	0.000	3.181	3.383	30	0.088	0.070	0.267	0.267	0.103	0.107	0.100	0.000	0.106	0.113
Oct-14	2.824	2.085	8.142	0.001	8.142	3.190	3.375	0.239	3.136	0.000	3.147	3.320	31	0.091	0.067	0.263	0.263	0.103	0.109	0.101	0.000	0.102	0.107
Nov-14	2.706	2.005	7.792	0.000	7.792	3.071	4.219	0.275	3.944	0.000	2.854	2.950	30	0.090	0.067	0.260	0.260	0.102	0.141	0.131	0.000	0.095	0.098
Dec-14	2.762	2.047	7.647	0.000	7.647	3.148	4.250	0.160	4.090	0.000	2.304	3.313	31	0.089	0.066	0.247	0.247	0.102	0.137	0.132	0.000	0.074	0.107
Jan-15	2.686	2.030	7.523	0.001	7.523	3.195	4.371	0.275	4.096	0.000	2.163	3.439	31	0.087	0.065	0.243	0.243	0.103	0.141	0.132	0.000	0.070	0.111
Feb-15	2.366	1.704	6.290	0.000	6.290	2.782	3.957	0.250	3.707	0.000	1.826	2.996	28	0.085	0.061	0.225	0.225	0.099	0.141	0.132	0.000	0.065	0.107
Mar-15	2.613	1.550	7.852	0.001	7.852	3.204	4.382	0.334	4.048	0.000	2.287	3.416	31	0.084	0.050	0.253	0.253	0.103	0.141	0.131	0.000	0.074	0.110
Apr-15	2.617	1.830	7.257	0.001	7.257	3.075	4.267	0.265	4.002	0.000	2.388	3.155	30	0.087	0.061	0.242	0.242	0.102	0.142	0.133	0.000	0.080	0.105
May-15	2.654	1.688	7.846	0.001	7.846	3.170	4.399	0.275	4.124	0.000	2.483	2.147	31	0.086	0.054	0.253	0.253	0.102	0.142	0.133	0.000	0.080	0.069
Jun-15	2.592	1.856	7.537	0.001	7.537	3.042	4.262	0.270	3.992	30.778	1.898	2.821	30	0.086	0.062	0.251	0.251	0.101	0.142	0.133	1.026	0.063	0.094
Jul-15	2.533	1.972	7.644	0.004	7.644	3.151	4.361	0.277	4.084	3.450	1.976	3.480	31	0.082	0.064	0.247	0.247	0.102	0.141	0.132	0.111	0.064	0.112
Aug-15	2.715	1.881	8.203	0.004	8.203	1.918	4.391	0.276	4.115	3.684	1.496	3.410	31	0.088	0.061	0.265	0.265	0.062	0.142	0.133	0.119	0.048	0.110
Sep-15	2.509	1.806	7.204	0.004	7.204	0.760	4.166	0.387	3.779	3.399	3.002	3.199	30	0.084	0.060	0.240	0.240	0.025	0.139	0.126	0.113	0.100	0.107
Oct-15	2.491	1.918	6.865	0.004	6.865	2.967	4.388	1.067	3.321	3.640	3.109	3.291	31	0.080	0.062	0.221	0.221	0.096	0.142	0.107	0.117	0.100	0.106
Nov-15	2.632	1.840	6.840	0.004	6.840	2.579	4.260	0.306	3.954	3.574	0.781	3.219	30	0.088	0.061	0.228	0.228	0.086	0.142	0.132	0.119	0.026	0.107
Dec-15	2.694	1.861	6.884	0.005	6.884	2.943	4.369	0.272	4.097	3.471	0.000	3.291	31	0.087	0.060	0.222	0.222	0.095	0.141	0.132	0.112	0.000	0.106
Averages																							
2013	2.356	1.356	6.397	0.001	6.396	2.603	4.746	0.293	4.453	3.930	3.230	3.588	30.000	0.078	0.045	0.211	0.211	0.086	0.156	0.146	0.129	0.106	0.117
2014	2.190	2.121	6.551	0.001	6.550	3.023	4.807	0.265	4.542	1.767	2.653	3.160	30.000	0.072	0.070	0.216	0.216	0.099	0.159	0.150	0.059	0.087	0.112
2015	2.583	1.810	7.311	0.002	7.309	2.732	4.298	0.355	3.943	4.333	1.951	3.155	30.000	0.085	0.060	0.241	0.241	0.090	0.142	0.130	0.066	0.064	0.104

Table B-4: Wakefield Valley Wells

Month	Well 1 (MG)	Well 2 (MG)	Total Wakefield Produced (MG)	Wakefield Backwash Water (MG)	Total Delivered (MG)	Days Per Month	Total Delivered (mgd)	Total Produced (mgd)
Jan-13	2.505	3.681	6.186	0.001	6.18563	31	0.1995	0.1996
Feb-13	2.403	2.711	5.114	0.005	5.10917	28	0.1825	0.1827
Mar-13	2.377	2.216	4.593	0.001	4.59261	31	0.1481	0.1482
Apr-13	0.000	0.000	0.000	0.000	0.00000	30	0.0000	0.0000
May-13	0.000	0.000	0.000	0.000	0.00000	31	0.0000	0.0000
Jun-13	0.000	0.000	0.000	0.000	0.00000	30	0.0000	0.0000
Jul-13	0.000	0.000	0.000	0.000	0.00000	31	0.0000	0.0000
Aug-13	0.000	0.000	0.000	0.000	0.00000	31	0.0000	0.0000
Sep-13	2.991	0.559	3.550	0.001	3.54936	30	0.1183	0.1183
Oct-13	2.303	3.714	6.017	0.001	6.01670	31	0.1941	0.1941
Nov-13	2.530	2.900	5.430	0.001	5.42951	30	0.1810	0.1810
Dec-13	2.189	4.240	6.429	0.001	6.42845	31	0.2074	0.2074
Jan-14	2.014	4.741	6.756	0.001	6.75501	31	0.2179	0.2179
Feb-14	1.724	4.155	5.880	0.001	5.87909	28	0.2100	0.2100
Mar-14	2.111	4.515	6.626	0.001	6.62504	31	0.2137	0.2137
Apr-14	2.037	4.431	6.468	0.001	6.46773	30	0.2156	0.2156
May-14	2.504	3.321	5.825	0.001	5.82470	31	0.1879	0.1879
Jun-14	2.188	3.962	6.150	0.001	6.14919	30	0.2050	0.2050
Jul-14	2.385	3.788	6.173	0.001	6.17272	31	0.1991	0.1991
Aug-14	2.388	3.809	6.197	0.001	6.19627	31	0.1999	0.1999
Sep-14	2.065	4.265	6.329	0.001	6.32879	30	0.2110	0.2110
Oct-14	2.417	4.039	6.456	0.001	6.45586	31	0.2083	0.2083
Nov-14	2.028	4.370	6.398	0.001	6.39738	30	0.2132	0.2133
Dec-14	2.706	2.916	5.621	0.001	5.62085	31	0.1813	0.1813
Jan-15	2.503	3.366	5.868	0.001	5.86773	31	0.1893	0.1893
Feb-15	2.230	3.156	5.386	0.001	5.38565	28	0.1923	0.1924
Mar-15	2.442	3.527	5.969	0.001	5.96843	31	0.1925	0.1925
Apr-15	2.530	3.010	5.540	0.001	5.53929	30	0.1846	0.1847
May-15	2.642	3.055	5.698	0.001	5.69710	31	0.1838	0.1838
Jun-15	2.396	3.389	5.785	0.001	5.78473	30	0.1928	0.1928
Jul-15	2.272	3.494	5.766	0.010	5.75686	31	0.1857	0.1860
Aug-15	2.422	3.469	5.891	0.006	5.88517	31	0.1898	0.1900
Sep-15	2.443	2.928	5.371	0.006	5.36472	30	0.1788	0.1790
Oct-15	2.618	3.006	5.625	0.005	5.61979	31	0.1813	0.1814
Nov-15	2.561	2.882	5.443	0.005	5.43814	30	0.1813	0.1814
Dec-15	2.520	3.305	5.825	0.005	5.81946	31	0.1877	0.1879
Averages								
2013	2.471	2.860	5.331	0.001	5.330	30	0.17522	0.17526
2014	2.214	4.026	6.240	0.001	6.239	30	0.20511	0.20513
2015	2.465	3.216	5.681	0.003	5.678	30	0.18665	0.18674

Notes:
1. Wakefield Backwash water is finished water used to backwash the filters.
2. Total delivered = Total Produced - Backwash Water

Table B-5: Sludge to WWTP

Month	Sludge to WWTP (gal)	Days Per Month	Sludge to WWTP (gpd)
Jan-13	76,490	31	2,467
Feb-13	0.00	28	0.00
Mar-13	0.00	31	0.00
Apr-13	418,320	30	13,944
May-13	203,460	31	6,563
Jun-13	0.00	30	0.00
Jul-13	109,040	31	3,517
Aug-13	0.00	31	0.00
Sep-13	255,840	30	8,528
Oct-13	245,520	31	7,920
Nov-13	0.00	30	0.00
Dec-13	64,590	31	2,084
Jan-14	0.00	31	0.00
Feb-14	0.00	28	0.00
Mar-14	294,240	31	9,492
Apr-14	194,360	30	6,479
May-14	5,450	31	176
Jun-14	0.00	30	0.00
Jul-14	0.00	31	0.00
Aug-14	0.00	31	0.00
Sep-14	464,710	30	15,490
Oct-14	430	31	14
Nov-14	0.00	30	0.00
Dec-14	72,910	31	2,352
Jan-15	257,270	31	8,299
Feb-15	0.00	28	0.00
Mar-15	16,730	31	540
Apr-15	657,740	30	21,925
May-15	0.00	31	0.00
Jun-15	23,750	30	792
Jul-15	0.00	31	0.00
Aug-15	909,130	31	29,327
Sep-15	769,080	30	25,636
Oct-15	329,310	31	10,623
Nov-15	409,760	30	13,659
Dec-15	0.00	31	0.00
Averages			
2013	114,438	30	3,752
2014	86,008	30	2,834
2015	281,064	30	9,233

Table B-6: Cranberry and Wakefield Valley Monthly and Average Daily Water Production

Month	Raw Water to Cranberry WTP	Well 3 (MG)	Well 4 (MG)	Well 5 (MG)	Well 6 (MG)	Well 7 (MG)	Well 8 (MG)	Well 9 & 10 (MG)	Well 11 (MG)	Cranberry Produced Water (MG)	Days Per Month	Cranberry Daily Water Produced (mgd)	Wakefield Produced Water (MG)	Wakefield Daily Water Produced (mgd)	Total Average Daily Water (mgd)
Jan-13	45.92	2.292	1.403	7.559	2.778	4.676	4.516	3.014	3.864	76.022	31	2.452	6.186	0.1996	2.652
Feb-13	40.09	2.207	1.138	6.418	2.518	4.321	3.994	2.732	3.510	66.930	28	2.390	5.114	0.1827	2.573
Mar-13	42.92	2.409	1.277	7.821	2.796	4.792	3.659	3.029	3.716	72.418	31	2.336	4.593	0.1482	2.484
Apr-13	49.11	2.379	1.131	7.885	2.424	4.499	4.142	3.403	3.815	78.787	30	2.626	0.00	0.00	2.626
May-13	56.19	2.464	1.337	5.975	2.660	4.826	3.831	3.575	3.822	84.684	31	2.732	0.00	0.00	2.732
Jun-13	54.37	2.360	1.331	6.312	2.559	4.686	3.291	3.449	3.687	82.044	30	2.735	0.00	0.00	2.735
Jul-13	57.54	2.455	1.325	6.409	2.354	4.830	4.302	3.416	3.568	86.202	31	2.781	0.00	0.00	2.781
Aug-13	56.94	2.404	1.275	6.603	2.372	4.827	4.226	3.493	3.687	85.830	31	2.769	0.00	0.00	2.769
Sep-13	51.75	2.293	1.159	6.397	2.065	4.757	4.052	3.222	3.206	78.904	30	2.630	3.550	0.1183	2.748
Oct-13	50.57	2.362	1.122	4.584	2.774	4.735	3.057	3.214	3.353	75.774	31	2.444	6.017	0.1941	2.638
Nov-13	40.53	2.288	1.626	6.235	2.907	4.677	4.306	2.978	3.327	68.871	30	2.296	5.430	0.1810	2.477
Dec-13	42.20	2.363	2.142	4.572	3.026	5.323	3.780	3.237	3.499	70.138	31	2.263	6.429	0.2074	2.470
Jan-14	43.55	1.176	2.202	5.738	3.100	5.662	3.984	3.202	3.544	72.159	31	2.328	6.756	0.2179	2.546
Feb-14	41.90	0.276	1.908	5.229	2.749	4.588	3.544	0.468	0.412	61.074	28	2.181	5.880	0.2100	2.391
Mar-14	43.46	0.978	2.212	6.385	3.071	5.646	3.207	1.469	3.518	69.941	31	2.256	6.626	0.2137	2.470
Apr-14	46.29	1.384	2.092	5.273	3.039	5.422	2.347	2.648	3.407	71.905	30	2.397	6.468	0.2156	2.612
May-14	50.46	2.810	2.086	5.237	3.168	5.399	3.492	3.617	3.583	79.854	31	2.576	5.825	0.1879	2.764
Jun-14	47.25	2.805	2.216	5.715	2.304	5.416	3.177	3.394	3.444	75.720	30	2.524	6.150	0.2050	2.729
Jul-14	50.06	2.971	2.313	5.802	3.193	5.569	1.458	2.755	3.494	77.614	31	2.504	6.173	0.1991	2.703
Aug-14	47.69	2.940	2.203	7.655	3.163	4.921	0.00	2.803	3.553	74.930	31	2.417	6.197	0.1999	2.617
Sep-14	49.78	2.651	2.086	8.003	3.080	3.214	0.00	3.181	3.383	75.379	30	2.513	6.329	0.2110	2.724
Oct-14	46.18	2.824	2.085	8.142	3.190	3.375	0.00	3.147	3.320	72.258	31	2.331	6.456	0.2083	2.539
Nov-14	42.20	2.706	2.005	7.792	3.071	4.219	0.00	2.854	2.950	67.796	30	2.260	6.398	0.2133	2.473
Dec-14	42.30	2.762	2.047	7.647	3.148	4.250	0.00	2.304	3.313	67.775	31	2.186	5.621	0.1813	2.368
Jan-15	42.97	2.686	2.030	7.523	3.195	4.371	0.00	2.163	3.439	68.380	31	2.206	5.868	0.1893	2.395
Feb-15	43.61	2.366	1.704	6.290	2.782	3.957	0.00	1.826	2.996	65.533	28	2.340	5.386	0.1924	2.533
Mar-15	46.74	2.613	1.550	7.852	3.204	4.382	0.00	2.287	3.416	72.042	31	2.324	5.969	0.1925	2.516
Apr-15	47.37	2.617	1.830	7.257	3.075	4.267	0.00	2.388	3.155	71.958	30	2.399	5.540	0.1847	2.583
May-15	55.23	2.654	1.688	7.846	3.170	4.399	0.00	2.483	2.147	79.621	31	2.568	5.698	0.1838	2.752
Jun-15	47.34	2.592	1.856	7.537	3.042	4.262	30.778	1.898	2.821	102.123	30	3.404	5.785	0.1928	3.597
Jul-15	49.56	2.533	1.972	7.644	3.151	4.361	3.450	1.976	3.480	78.127	31	2.520	5.766	0.1860	2.706
Aug-15	52.24	2.715	1.881	8.203	1.918	4.391	3.684	1.496	3.410	79.934	31	2.579	5.891	0.1900	2.769
Sep-15	49.08	2.509	1.806	7.204	0.760	4.166	3.399	3.002	3.199	75.124	30	2.504	5.371	0.1790	2.683
Oct-15	47.17	2.491	1.918	6.865	2.967	4.388	3.640	3.109	3.291	75.844	31	2.447	5.625	0.1814	2.628
Nov-15	42.10	2.632	1.840	6.840	2.579	4.260	3.574	0.781	3.219	67.826	30	2.261	5.443	0.1814	2.442
Dec-15	43.15	2.694	1.861	6.884	2.943	4.369	3.471		3.291	68.667	31	2.215	5.825	0.1879	2.403
Averages															
2013	49.01	2.356	1.356	6.397	2.603	4.746	3.930	3.230	3.588	77.217	30	2.538	5.331	0.176	2.714
2014	45.93	2.190	2.121	6.551	3.023	4.807	1.767	2.653	3.160	72.201	30	2.373	6.240	0.205	2.578
2015	47.21	2.583	1.810	7.311	2.732	4.298	4.333	1.951	3.155	75.387	30	2.481	5.681	0.187	2.667

Table B-7: Cranberry and Wakefield Valley Monthly and Average Daily Water Delivered To Water System

Month	Cranberry WTP Water Delivered (MG)	Well 3 (MG)	Well 4 (MG)	Well 5 To System (MG)	Well 6 (MG)	Well 7 to System (MG)	Well 8 (MG)	Well 9 & 10 (MG)	Well 11 (MG)	Monthly Cranberry Delivered Water	Days Per Month	Cranberry Daily Water Usage (mgd)	Monthly Wakefield Delivered Water (mgd)	Wakefield Daily Water Usage (mgd)	Total Daily Water Usage (mgd)
Jan-13	45.71	2.292	1.403	7.559	2.778	4.362	4.516	3.014	3.864	75.495	31	2.435	6.186	0.200	2.635
Feb-13	39.86	2.207	1.138	6.418	2.518	4.039	3.994	2.732	3.510	66.420	28	2.372	5.109	0.182	2.555
Mar-13	42.75	2.409	1.277	7.821	2.796	4.480	3.659	3.029	3.716	71.932	31	2.320	4.593	0.148	2.469
Apr-13	48.93	2.379	1.131	7.885	2.424	4.373	4.142	3.403	3.815	78.483	30	2.616	0.00	0.00	2.616
May-13	55.99	2.464	1.337	5.975	2.660	4.489	3.831	3.575	3.822	84.139	31	2.714	0.00	0.00	2.714
Jun-13	54.23	2.360	1.331	6.312	2.559	4.387	3.291	3.449	3.687	81.608	30	2.720	0.00	0.00	2.720
Jul-13	57.34	2.455	1.325	6.409	2.354	4.512	4.302	3.416	3.568	85.687	31	2.764	0.00	0.00	2.764
Aug-13	56.81	2.404	1.275	6.603	2.372	4.514	4.226	3.493	3.687	85.382	31	2.754	0.00	0.00	2.754
Sep-13	51.50	2.293	1.159	6.397	2.065	4.437	4.052	3.222	3.206	78.326	30	2.611	3.549	0.118	2.729
Oct-13	50.44	2.362	1.122	4.584	2.774	4.420	3.057	3.214	3.353	75.325	31	2.430	6.017	0.194	2.624
Nov-13	40.33	2.288	1.626	6.235	2.907	4.397	4.306	2.978	3.327	68.391	30	2.280	5.430	0.181	2.461
Dec-13	41.86	2.363	2.142	4.572	3.026	5.024	3.780	3.237	3.499	69.504	31	2.242	6.428	0.207	2.449
Jan-14	43.37	1.176	2.202	5.738	3.100	5.380	3.984	3.202	3.544	71.693	31	2.313	6.755	0.218	2.531
Feb-14	41.71	0.276	1.908	5.229	2.749	4.339	3.544	0.468	0.412	60.637	28	2.166	5.879	0.210	2.376
Mar-14	43.19	0.978	2.212	6.385	3.071	5.374	3.207	1.469	3.518	69.407	31	2.239	6.625	0.214	2.453
Apr-14	46.12	1.384	2.092	5.273	3.039	5.169	2.347	2.648	3.407	71.484	30	2.383	6.468	0.216	2.598
May-14	50.30	2.810	2.086	5.237	3.168	5.134	3.492	3.617	3.583	79.430	31	2.562	5.825	0.188	2.750
Jun-14	47.09	2.805	2.216	5.715	2.304	5.141	3.177	3.394	3.444	75.290	30	2.510	6.149	0.205	2.715
Jul-14	49.91	2.971	2.313	5.802	3.193	5.289	1.458	2.755	3.494	77.188	31	2.490	6.173	0.199	2.689
Aug-14	47.58	2.940	2.203	7.655	3.163	4.498	0.00	2.803	3.553	74.397	31	2.400	6.196	0.200	2.600
Sep-14	49.60	2.651	2.086	8.003	3.080	3.012	0.00	3.181	3.383	74.997	30	2.500	6.329	0.211	2.711
Oct-14	45.95	2.824	2.085	8.142	3.190	3.136	0.00	3.147	3.320	71.790	31	2.316	6.456	0.208	2.524
Nov-14	41.97	2.706	2.005	7.792	3.071	3.944	0.00	2.854	2.950	67.297	30	2.243	6.397	0.213	2.456
Dec-14	42.16	2.762	2.047	7.647	3.148	4.090	0.00	2.304	3.313	67.468	31	2.176	5.621	0.181	2.358
Jan-15	42.73	2.686	2.030	7.523	3.195	4.096	0.00	2.163	3.439	67.862	31	2.189	5.868	0.189	2.378
Feb-15	43.34	2.366	1.704	6.290	2.782	3.707	0.00	1.826	2.996	65.010	28	2.322	5.386	0.192	2.514
Mar-15	46.28	2.613	1.550	7.852	3.204	4.048	0.00	2.287	3.416	71.252	31	2.298	5.968	0.193	2.491
Apr-15	47.10	2.617	1.830	7.257	3.075	4.002	0.00	2.388	3.155	71.425	30	2.381	5.539	0.185	2.565
May-15	54.93	2.654	1.688	7.846	3.170	4.124	0.00	2.483	2.147	79.044	31	2.550	5.697	0.184	2.734
Jun-15	46.93	2.592	1.856	7.537	3.042	3.992	30.778	1.898	2.821	101.443	30	3.381	5.785	0.193	3.574
Jul-15	49.22	2.533	1.972	7.644	3.151	4.084	3.450	1.976	3.480	77.514	31	2.500	5.757	0.186	2.686
Aug-15	51.90	2.715	1.881	8.203	1.918	4.115	3.684	1.496	3.410	79.324	31	2.559	5.885	0.190	2.749
Sep-15	48.42	2.509	1.806	7.204	0.760	3.779	3.399	3.002	3.199	74.078	30	2.469	5.365	0.179	2.648
Oct-15	46.79	2.491	1.918	6.865	2.967	3.321	3.640	3.109	3.291	74.395	31	2.400	5.620	0.181	2.581
Nov-15	41.88	2.632	1.840	6.840	2.579	3.954	3.574	0.781	3.219	67.302	30	2.243	5.438	0.181	2.425
Dec-15	42.90	2.694	1.861	6.884	2.943	4.097	3.471	0.00	3.291	68.138	31	2.198	5.819	0.188	2.386
Averages															
2013	48.81	2.36	1.36	6.40	2.60	4.45	3.93	3.23	3.59	76.72	30.42	2.52	5.33	0.18	2.62
2014	45.75	2.19	2.12	6.55	3.02	4.54	3.03	2.65	3.16	71.76	30.42	2.36	6.24	0.21	2.56
2015	46.87	2.59	1.83	7.33	2.73	3.94	7.43	2.13	3.16	74.73	30.42	2.46	5.68	0.19	2.64

Appendix C – Sold Water Data

TABLE C-1: Cranbery and Wakefield Water Consumption Data

In/Out of City	In	In	Out	Out	In	In	Out	Out	
Tier	1	1	1	1	2	2	2	2	
Res/NonRes	Res	Non Res	Res	Non Res	Res	Non Res	Res	Non Res	Total
Jan-13	20,757,055	3,665,442	7,241,180	1,044,286	11,080,147	26,639,627	2,933,113	12,671,255	86,032,105
Feb-13	19,471,161	1,593,350	8,012,427	87,521	3,219,616	2,094,546	936,561	391,979	35,807,161
Mar-13	18,348,291	1,157,228	20,341,140	386,744	4,272,874	5,816,105	87,523	6,351,712	56,761,617
Apr-13	17,523,955	3,064,006	6,353,240	860,265	9,672,317	23,673,604	2,592,004	11,984,549	75,723,940
May-13	17,526,197	1,582,878	7,063,150	77,797	2,920,397	2,369,081	830,338	301,464	32,671,302
Jun-13	18,772,438	1,487,870	21,069,756	343,354	4,068,656	7,547,851	65,081	9,233,205	62,588,211
Jul-13	17,301,806	3,250,273	6,352,488	933,572	9,235,455	27,812,579	2,325,695	14,993,954	82,205,822
Aug-13	20,774,255	1,799,071	8,511,382	86,026	3,061,030	3,777,175	925,343	353,080	39,287,362
Sep-13	19,081,398	1,624,761	22,120,018	480,995	3,640,770	6,734,711	75,553	15,272,979	69,031,185
Oct-13	19,795,031	3,514,338	7,094,546	1,407,835	9,700,745	31,661,308	2,631,647	13,496,359	89,301,809
Nov-13	19,599,822	1,783,359	7,796,983	91,264	3,061,032	2,803,699	879,710	326,150	36,342,019
Dec-13	19,454,681	1,582,125	20,789,253	334,379	4,415,755	6,775,856	62,837	7,981,716	61,396,602
2013	**228,406,090**	**26,104,701**	**142,745,563**	**6,134,038**	**68,348,794**	**147,706,142**	**14,345,405**	**93,358,402**	**727,149,135**
Jan-14	18,986,405	3,678,910	6,871,644	992,664	9,336,439	25,773,388	2,750,590	25,773,388	94,163,428
Feb-14	18,240,567	1,524,530	7,575,562	75,552	3,155,285	2,355,615	833,330	2,355,615	36,116,056
Mar-14	17,675,084	1,400,347	19,562,442	342,604	4,498,039	6,174,427	149,610	6,174,427	55,976,980
Apr-14	17,998,218	2,949,559	6,245,528	988,925	9,409,000	22,886,654	2,752,835	22,886,654	86,117,373
May-14	20,033,687	1,621,030	8,045,332	83,034	3,192,686	3,221,865	883,449	3,221,865	40,302,948
Jun-14	20,950,780	1,628,505	22,884,517	591,712	4,479,337	8,668,428	99,492	8,668,428	67,971,199
Jul-14	17,988,527	3,230,079	6,019,609	883,447	9,355,887	27,610,601	2,372,824	27,610,601	95,071,575
Aug-14	18,904,866	1,472,912	7,037,710	56,104	3,152,291	5,207,937	927,586	5,207,937	41,967,343
Sep-14	17,354,174	1,401,093	19,632,019	510,920	3,675,928	6,216,311	68,821	6,216,311	55,075,577
Oct-14	19,135,268	3,978,873	6,521,545	938,057	9,149,425	35,666,377	2,633,892	35,666,377	113,689,814
Nov-14	17,376,611	1,410,828	6,712,321	44,883	3,117,135	2,716,927	1,113,104	2,716,927	35,208,736
Dec-14	17,336,211	1,396,606	19,320,090	415,916	4,049,206	6,995,784	79,293	6,995,784	56,588,890
2014	**221,980,398**	**25,693,272**	**136,428,319**	**5,923,818**	**66,570,658**	**153,494,314**	**14,664,826**	**153,494,314**	**778,249,919**
Jan-15	17,361,621	3,332,561	5,706,181	991,911	8,879,378	25,043,289	2,397,511	18,273,414	81,985,866
Feb-15	18,844,298	1,566,420	7,721,430	56,852	3,105,911	2,971,266	1,123,576	249,850	35,639,603
Mar-15	19,050,727	1,368,930	20,485,535	453,319	3,885,385	5,745,789	77,050	5,902,131	56,968,866
Apr-15	19,673,867	3,005,662	6,475,178	973,962	9,495,775	26,218,478	3,297,416	11,220,781	80,361,119
May-15	17,746,124	1,736,978	7,271,108	72,562	3,150,047	3,285,444	987,430	347,097	34,596,790
Jun-15	16,528,307	1,196,130	19,040,308	460,800	3,932,513	6,308,323	109,215	8,942,963	56,518,559
Jul-15	16,760,204	2,810,426	5,858,773	1,035,302	8,715,558	26,107,774	2,171,596	13,543,480	77,003,113
Aug-15	16,731,017	1,407,831	6,851,452	56,852	2,916,659	3,847,236	864,002	259,573	32,934,622
Sep-15	20,071,071	1,425,035	22,642,176	590,211	4,795,763	7,609,187	47,875	14,419,452	71,600,770
Oct-15	19,788,317	3,469,451	6,579,151	1,220,817	9,043,202	33,933,140	2,523,929	16,640,424	93,198,431
Nov-15	18,582,454	1,464,684	7,368,353	51,617	2,953,310	3,492,657	878,215	270,046	35,061,336
Dec-15	18,110,445	1,389,129	19,823,530	513,163	4,504,022	7,099,016	54,608	7,046,649	58,540,562
2015	**219,248,452**	**24,173,237**	**135,823,175**	**6,477,368**	**65,377,523**	**151,661,599**	**14,532,423**	**97,115,860**	**714,409,637**

*Numbers in MG

Table C-2: Wakefield and Cranberry Metered Usage

Year	Total Sold Water(MGD)	Total Residential Sold Water (MGD)	Total Residential Produced Water (MGD)	Non-Residential Sold Water(MGD)	Non-Residential Produced Water(MGD)
2013	1.99	1.24	1.64	0.75	0.99
2014	2.13	1.20	1.46	0.93	1.12
2015	1.96	1.19	1.56	0.77	1.00
Average	2.03	1.21	1.55	0.81	1.04

Table C-3: Overall Unaccouanted for Water

Year	Delivered Flow (MGD)	Sold Water (MGD)	Unaccounted for Water (MGD)	Unaccounted for Water (%)
2013	2.706	1.99	0.716	0.26
2014	2.572	2.132	0.44	0.17
2015	2.656	1.957	0.699	0.26
Average	2.64	2.03	0.62	23.00%

Appendix D – ISO Properties Inc Classification Details

CLASSIFICATION DETAILS

Graded Area: Westminster FD
County: Carroll State: MD
Date Surveyed: April, 2004 Total Credit: 56.13 Class: 5/8B Pop.: 34345

RECEIVING AND HANDLING FIRE ALARMS

This section of the Fire Suppression Rating Schedule reviews the facilities provided for the general public to report fires, and for the operator on duty at the communication center to dispatch fire department companies to the fires.

	Credit	
	Actual	Maximum
1. Credit for Telephone Service (Item 414)		
This item reviews the facilities provided for the public to report fires, including the listing of fire and business numbers in the telephone directory.	1.90	2.00
2. Credit for Operators (Item 422)		
This item reviews the number of operators on-duty at the communication center to handle fire calls.	2.49	3.00
3. Credit for Dispatch Circuits (Item 432)		
This item reviews the dispatch circuit facilities used to transmit alarms to fire department members.	2.05	5.00
4. Total Credit for Receiving and Handling Fire Alarms:	6.44	10.00
Relative Classification for Receiving and Handling Fire Alarms:	4	

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Graded Area: Westminster FD
County: Carroll State: MD
Date Surveyed: April, 2004 Total Credit: 56.13 Class: 5/8B Pop.: 34345

FIRE DEPARTMENT

This section of the Fire Suppression Rating Schedule reviews the engine and ladder-service companies, equipment carried, response to fires, training and available fire fighters.

	Credit	
	Actual	Maximum
1. Credit for Engine Companies (Item 513)		
This item reviews the number of engine companies and the hose equipment carried.	8.20	10.00
2. Credit for Reserve Pumpers (Item 523)		
This item reviews the number of reserve pumpers, their pump capacity and the hose equipment carried on each.	0.59	1.00
3. Credit for Pump Capacity (Item 532)		
This item reviews the total available pump capacity.	5.00	5.00
4. Credit for Ladder-Service Companies (Item 549)		
This item reviews the number of ladder and service companies and the equipment carried.	3.66	5.00
5. Credit for Reserve Ladder-Service Companies (Item 553)		
This item reviews the number of reserve ladder and service trucks, and the equipment carried.	0.08	1.00

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Graded Area: Westminster FD
County: Carroll State: MD
Date Surveyed: April, 2004 Total Credit: 56.13 Class: 5/8B Pop.: 34345

FIRE DEPARTMENT
(continued)

	Credit Actual	Credit Maximum
6. Credit for Distribution (Item 561)		
This item reviews the percent of the built-upon area of the city which has an adequately-equipped, responding first-due engine company within 1.5 miles and an adequately-equipped, responding ladder-service company within 2.5 miles.	2.20	4.00
7. Credit for Company Personnel (Item 571)		
This item reviews the average number of equivalent fire fighters and company officers on duty with existing companies.	2.29	15.00+
8. Credit for Training (Item 581)		
This item reviews the training facilities and their use.	1.53	9.00
9. Total Credit for Fire Department:	23.55	50.00+
Relative Classification for Fire Department:	6	

+ This indicates that credit for manning is open-ended, with no maximum credit for this item.

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Graded Area: Westminster FD
County: Carroll State: MD
Date Surveyed: April, 2004 Total Credit: 56.13 Class: 5/8B Pop.: 34345

WATER SUPPLY

This section of the Fire Suppression Rating Schedule reviews the water supply system that is available for fire suppression in the city.

	Credit	
	Actual	Maximum
1. Credit for the Water System (Item 616)		
This item reviews the supply works, the main capacity and hydrant distribution.	30.72	35.00
2. Credit for Hydrants (Item 621)		
This item reviews the type of hydrants, and method of installation.	1.98	2.00
3. Credit for Inspection and Condition of Hydrants (Item 631)		
This item reviews the frequency of inspections of hydrants and their condition	0.74	3.00
4. Total Credit for Water Supply:	33.44	40.00
Relative Classification for Water Supply:	2	

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PUBLIC PROTECTION CLASSIFICATION

IMPROVEMENT STATEMENTS
FOR
Westminster FD
Carroll County, MD

Prepared by
INSURANCE SERVICES OFFICE, INC.
4B Eves Drive, Suite 200, Marlton, NJ 08053
800 444-4554 FAX 856 985-6491

The following statements are based upon the criteria contained in our Fire Suppression Rating Schedule and upon conditions in Westminster FD, MD during April, 2004. They indicate the performance needed to receive full credit for the specific item in the Schedule, and the quantity you have provided. Partial improvement will result in receiving a partial increase in the credit. These statements relate only to the fire insurance classification of your fire district. They are not for property loss prevention or life safety purposes and no life safety or property loss prevention recommendations are made.

RECEIVING AND HANDLING FIRE ALARMS

Credit For Telephone Service (Item 414).

Actual = 1.90%; Maximum = 2.00%

For maximum credit in the Schedule, there should be 6 incoming telephone lines reserved for receiving notification of fires (and other emergency calls). You have 6 lines reserved.

For maximum credit in the Schedule, both the number to report a fire and the fire department business number should be listed under "Fire Department" in the white pages directory (or government section of the white pages). Your fire number is not listed and your business number is not listed under "Fire Department".

Credit For Operators (Item 422).

Actual = 2.49%; Maximum = 3.00%

For maximum credit in the Schedule, 6 operators are needed on duty at all times. You have an average of 5 operators on duty.

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Credit For Dispatch Circuits (Item 432).

Actual = 2.05%; Maximum = 5.00%

For maximum credit in the Schedule, the primary alarm dispatch circuit should be monitored for integrity in accordance with National Fire Protection Association Standard, 1221.

For maximum credit in the Schedule, the alarm dispatch circuits should have recording facilities at the communication center.

For maximum credit in the Schedule, both alarm dispatch circuits should have an emergency power supply in accordance with National Fire Protection Association Standard, 1221.

Total credit for Receiving and Handling Fire Alarms (Item 440)

Actual = 6.44%; Maximum = 10.00%

FIRE DEPARTMENT

Credit For Engine Companies (Item 513).

Actual = 8.20%; Maximum = 10.00%

For maximum credit in the Schedule, 3 engine companies are needed in your fire district.
These are calculated as follows:

3 for the Basic Fire Flow of 3500 gpm.

You have 3 engine companies in service.
These are calculated as follows:

87 percent for Engine E-31 because of insufficient equipment.
Additionally Engine E-31 is lacking: an adequate hose testing program.

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88 percent for Engine E-32 because of insufficient equipment.
Additionally Engine E-32 is lacking: an adequate hose testing program.

88 percent for Engine E-33 because of insufficient equipment.
Additionally Engine E-33 is lacking: an adequate hose testing program.

For maximum credit in the Schedule, at least 2 engine companies should respond for all first alarms for fires in buildings. The credit for engine companies has been reduced by 7 percent due to the lack of adequate response to part of the fire district.

Credit For Reserve Pumpers (Item 523).

Actual = 0.59%; Maximum = 1.00%

For maximum credit in the Schedule, 1 fully-equipped reserve pumper is needed. You have 0 reserve pumpers.

Credit For Ladder And Service Companies (Item 549).

Actual = 3.66%; Maximum = 5.00%

For maximum credit in the Schedule, 1 ladder company and 1 service company are needed in your fire district.
These are calculated as follows:

1 ladder company and 1 service company due to method of operation.

You have 1 ladder company and 1 service company.
These are calculated as follows:

92 percent for Ladder T-3 because of insufficient equipment.

*27 percent for Engine-Service E-32 because of insufficient equipment.

*Limited to 50% credit maximum by Fire Suppression Rating Schedule due to dual operations.
The percentage shown has been adjusted to reflect this limitation.

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Credit For Reserve Ladder And Service Companies (Item 553).

Actual = 0.08%; Maximum = 1.00%

For maximum credit in the Schedule, 1 fully-equipped reserve ladder truck is needed.
You have 1 reserve ladder truck.
This is calculated as follows:

24 percent for Service UT-3 because of insufficient equipment.

Credit For Distribution (Item 561).

Actual = 2.20%; Maximum = 4.00%

For maximum credit in the Schedule, all sections of the fire district with hydrant protection should be within 1½ miles of a fully-equipped engine company and 2½ miles of a fully-equipped ladder, service, engine-ladder or engine-service company. The distance to be measured along all-weather roads.

Credit For Company Personnel (Item 571).

Actual = 2.29%; Maximum = 15.00%

An increase in the on-duty company personnel by one person will increase the fire department credit by 0.63 and an increase in the average response by other fire department members by one person will increase the fire department credit by 0.21.

Credit For Training (Item 581).

Actual = 1.53%; Maximum = 9.00%

For maximum credit in the Schedule, the training program should be improved. You received 17 percent credit for the current training program and the use of facilities.

For maximum credit in the Schedule, pre-fire planning inspections of each commercial, industrial, institutional and other similar-type building should be made twice a year by company members. Records of the inspections should include complete and up-to-date notes and sketches.

Total credit for Fire Department (Item 590)

Actual = 23.55%; Maximum = 50.00%

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WATER SUPPLY

Credit For Supply System (Item 616).

Actual = 30.72%; Maximum = 35.00%

For maximum credit in the Schedule, the needed fire flows should be available at each location in your fire district. Needed fire flows of 2500 gpm and less should be available for 2 hours, 3000 and 3500 gpm for 3 hours and all others for 4 hours. See the attached table for an evaluation of fire flow tests made at representative locations in your fire district.

All AWWA standard hydrants within 1000 feet of a building, measured as hose can be laid by apparatus, are credited; 1000 gpm for hydrants within 300 feet; 670 gpm for 301 to 600 feet; and 250 gpm for 601 to 1000 feet. Credit is reduced when hydrants lack a pumper outlet, and is further reduced when they have only a single 2½-inch outlet.

Credit For Hydrants (Item 621).

Actual = 1.98%; Maximum = 2.00%

For maximum credit in the Schedule, all hydrants should have a 6-inch or larger branch connection.

Credit For Inspection and Condition of Hydrants (Item 631).

Actual = 0.74%; Maximum = 3.00%

For maximum credit in the Schedule, all hydrants should be inspected twice a year, the inspection should include operation and a test at domestic pressure. Records should be kept of the inspections. Hydrants should be conspicuous, well located for use by a pumper, and in good condition.

Total credit for Water Supply (Item 640)

Actual = 33.44%; Maximum = 40.00%

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FIRE FLOW TESTS

Westminster FD, MD

Tests witnessed on March 25, 2004

Test No.	Needed Fire Flow† gpm	Limited By Supply Works, gpm	Limited by Distribution Mains (flow tests), gpm	Limited By Hydrant Spacing, gpm
1†	4500		4300	3850
2†	4000		3900	
3†	4000			2900
4†	4000		2900	3900
6†	4000		1600	950
6A	3000		1600	
8	3000		2100	
10†	7000	3857	3000	5850
11	3500		2700	
13	2500			1000
16†	4500		2600	
17	2500		2000	
18†	4500		1100	2000

†Needed fire flows exceeding 3500 gpm are not considered in Item 616 (CSS) Credit for System Supply

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INSURANCE SERVICES OFFICE, INC.

HYDRANT FLOW DATA SUMMARY

City Westminster FD

County Carroll State MD Witnessed by Insurance Services Office, Inc. Date March 25, 2004

TEST NO.	TYPE DIST.*	TEST LOCATION	SERVICE	FLOW - GPM $Q=(29.83(C(d^2)p^{0.5}))$ INDIVIDUAL HYDRANTS			TOTAL	PRESSURE PSI STATIC	RESID.	FLOW -AT 20 PSI $Q_R=Q_F(h_R^{0.54}/h_F^{0.54})$ NEEDED **	AVAIL.	REMARKS***
1	Comm	Tuc Rd. & Longwell Ave.	Main	1420			1420	83	75	4500	4300	(A)-(3850 gpm)
1A	Comm	Tuc Rd. & Longwell Ave.	Main	1420			1420	83	75	2000	4300	
2	Comm	Main St. West of Railroad Ave.	Main	1280			1280	100	90	4000	3900	
2A	Comm	Main St. West of Railroad Ave.	Main	1280			1280	100	90	3000	3900	
3	Comm	Hahn Rd. & Rte. 27	Main	1450			1450	120	115	4000	7300	(A)-(2900 gpm)
3A	Comm	Hahn Rd. & Rte. 27	Main	1450			1450	120	115	3000	7300	
4	Comm	Englar Rd. & Monroe St.	Main	1190			1190	100	85	4000	2900	(A)-(3900 gpm)
4A	Comm	Englar Rd. & Monroe St.	Main	1190			1190	100	85	2500	2900	
5	Comm	Pennsylvania Ave. North of Ward Ave.	Main	1190			1190	80	65	1500	2500	
6	Comm	Airport Dr. & Rte. 97	Main	1060			1060	85	55	4000	1600	(A)-(950 gpm)
6A	Comm	Airport Dr. & Rte. 97	Main	1060			1060	85	55	3000	1600	
7	Res	Buck Cash Rd. & Royer Rd.	Main	1420			1420	109	70	750	2200	
8	Comm	Uniontown Rd. & Janice Way	Main	1300			1300	115	75	3000	2100	
9	Comm	Burning Tree Dr. & Doral Ct.	Wakefield	1130			1130	50	40	2000	2000	
10	Comm	St. Marks Way & St. Matthew Ct.	Wakefield	1130			1130	50	45	7000	3000	(A)-(5850 gpm) (D)-(3857 gpm)
10A	Comm	St. Marks Way & St. Matthew Ct.	Wakefield	1130			1130	50	45	2250	3000	

THE ABOVE LISTED NEEDED FIRE FLOWS ARE FOR PROPERTY INSURANCE PREMIUM CALCULATIONS ONLY AND ARE *NOT* INTENDED TO PREDICT THE MAXIMUM AMOUNT OF WATER REQUIRED FOR A LARGE SCALE FIRE CONDITION. THE AVAILABLE FLOWS ONLY INDICATE THE CONDITIONS THAT EXISTED AT THE TIME AND AT THE LOCATION WHERE TESTS WERE WITNESSED.

*Comm = Commercial; Res = Residential.

**Needed is the rate of flow for a specific duration for a full credit condition. Needed Fire Flows greater than 3,500 gpm are not considered in determining the classification of the city when using the Fire Suppression Rating Schedule.

***(A)-Limited by available hydrants to gpm shown. Available facilities limit flow to gpm shown plus consumption for the needed duration of (D)-4 hours.

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INSURANCE SERVICES OFFICE, INC.

HYDRANT FLOW DATA SUMMARY

City Westminster FD

County Carroll State MD Witnessed by Insurance Services Office, Inc. Date March 25, 2004

TEST NO.	TYPE DIST.*	TEST LOCATION	SERVICE	FLOW - GPM $Q=(29.83(C(d^2)p^{0.5}))$ INDIVIDUAL HYDRANTS			TOTAL	PRESSURE PSI STATIC	RESID.	FLOW -AT 20 PSI $Q_R=Q_F(h_R^{0.54}/h_F^{0.54})$ NEEDED **	AVAIL.	REMARKS***
11	Comm	Cranberry Rd. & Rte. 140	Main	1800			1800	88	55	3500	2700	
12	Comm	E. Green St. & Bishop St.	Main	1360			1360	85	65	2500	2600	
12A	Res	E. Green St. & Bishop St.	Main	1360			1360	85	65	1500	2600	
13	Comm	Old Westminster Pike & Malcolm Dr.	High	1190			1190	90	85	2500	4900	(A)-(1000 gpm)
14	Res	Morningstar Way & Zachary Dr.	Main	1240			1240	160	105	750	2100	
15	Comm	Rte. 32 & Dorothy Ave.	Main	1130			1130	75	65	2000	2800	
16	Comm	Baltimore Blvd. East of Gorsuch Rd.	Main	1280			1280	82	65	4500	2600	
16A	Comm	Baltimore Blvd. East of Gorsuch Rd.	Main	1280			1280	82	65	2500	2600	
17	Comm	Baltimore Blvd. West of Leidy Rd.	High	1130			1130	80	60	2500	2000	
18	Comm	Smith Ave. & Winchester Dr.	Main	750			750	100	60	4500	1100	(A)-(2000 gpm)
18A	Res	Smith Ave. & Winchester Dr.	Main	750			750	100	60	1000	1100	

THE ABOVE LISTED NEEDED FIRE FLOWS ARE FOR PROPERTY INSURANCE PREMIUM CALCULATIONS ONLY AND ARE *NOT* INTENDED TO PREDICT THE MAXIMUM AMOUNT OF WATER REQUIRED FOR A LARGE SCALE FIRE CONDITION. THE AVAILABLE FLOWS ONLY INDICATE THE CONDITIONS THAT EXISTED AT THE TIME AND AT THE LOCATION WHERE TESTS WERE WITNESSED.

*Comm = Commercial; Res = Residential.

**Needed is the rate of flow for a specific duration for a full credit condition. Needed Fire Flows greater than 3,500 gpm are not considered in determining the classification of the city when using the Fire Suppression Rating Schedule.

***(A)-Limited by available hydrants to gpm shown.

Edition 2: 5/01/02

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Appendix E – Resolution No. R08-3

Sponsored By: L. Gregory Pecoraro, Councilman
Dr. Robert Wack, Councilman

RESOLUTION NO. R08-3

RESOLUTION of The Mayor and Common Council of Westminster:

SUBJECT: Water Allocation Policy

WHEREAS, the City owns and operates two water supply systems serving the City of Westminster and the surrounding portions of Carroll County, Maryland; and

WHEREAS, in the past, the City of Westminster has from time to time experienced drought conditions which have adversely affected the availability of the City's water supply and the City has taken significant steps to improve its water system capacity; and

WHEREAS, the City has been working with the State of Maryland, Department of the Environment ("MDE") to bridge the gap between its water supply and demand during drought conditions;

WHEREAS, the City and MDE entered into a Consent Order dated April 3, 2007, which has assisted the City in improving water system capacity and the drought year deficit and required the City to adopt an interim Allocation Policy to regulate the allocation of water provided for in the Consent Order; and

WHEREAS, Section 160-14A and C of the Westminster City Code authorizes The Mayor and Common Council of Westminster to establish an Allocation Policy regarding the issuance of water connections; and

WHEREAS, The Mayor and Common Council of Westminster adopted Resolution No. R07-2 that contained the interim Allocation Policy referenced in the Consent Order; and

WHEREAS, The Mayor and Common Council of Westminster desire to adopt an Allocation Policy to regulate the allocation of water; and

WHEREAS, the Common Council's Growth and Annexation Committee conducted a public meeting on January 22, 2008 to consider and recommend modifications to the interim Allocation Policy to build upon it and replace its contents with an Allocation Policy; and

NOW, THEREFORE, BE IT RESOLVED by The Mayor and Common Council of Westminster that it hereby adopts the following Allocation Policy for the issuance of water connections.

I.

INTRODUCTION

In accordance with the terms of a Consent Order that was approved by the City and MDE on April 3, 2007, the City was required to adopt within thirty (30) days from the effective date of the Consent Order an interim Allocation Policy to regulate the issuance of water connections. On April 9, 2007, The Mayor and Common Council of Westminster adopted Resolution No. R07-2 that contained the interim Allocation Policy referenced in the Consent Order. At this time, The Mayor and Common Council of Westminster hereby modify the existing interim Allocation Policy as provided herein.

II.

ALLOCATION OF WATER SERVICE CAPACITY

A. The Mayor and Common Council of Westminster authorizes the allocation of water service capacity and hereby provides that the following uses shall obtain a water allocation and that an allocation of water connections may be approved by the Director of Planning for those uses:

1. Residential Development;

2. Non-Residential Development;

3. Change-of-Use for a building when the Director determines the new use increases water consumption; and

4. Emergency Projects – projects which have been identified by the Carroll County Health Department as requiring water service for health and safety reasons which do not require subdivision approval.

The Director may set-aside a portion of the City's water service capacity for projects that would result in substantial benefits to the City and its citizens.

B. In reviewing any application, the Director shall consider the available capacity and the readiness of the project to proceed. The Director shall give priority to the following categories of applications

1. Projects providing benefits to the City's utility systems including, but not limited to easements, new water sources and related matters. The Director shall maintain a schedule of any such projects;

2. Governmental and institutional projects;

3. Major commercial and industrial projects;

4. Infill residential projects; and

5. Cooperative City-County projects.

Projects contained in II.A will be eligible for allocation of water connections provided that the project satisfies the Director that the following standards have been met:

1. It will not adversely affect the City's water system; and

2. It provides for the orderly and consistent growth of the community consistent with the City's comprehensive plan.

C. Procedures for Requesting Allocations

1. Any property owner seeking to obtain an allocation under this policy shall file an application with the Director on a form provided by the Director. A copy of said form is attached hereto as Exhibit A and incorporated herein. The Director shall review said application for conformity with the criteria set forth in Section 1. Said application shall be accompanied by all supporting documents, information and other details relevant to establishing the project's eligibility for an allocation. The Director may also request that the applicant provide whatever information the Director deems necessary at the expense of the applicant.

2. After review of the application and supporting documents, the Director may approve, disapprove or conditionally approve any request for an allocation under this policy. Any such approval may contain such conditions as the Director deems appropriate, including, but not limited to, the installation of water saving devices, project phasing and time limits for the issuance and utilization of water connections.

3. In the event an application is approved for a project covered under existing sunset provisions contained in Sections 164-188O, 164-199B and 164-211F of the

Westminster City Code, and the approval lapses under those sections, then the water allocation approval also lapses and an a new application must be filed with the Director.

4. An applicant may appeal the decision of the Director to The Mayor and Common Council within ten (10) days from the date of the written decision. Said appeal must be made with the Director on a formal appeals form and shall state the factual basis for the appeal. After its review, The Mayor and Common Council shall affirm, reverse or modify the Director's decision by resolution within a 60 days period from the date of the appeal. The decision of The Mayor and Common Council is final.

III.

Annual Review

The Director shall conduct an annual review of water allocations to insure that approved allocations are being utilized in a manner consistent with the approved applications.

BE IT FURTHER RESOLVED BY The Mayor and Common Council of Westminster that Resolution No. R07-2 and any prior water allocation policies are hereby rescinded and shall have no further force and effect, except that the terms and conditions of Resolution No. R07-2 shall apply to any and all applications filed with the City before January 28, 2008.

BE IT FURTHER RESOLVED BY The Mayor and Common Council of Westminster that this Resolution shall become effective upon its passage and approval.

INTRODUCED this ___ day of _____, 2008.

_____
Laurell E. Taylor, City Clerk

PASSED this ____ day of _____, 2008.

_____
Laurell E. Taylor, City Clerk

APPROVED this ____ day of _____, 2008.

_____
Thomas K. Ferguson, Mayor

Approved as to legal form
and sufficiency this 25th
day of Jan, 2008.

_____
John B. Walsh, Jr., City Attorney

Version: January 24, 2007[2]

Appendix F – Flow Mass Analysis

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity	1.60	mgd	Hull Creek Minimum Stream Flow-By:	0.355	mgd	Min Reservoir Level	12.6	ft	Medford Quarry Pump Rate	0.750	MGD	MQ Stop Set Point	116.0	MG	
Reservoir Volume	121.80	MG	Cranberry Branch Minimum Stream Flow-By:	0.194	mgd				Medford Quarry Max Annual Vol	176	MG				
Medford Quarry Start Setpoint	104	MG								234	days				

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
1/1/64	1.60	0.36	1.25	0.814	1.30	YES	1.25	0.19	1.06	0.05	1.00	***121.8***	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.85	0.5793	121.80
1/2/64	2.69	0.36	2.33	0.814	1.30	NO	2.09	0.19	1.90	0.00	1.90	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/3/64	2.00	0.36	1.65	0.814	1.30	NO	1.56	0.19	1.37	0.00	1.37	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/4/64	2.45	0.36	2.09	0.814	1.30	NO	1.91	0.19	1.71	0.00	1.71	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/5/64	2.16	0.36	1.81	0.814	1.30	NO	1.69	0.19	1.49	0.00	1.49	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/6/64	2.00	0.36	1.65	0.814	1.30	NO	1.56	0.19	1.37	0.00	1.37	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.49	0.3340	121.80
1/7/64	4.81	0.36	4.46	0.814	1.30	NO	3.75	0.19	3.56	0.00	3.56	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.26	0.1772	121.80
1/8/64	2.53	0.36	2.17	0.814	1.30	NO	1.97	0.19	1.77	0.00	1.77	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/9/64	28.54	0.36	28.19	0.814	1.30	NO	22.25	0.19	22.06	0.00	22.06	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	1.47	1.0019	121.80
1/10/64	7.46	0.36	7.10	0.814	1.30	NO	5.81	0.19	5.62	0.00	5.62	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/11/64	3.41	0.36	3.05	0.814	1.30	NO	2.66	0.19	2.46	0.00	2.46	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/12/64	2.65	0.36	2.29	0.814	1.30	NO	2.06	0.19	1.87	0.00	1.87	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.13	0.0886	121.80
1/13/64	2.00	0.36	1.65	0.814	1.30	NO	1.56	0.19	1.37	0.00	1.37	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.72	0.4907	121.80
1/14/64	3.21	0.36	2.85	0.814	1.30	NO	2.50	0.19	2.31	0.00	2.31	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/15/64	3.01	0.36	2.65	0.814	1.30	NO	2.34	0.19	2.15	0.00	2.15	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/16/64	2.81	0.36	2.45	0.814	1.30	NO	2.19	0.19	1.99	0.00	1.99	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/17/64	2.65	0.36	2.29	0.814	1.30	NO	2.06	0.19	1.87	0.00	1.87	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/18/64	2.53	0.36	2.17	0.814	1.30	NO	1.97	0.19	1.77	0.00	1.77	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/19/64	2.53	0.36	2.17	0.814	1.30	NO	1.97	0.19	1.77	0.00	1.77	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/20/64	4.05	0.36	3.69	0.814	1.30	NO	3.16	0.19	2.96	0.00	2.96	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.46	0.3135	121.80
1/21/64	10.02	0.36	9.67	0.814	1.30	NO	7.81	0.19	7.62	0.00	7.62	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/22/64	4.41	0.36	4.05	0.814	1.30	NO	3.44	0.19	3.24	0.00	3.24	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/23/64	3.17	0.36	2.81	0.814	1.30	NO	2.47	0.19	2.28	0.00	2.28	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/24/64	2.77	0.36	2.41	0.814	1.30	NO	2.16	0.19	1.96	0.00	1.96	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.09	0.0613	121.80
1/25/64	9.46	0.36	9.11	0.814	1.30	NO	7.38	0.19	7.18	0.00	7.18	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.8	0.5453	121.80
1/26/64	4.13	0.36	3.77	0.814	1.30	NO	3.22	0.19	3.03	0.00	3.03	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/27/64	2.89	0.36	2.53	0.814	1.30	NO	2.25	0.19	2.06	0.00	2.06	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/28/64	2.57	0.36	2.21	0.814	1.30	NO	2.00	0.19	1.81	0.00	1.81	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/29/64	2.33	0.36	1.97	0.814	1.30	NO	1.81	0.19	1.62	0.00	1.62	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/30/64	2.16	0.36	1.81	0.814	1.30	NO	1.69	0.19	1.49	0.00	1.49	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/31/64	2.00	0.36	1.65	0.814	1.30	NO	1.56	0.19	1.37	0.00	1.37	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/1/64	2.16	0.36	1.81	0.788	1.26	NO	1.69	0.19	1.49	0.00	1.49	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.2	0.1363	121.80
2/2/64	2.00	0.36	1.65	0.788	1.26	NO	1.56	0.19	1.37	0.00	1.37	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/3/64	1.88	0.36	1.53	0.788	1.26	NO	1.47	0.19	1.27	0.00	1.27	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/4/64	1.80	0.36	1.45	0.788	1.26	NO	1.41	0.19	1.21	0.00	1.21	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/5/64	1.80	0.36	1.45	0.788	1.26	NO	1.41	0.19	1.21	0.00	1.21	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/6/64	5.21	0.36	4.86	0.788	1.26	NO	4.06	0.19	3.87	0.00	3.87	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	1.27	0.8656	121.80
2/7/64	3.61	0.36	3.25	0.788	1.26	NO	2.81	0.19	2.62	0.00	2.62	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/8/64	2.81	0.36	2.45	0.788	1.26	NO	2.19	0.19	1.99	0.00	1.99	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/9/64	2.57	0.36	2.21	0.788	1.26	NO	2.00	0.19	1.81	0.00	1.81	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/10/64	2.41	0.36	2.05	0.788	1.26	NO	1.88	0.19	1.68	0.00	1.68	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.05	0.0341	121.80
2/11/64	2.08	0.36	1.73	0.788	1.26	NO	1.63	0.19	1.43	0.00	1.43	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.8	0.5453	121.80
2/12/64	2.41	0.36	2.05	0.788	1.26	NO	1.88	0.19	1.68	0.00	1.68	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/13/64	2.24	0.36	1.89	0.788	1.26	NO	1.75	0.19	1.56	0.00	1.56	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/14/64	2.20	0.36	1.85	0.788	1.26	NO	1.72	0.19	1.52	0.00	1.52	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/15/64	2.08	0.36	1.73	0.788	1.26	NO	1.63	0.19	1.43	0.00	1.43	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.36	0.2454	121.80
2/16/64	2.57	0.36	2.21	0.788	1.26	NO	2.00	0.19	1.81	0.00	1.81	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.24	0.1636	121.80
2/17/64	2.33	0.36	1.97	0.788	1.26	NO	1.81	0.19	1.62	0.00	1.62	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/18/64	2.24	0.36	1.89	0.788	1.26	NO	1.75	0.19	1.56	0.00	1.56	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.79	0.5384	121.80
2/19/64	2.41	0.36	2.05	0.788	1.26	NO	1.88	0.19	1.68	0.00	1.68	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.4	0.2726	121.80
2/20/64	2.24	0.36	1.89	0.788	1.26	NO	1.75	0.19	1.56	0.00	1.56	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/21/64	2.00	0.36	1.65	0.788	1.26	NO	1.56	0.19	1.37	0.00	1.37	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/22/64	1.84	0.36	1.49	0.788	1.26	NO	1.44	0.19	1.24	0.00	1.24	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/23/64	1.84	0.36	1.49	0.788	1.26	NO	1.44	0.19	1.24	0.00	1.24	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/24/64	1.88	0.36	1.53	0.788	1.26	NO	1.47	0.19	1.27	0.00	1.27	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/25/64	1.84	0.36	1.49	0.788	1.26	NO	1.44	0.19	1.24	0.00	1.24	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/26/64	1.92	0.36	1.57	0.788	1.26	NO	1.50	0.19	1.31	0.00	1.31	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/27/64	1.96	0.36	1.61	0.788	1.26	NO	1.53	0.19	1.34	0.00	1.34	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/28/64	1.92	0.36	1.57	0.788	1.26	NO	1.50	0.19	1.31	0.00	1.31	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.25	0.1704	121.80
2/29/64	1.96	0.36	1.61	0.788	1.26	NO	1.53	0.19	1.34	0.00	1.34	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/1/64	1.92	0.36	1.57	0.915	1.46	NO	1.50	0.19	1.31	0.00	1.31	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/2/64	2.20	0.36	1.85	0.915	1.46	NO	1.72	0.19	1.52	0.00	1.52	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/3/64	5.57	0.36	5.22	0.915	1.46	NO	4.34	0.19	4.15	0.00	4.15	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.43	0.2931	121.80
3/4/64	6.94	0.36	6.58	0.915	1.46	NO	5.41	0.19	5.21	0.00	5.21	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.01	0.0068	121.80
3/5/64	11.43	0.36	11.07	0.915	1.46	NO	8.91	0.19	8.71	0.00	8.71	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/6/64	5.85	0.36	5.50	0.915	1.46	NO	4.56	0.19	4.37	0.00	4.37	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/7/64	4.21	0.36	3.85	0.915	1.46	NO	3.28	0.19	3.09	0.00	3.09	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.03	0.0204	121.80
3/8/64	3.73	0.36	3.37	0.915	1.46	NO	2.91	0.19	2.71	0.00	2.71	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.18	0.1227	121.80
3/9/64	3.77	0.36	3.41	0.915	1.46	NO	2.94	0.19	2.74	0.00	2.74	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/10/64	3.49	0.36	3.13	0.915	1.46	NO	2.72	0.19	2.53	0.00	2.53	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/11/64	3.13	0.36	2.77	0.915	1.46	NO	2.44	0.19	2.24	0.00	2.24	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/12/64	3.13	0.36	2.77	0.915	1.46	NO	2.44	0.19	2.24	0.00	2.24	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.06	0.0409	121.80
3/13/64	3.29	0.36	2.93	0.915	1.46	NO	2.56	0.19	2.37	0.00	2.37	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/14/64	3.25	0.36	2.89	0.915	1.46	NO	2.53	0.19	2.34	0.00	2.34	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.16	0.1091	121.80
3/15/64	3.49	0.36	3.13	0.915	1.46	NO	2.72	0.19	2.53	0.00	2.53	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.02	0.0136	121.80
3/16/64	3.13	0.36	2.77	0.915	1.46	NO	2.44	0.19	2.24	0.00	2.24	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/17/64	2.97	0.36	2.61	0.915	1.46	NO	2.31	0.19	2.12	0.00	2.12	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/18/64	2.81	0.36	2.45	0.915	1.46	NO	2.19	0.19	1.99	0.00	1.99	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/19/64	2.73	0.36	2.37	0.915	1.46	NO	2.13	0.19	1.93	0.00	1.93	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/20/64	2.49	0.36	2.13	0.915	1.46	NO	1.94	0.19	1.74	0.00	1.74	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/21/64	2.61	0.36	2.25	0.915	1.46	NO	2.03	0.19	1.84	0.00	1.84	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	1.63	1.1110	121.80
3/22/64	3.85	0.36	3.49	0.915	1.46	NO	3.00	0.19	2.81	0.00	2.81	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.18	0.1227	121.80
3/23/64	4.97	0.36	4.62	0.915	1.46	NO	3.88	0.19	3.68	0.00	3.68	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/24/64	4.89	0.36	4.54	0.915	1.46	NO	3.81	0.19	3.62	0.00	3.62	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity	1.60	mgd	
Reservoir Volume	121.80	MG	
Medford Quarry Start Setpoint	104	MG	
Hull Creek Minimum Stream Flow-By:	0.355	mgd	
Cranberry Branch Minimum Stream Flow-By:	0.194	mgd	
Min Reservoir Level	12.6	ft	
Medford Quarry Pump Rate	0.750	MGD	
Medford Quarry Max Annual Vol	176	MG	
	234	days	
MQ Stop Set Point	116.0	MG	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)
3/25/64	4.25	0.36	3.89	0.915	1.46	NO	3.31	0.19	3.12	0.00	3.12	121.8	NO	0.00	YES
3/26/64	3.53	0.36	3.17	0.915	1.46	NO	2.75	0.19	2.56	0.00	2.56	121.8	NO	0.00	YES
3/27/64	3.09	0.36	2.73	0.915	1.46	NO	2.41	0.19	2.21	0.00	2.21	121.8	NO	0.00	YES
3/28/64	2.89	0.36	2.53	0.915	1.46	NO	2.25	0.19	2.06	0.00	2.06	121.8	NO	0.00	YES
3/29/64	2.81	0.36	2.45	0.915	1.46	NO	2.19	0.19	1.99	0.00	1.99	121.8	NO	0.00	YES
3/30/64	2.81	0.36	2.45	0.915	1.46	NO	2.19	0.19	1.99	0.00	1.99	121.8	NO	0.00	YES
3/31/64	2.69	0.36	2.33	0.915	1.46	NO	2.09	0.19	1.90	0.00	1.90	121.8	NO	0.00	YES
4/1/64	2.69	0.36	2.33	0.992	1.59	NO	2.09	0.19	1.90	0.00	1.90	121.8	NO	0.00	YES
4/2/64	2.77	0.36	2.41	0.992	1.59	NO	2.16	0.19	1.96	0.00	1.96	121.7	NO	0.00	YES
4/3/64	3.53	0.36	3.17	0.992	1.59	NO	2.75	0.19	2.56	0.00	2.56	121.8	NO	0.00	YES
4/4/64	2.77	0.36	2.41	0.992	1.59	NO	2.16	0.19	1.96	0.00	1.96	121.7	NO	0.00	YES
4/5/64	2.61	0.36	2.25	0.992	1.59	NO	2.03	0.19	1.84	0.00	1.84	121.7	NO	0.00	YES
4/6/64	2.97	0.36	2.61	0.992	1.59	NO	2.31	0.19	2.12	0.00	2.12	121.7	NO	0.00	YES
4/7/64	3.29	0.36	2.93	0.992	1.59	NO	2.56	0.19	2.37	0.00	2.37	121.8	NO	0.00	YES
4/8/64	4.37	0.36	4.01	0.992	1.59	NO	3.41	0.19	3.21	0.00	3.21	121.8	NO	0.00	YES
4/9/64	3.77	0.36	3.41	0.992	1.59	NO	2.94	0.19	2.74	0.00	2.74	121.8	NO	0.00	YES
4/10/64	3.17	0.36	2.81	0.992	1.59	NO	2.47	0.19	2.28	0.00	2.28	121.7	NO	0.00	YES
4/11/64	2.93	0.36	2.57	0.992	1.59	NO	2.28	0.19	2.09	0.00	2.09	121.7	NO	0.00	YES
4/12/64	2.77	0.36	2.41	0.992	1.59	NO	2.16	0.19	1.96	0.00	1.96	121.7	NO	0.00	YES
4/13/64	2.73	0.36	2.37	0.992	1.59	NO	2.13	0.19	1.93	0.00	1.93	121.7	NO	0.00	YES
4/14/64	4.01	0.36	3.65	0.992	1.59	NO	3.13	0.19	2.93	0.00	2.93	121.7	NO	0.00	YES
4/15/64	3.41	0.36	3.05	0.992	1.59	NO	2.66	0.19	2.46	0.00	2.46	121.8	NO	0.00	YES
4/16/64	2.93	0.36	2.57	0.992	1.59	NO	2.28	0.19	2.09	0.00	2.09	121.8	NO	0.00	YES
4/17/64	2.77	0.36	2.41	0.992	1.59	NO	2.16	0.19	1.96	0.00	1.96	121.7	NO	0.00	YES
4/18/64	2.65	0.36	2.29	0.992	1.59	NO	2.06	0.19	1.87	0.00	1.87	121.7	NO	0.00	YES
4/19/64	2.65	0.36	2.29	0.992	1.59	NO	2.06	0.19	1.87	0.00	1.87	121.7	NO	0.00	YES
4/20/64	2.97	0.36	2.61	0.992	1.59	NO	2.31	0.19	2.12	0.00	2.12	121.8	NO	0.00	YES
4/21/64	6.09	0.36	5.74	0.992	1.59	NO	4.75	0.19	4.56	0.00	4.56	121.8	NO	0.00	YES
4/22/64	4.25	0.36	3.89	0.992	1.59	NO	3.31	0.19	3.12	0.00	3.12	121.8	NO	0.00	YES
4/23/64	3.57	0.36	3.21	0.992	1.59	NO	2.78	0.19	2.59	0.00	2.59	121.7	NO	0.00	YES
4/24/64	3.25	0.36	2.89	0.992	1.59	NO	2.53	0.19	2.34	0.00	2.34	121.7	NO	0.00	YES
4/25/64	2.97	0.36	2.61	0.992	1.59	NO	2.31	0.19	2.12	0.00	2.12	121.7	NO	0.00	YES
4/26/64	2.85	0.36	2.49	0.992	1.59	NO	2.22	0.19	2.03	0.00	2.03	121.7	NO	0.00	YES
4/27/64	2.77	0.36	2.41	0.992	1.59	NO	2.16	0.19	1.96	0.00	1.96	121.7	NO	0.00	YES
4/28/64	3.05	0.36	2.69	0.992	1.59	NO	2.38	0.19	2.18	0.00	2.18	121.7	NO	0.00	YES
4/29/64	2.97	0.36	2.61	0.992	1.59	NO	2.31	0.19	2.12	0.00	2.12	121.8	NO	0.00	YES
4/30/64	5.73	0.36	5.38	0.992	1.59	NO	4.47	0.19	4.28	0.00	4.28	121.8	NO	0.00	YES
5/1/64	3.97	0.36	3.61	1.051	1.68	NO	3.09	0.19	2.90	0.00	2.90	121.8	NO	0.00	YES
5/2/64	3.37	0.36	3.01	1.051	1.68	NO	2.63	0.19	2.43	0.00	2.43	121.7	NO	0.00	YES
5/3/64	3.13	0.36	2.77	1.051	1.68	NO	2.44	0.19	2.24	0.00	2.24	121.7	NO	0.00	YES
5/4/64	2.97	0.36	2.61	1.051	1.68	NO	2.31	0.19	2.12	0.00	2.12	121.7	NO	0.00	YES
5/5/64	2.77	0.36	2.41	1.051	1.68	NO	2.16	0.19	1.96	0.00	1.96	121.7	NO	0.00	YES
5/6/64	2.65	0.36	2.29	1.051	1.68	NO	2.06	0.19	1.87	0.00	1.87	121.7	NO	0.00	YES
5/7/64	2.61	0.36	2.25	1.051	1.68	NO	2.03	0.19	1.84	0.00	1.84	121.7	NO	0.00	YES
5/8/64	2.53	0.36	2.17	1.051	1.68	NO	1.97	0.19	1.77	0.00	1.77	121.7	NO	0.00	YES
5/9/64	2.49	0.36	2.13	1.051	1.68	NO	1.94	0.19	1.74	0.00	1.74	121.7	NO	0.00	YES
5/10/64	2.37	0.36	2.01	1.051	1.68	NO	1.84	0.19	1.65	0.00	1.65	121.7	NO	0.00	YES
5/11/64	2.29	0.36	1.93	1.051	1.68	NO	1.78	0.19	1.59	0.00	1.59	121.7	NO	0.00	YES
5/12/64	2.24	0.36	1.89	1.051	1.68	NO	1.75	0.19	1.56	0.00	1.56	121.7	NO	0.00	YES
5/13/64	2.93	0.36	2.57	1.051	1.68	NO	2.28	0.19	2.09	0.00	2.09	121.7	NO	0.00	YES
5/14/64	2.93	0.36	2.57	1.051	1.68	NO	2.28	0.19	2.09	0.00	2.09	121.8	NO	0.00	YES
5/15/64	2.41	0.36	2.05	1.051	1.68	NO	1.88	0.19	1.68	0.00	1.68	121.7	NO	0.00	YES
5/16/64	2.33	0.36	1.97	1.051	1.68	NO	1.81	0.19	1.62	0.00	1.62	121.7	NO	0.00	YES
5/17/64	2.20	0.36	1.85	1.051	1.68	NO	1.72	0.19	1.52	0.00	1.52	121.7	NO	0.00	YES
5/18/64	2.16	0.36	1.81	1.051	1.68	NO	1.69	0.19	1.49	0.00	1.49	121.7	NO	0.00	YES
5/19/64	2.04	0.36	1.69	1.051	1.68	NO	1.59	0.19	1.40	0.00	1.40	121.7	NO	0.00	YES
5/20/64	1.96	0.36	1.61	1.051	1.68	YES	1.53	0.19	1.34	0.07	1.26	121.7	NO	0.00	YES
5/21/64	1.92	0.36	1.57	1.051	1.68	YES	1.50	0.19	1.31	0.11	1.19	121.7	NO	0.00	YES
5/22/64	1.92	0.36	1.57	1.051	1.68	YES	1.50	0.19	1.31	0.11	1.19	121.7	NO	0.00	YES
5/23/64	1.88	0.36	1.53	1.051	1.68	YES	1.47	0.19	1.27	0.15	1.12	121.7	NO	0.00	YES
5/24/64	1.84	0.36	1.49	1.051	1.68	YES	1.44	0.19	1.24	0.19	1.05	121.7	NO	0.00	YES
5/25/64	1.76	0.36	1.41	1.051	1.68	YES	1.38	0.19	1.18	0.27	0.91	121.7	NO	0.00	YES
5/26/64	1.72	0.36	1.37	1.051	1.68	YES	1.34	0.19	1.15	0.31	0.84	121.7	NO	0.00	YES
5/27/64	1.72	0.36	1.37	1.051	1.68	YES	1.34	0.19	1.15	0.31	0.84	121.7	NO	0.00	YES
5/28/64	1.68	0.36	1.33	1.051	1.68	YES	1.31	0.19	1.12	0.35	0.77	121.7	NO	0.00	YES
5/29/64	1.72	0.36	1.37	1.051	1.68	YES	1.34	0.19	1.15	0.31	0.84	121.7	NO	0.00	YES
5/30/64	1.84	0.36	1.49	1.051	1.68	YES	1.44	0.19	1.24	0.19	1.05	121.7	NO	0.00	YES
5/31/64	1.92	0.36	1.57	1.051	1.68	YES	1.50	0.19	1.31	0.11	1.19	121.7	NO	0.00	YES
6/1/64	2.00	0.36	1.65	1.164	1.86	YES	1.56	0.19	1.37	0.21	1.16	121.7	NO	0.00	YES
6/2/64	2.08	0.36	1.73	1.164	1.86	YES	1.63	0.19	1.43	0.13	1.30	121.7	NO	0.00	YES
6/3/64	1.96	0.36	1.61	1.164	1.86	YES	1.53	0.19	1.34	0.25	1.08	121.7	NO	0.00	YES
6/4/64	1.92	0.36	1.57	1.164	1.86	YES	1.50	0.19	1.31	0.29	1.01	121.7	NO	0.00	YES
6/5/64	1.88	0.36	1.53	1.164	1.86	YES	1.47	0.19	1.27	0.33	0.94	121.7	NO	0.00	YES
6/6/64	1.96	0.36	1.61	1.164	1.86	YES	1.53	0.19	1.34	0.25	1.08	121.7	NO	0.00	YES
6/7/64	2.16	0.36	1.81	1.164	1.86	YES	1.69	0.19	1.49	0.05	1.44	121.8	NO	0.00	YES
6/8/64	2.08	0.36	1.73	1.164	1.86	YES	1.63	0.19	1.43	0.13	1.30	121.7	NO	0.00	YES
6/9/64	1.80	0.36	1.45	1.164	1.86	YES	1.41	0.19	1.21	0.41	0.80	121.7	NO	0.00	YES
6/10/64	1.64	0.36	1.29	1.164	1.86	YES	1.28	0.19	1.09	0.57	0.51	121.7	NO	0.00	YES
6/11/64	1.52	0.36	1.17	1.164	1.86	YES	1.19	0.19	0.99	0.69	0.30	121.7	NO	0.00	YES
6/12/64	1.52	0.36	1.17	1.164	1.86	YES	1.19	0.19	0.99	0.69	0.30	121.7	NO	0.00	YES
6/13/64	1.64	0.36	1.29	1.164	1.86	YES	1.28	0.19	1.09	0.57	0.51	121.7	NO	0.00	YES
6/14/64	1.60	0.36	1.25	1.164	1.86	YES	1.25	0.19	1.06	0.61	0.44	121.7	NO	0.00	YES
6/15/64	1.60	0.36	1.25	1.164	1.86	YES	1.25	0.19	1.06	0.61	0.44	121.7	NO	0.00	YES
6/16/64	1.68	0.36	1.33	1.164	1.86	YES	1.31	0.19	1.12	0.53	0.58	121.8	NO	0.00	YES

1	17	18	19	20	21	22	23	24	25	26	27	28	29
Date	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
3/25/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/26/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.12	0.0818	121.80
3/27/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/28/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/29/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/30/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.15	0.1022	121.80
3/31/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.01	0.0068	121.80
4/1/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0.04	0.0273	121.70
4/2/64	121.7	YES	2.0	2.0	0.000	0.0	121.8	24.48	0.1895	0.13	0.27	0.1840	121.80
4/3/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0.08	0.0545	121.73
4/4/64	121.7	YES	2.0	2.0	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/5/64	121.7	YES	1.8	1.8	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/6/64	121.7	YES	2.1	2.1	0.000	0.0	121.8	24.48	0.1895	0.13	0.56	0.3817	121.80
4/7/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0.3	0.2045	121.80
4/8/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0.35	0.2386	121.80
4/9/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/10/64	121.7	YES	2.3	2.3	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/11/64	121.7	YES	2.1	2.1	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/12/64	121.7	YES	2.0	2.0	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/13/64	121.7	YES	1.9	1.9	0.000	0.0	121.8	24.48	0.1895	0.13	0.05	0.0341	121.71
4/14/64	121.7	YES	2.9	2.9	0.000	0.0	121.8	24.48	0.1895	0.13	0.51	0.3476	121.80
4/15/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0.29	0.1977	121.80
4/16/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/17/64	121.7	YES	2.0	2.0	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/18/64	121.7	YES	1.9	1.9	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/19/64	121.7	YES	1.9	1.9	0.000	0.0	121.8	24.48	0.1895	0.13	0.26	0.1772	121.80
4/20/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0.5	0.3408	121.80
4/21/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0.18	0.1227	121.80
4/22/64	121.8	YES	3.1	3.0	0.000	0.0	121.8	24.48	0.1895	0.13	0.02	0.0136	121.69
4/23/64	121.7	YES	2.6	2.6	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/24/64	121.7	YES	2.3	2.3	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/25/64	121.7	YES	2.1	2.1	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/26/64	121.7	YES	2.0	2.0	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/27/64	121.7	YES	2.0	2.0	0.000	0.0	121.8	24.48	0.1895	0.13	0.05	0.0341	121.71
4/28/64	121.7	YES	2.2	2.2	0.000	0.0	121.8	24.48	0.1895	0.13	0.21	0.1431	121.80
4/29/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0.25	0.1704	121.80
4/30/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0.45	0.3067	121.80
5/1/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/2/64	121.7	YES	2.4	2.4	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/3/64	121.7	YES	2.2	2.2	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/4/64	121.7	YES	2.1	2.1	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/5/64	121.7	YES	2.0	2.0	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/6/64	121.7	YES	1.9	1.9	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/7/64	121.7	YES	1.8	1.8	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/8/64	121.7	YES	1.8	1.8	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/9/64	121.7	YES	1.7	1.7	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/10/64	121.7	YES	1.6	1.6	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/11/64	121.7	YES	1.6	1.6	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/12/64	121.7	YES	1.6	1.6	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/13/64	121.7	YES	2.1	2.1	0.000	0.0	121.8	24.48	0.1895	0.13	0.43	0.2931	121.80
5/14/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/15/64	121.7	YES	1.7	1.7	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/16/64	121.7	YES	1.6	1.6	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/17/64	121.7	YES	1.5	1.5	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/18/64	121.7	YES	1.5	1.5	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/19/64	121.7	YES	1.4	1.4	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/20/64	121.7	YES	1.3	1.3	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/21/64	121.7	YES	1.2	1.2	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/22/64	121.7	YES	1.2	1.2	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/23/64	121.7	YES	1.1	1.1	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/24/64	121.7	YES	1.1	1.1	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/25/64	121.7	YES	0.9	0.9	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/26/64	121.7	YES	0.8	0.8	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/27/64	121.7	YES	0.8	0.8	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/28/64	121.7	YES	0.8	0.8	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/29/64	121.7	YES	0.8	0.8	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/30/64	121.7	YES	1.1	1.1	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/31/64	121.7	YES	1.2	1.2	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/1/64	121.7	YES	1.2	1.2	0.000	0.0	121.8	24.48	0.1895	0.13	0.01	0.0068	121.68
6/2/64	121.7	YES	1.3	1.3	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/3/64	121.7	YES	1.1	1.1	0.000	0.0	121.8	24.48	0.1895	0.13	0.09	0.0613	121.74
6/4/64	121.7	YES	1.0	1.0	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/5/64	121.7	YES	0.9	0.9	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/6/64	121.7	YES	1.1	1.1	0.000	0.0	121.8	24.48	0.1895	0.13	0.28	0.1908	121.80
6/7/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/8/64	121.7	YES	1.3	1.3	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/9/64	121.7	YES	0.8	0.8	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/10/64	121.7	YES	0.5	0.5	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/11/64	121.7	YES	0.3	0.3	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/12/64	121.7	YES	0.3	0.3	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/13/64	121.7	YES	0.5	0.5	0.000	0.0	121.8	24.48	0.1895	0.13	0.03	0.0204	121.69
6/14/64	121.7	YES	0.4	0.4	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/15/64	121.7	YES	0.4	0.4	0.000	0.0	121.8	24.48	0.1895	0.13	0.5	0.3408	121.80
6/16/64	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity	1.60	mgd	Hull Creek Minimum Stream Flow-By:	0.355	mgd	Min Reservoir Level	12.6	ft	Medford Quarry Pump Rate	0.750	MGD	`	MQ Stop Set Point	116.0 MG
Reservoir Volume	121.80	MG	Cranberry Branch Minimum Stream Flow-By:	0.194	mgd				Medford Quarry Max Annual Vol	176	MG			
Medford Quarry Start Setpoint	104	MG								234	days			

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
6/17/64	1.48	0.36	1.13	1.164	1.86	YES	1.16	0.19	0.96	0.73	0.23	121.7	NO	0.00	YES	121.7	YES	0.2	0.2	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/18/64	1.48	0.36	1.13	1.164	1.86	YES	1.16	0.19	0.96	0.73	0.23	121.7	NO	0.00	YES	121.7	YES	0.2	0.2	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/19/64	1.68	0.36	1.33	1.164	1.86	YES	1.31	0.19	1.12	0.53	0.58	121.7	NO	0.00	YES	121.7	YES	0.6	0.6	0.000	0.0	121.8	24.48	0.1895	0.13	0.3	0.2045	121.80
6/20/64	1.84	0.36	1.49	1.164	1.86	YES	1.44	0.19	1.24	0.37	0.87	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0.13	0.0886	121.76
6/21/64	1.48	0.36	1.13	1.164	1.86	YES	1.16	0.19	0.96	0.73	0.23	121.8	NO	0.00	YES	121.8	YES	0.2	0.2	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/22/64	1.52	0.36	1.17	1.164	1.86	YES	1.19	0.19	0.99	0.69	0.30	121.7	NO	0.00	YES	121.7	YES	0.3	0.3	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/23/64	1.48	0.36	1.13	1.164	1.86	YES	1.16	0.19	0.96	0.73	0.23	121.7	NO	0.00	YES	121.7	YES	0.2	0.2	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/24/64	3.01	0.36	2.65	1.164	1.86	NO	2.34	0.19	2.15	0.00	2.15	121.7	NO	0.00	YES	121.7	YES	2.2	2.2	0.000	0.0	121.8	24.48	0.1895	0.13	0.46	0.3135	121.80
6/25/64	1.44	0.36	1.09	1.164	1.86	YES	1.13	0.19	0.93	0.77	0.16	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/26/64	1.24	0.36	0.89	1.164	1.86	YES	0.97	0.19	0.77	0.98	0.00	121.7	YES	0.20	YES	121.5	NO	0.0	0.0	0.000	0.0	121.5	24.48	0.1895	0.13	0	0.0000	121.35
6/27/64	1.16	0.36	0.81	1.164	1.86	YES	0.91	0.19	0.71	1.06	0.00	121.3	YES	0.34	YES	121.0	NO	0.0	0.0	0.000	0.0	121.0	24.49	0.1895	0.13	0.6	0.4089	121.29
6/28/64	1.16	0.36	0.81	1.164	1.86	YES	0.91	0.19	0.71	1.06	0.00	121.3	YES	0.34	YES	120.9	NO	0.0	0.0	0.000	0.0	120.9	24.49	0.1895	0.13	0	0.0000	120.82
6/29/64	1.08	0.36	0.73	1.164	1.86	YES	0.84	0.19	0.65	1.14	0.00	120.8	YES	0.49	YES	120.3	NO	0.0	0.0	0.000	0.0	120.3	24.50	0.1895	0.13	0	0.0000	120.21
6/30/64	1.08	0.36	0.73	1.164	1.86	YES	0.84	0.19	0.65	1.14	0.00	120.2	YES	0.49	YES	119.7	NO	0.0	0.0	0.000	0.0	119.7	24.50	0.1895	0.13	0	0.0000	119.59
7/1/64	1.04	0.36	0.69	1.300	2.08	YES	0.81	0.19	0.62	1.39	0.00	119.6	YES	0.77	YES	118.8	NO	0.0	0.0	0.000	0.0	118.8	24.51	0.1895	0.13	0	0.0000	118.69
7/2/64	1.04	0.36	0.69	1.300	2.08	YES	0.81	0.19	0.62	1.39	0.00	118.7	YES	0.77	YES	117.9	NO	0.0	0.0	0.000	0.0	117.9	24.52	0.1895	0.13	0	0.0000	117.79
7/3/64	1.16	0.36	0.81	1.300	2.08	YES	0.91	0.19	0.71	1.27	0.00	117.8	YES	0.56	YES	117.2	NO	0.0	0.0	0.000	0.0	117.2	24.52	0.1895	0.13	0.14	0.0954	117.20
7/4/64	3.17	0.36	2.81	1.300	2.08	NO	2.47	0.19	2.28	0.00	2.28	117.2	NO	0.00	YES	117.2	YES	2.3	2.3	0.000	0.0	119.5	24.52	0.1895	0.13	0.03	0.0204	119.37
7/5/64	1.20	0.36	0.85	1.300	2.08	YES	0.94	0.19	0.74	1.23	0.00	119.4	YES	0.49	YES	118.9	NO	0.0	0.0	0.000	0.0	118.9	24.51	0.1895	0.13	0	0.0000	118.76
7/6/64	1.08	0.36	0.73	1.300	2.08	YES	0.84	0.19	0.65	1.35	0.00	118.8	YES	0.70	YES	118.1	NO	0.0	0.0	0.000	0.0	118.1	24.52	0.1895	0.13	0	0.0000	117.93
7/7/64	1.04	0.36	0.69	1.300	2.08	YES	0.81	0.19	0.62	1.39	0.00	117.9	YES	0.77	YES	117.2	NO	0.0	0.0	0.000	0.0	117.2	24.52	0.1895	0.13	0	0.0000	117.03
7/8/64	3.89	0.36	3.53	1.300	2.08	NO	3.03	0.19	2.84	0.00	2.84	117.0	NO	0.00	YES	117.0	YES	2.8	2.8	0.000	0.0	119.9	24.52	0.1895	0.13	1.23	0.8383	120.58
7/9/64	2.00	0.36	1.65	1.300	2.08	YES	1.56	0.19	1.37	0.43	0.94	120.6	NO	0.00	YES	120.6	YES	0.9	0.9	0.000	0.0	121.5	24.50	0.1895	0.13	0	0.0000	121.39
7/10/64	1.40	0.36	1.05	1.300	2.08	YES	1.09	0.19	0.90	1.03	0.00	121.4	YES	0.13	YES	121.3	NO	0.0	0.0	0.000	0.0	121.3	24.49	0.1895	0.13	0	0.0000	121.13
7/11/64	1.20	0.36	0.85	1.300	2.08	YES	0.94	0.19	0.74	1.23	0.00	121.1	YES	0.49	YES	120.6	NO	0.0	0.0	0.000	0.0	120.6	24.49	0.1895	0.13	0	0.0000	120.52
7/12/64	1.12	0.36	0.77	1.300	2.08	YES	0.88	0.19	0.68	1.31	0.00	120.5	YES	0.63	YES	119.9	NO	0.0	0.0	0.000	0.0	119.9	24.50	0.1895	0.13	0.39	0.2658	120.03
7/13/64	2.57	0.36	2.21	1.300	2.08	NO	2.00	0.19	1.81	0.00	1.81	120.0	NO	0.00	YES	120.0	YES	1.8	1.8	0.000	0.0	121.8	24.51	0.1895	0.13	0.35	0.2386	121.80
7/14/64	1.44	0.36	1.09	1.300	2.08	YES	1.13	0.19	0.93	0.99	0.00	121.8	YES	0.06	YES	121.7	NO	0.0	0.0	0.000	0.0	121.7	24.48	0.1895	0.13	0	0.0000	121.61
7/15/64	1.52	0.36	1.17	1.300	2.08	YES	1.19	0.19	0.99	0.91	0.08	121.6	NO	0.00	YES	121.6	YES	0.1	0.1	0.000	0.0	121.7	24.48	0.1895	0.13	0	0.0000	121.57
7/16/64	1.20	0.36	0.85	1.300	2.08	YES	0.94	0.19	0.74	1.23	0.00	121.6	YES	0.49	YES	121.1	NO	0.0	0.0	0.000	0.0	121.1	24.49	0.1895	0.13	0	0.0000	120.95
7/17/64	1.16	0.36	0.81	1.300	2.08	YES	0.91	0.19	0.71	1.27	0.00	121.0	YES	0.56	YES	120.4	NO	0.0	0.0	0.000	0.0	120.4	24.49	0.1895	0.13	0	0.0000	120.27
7/18/64	1.12	0.36	0.77	1.300	2.08	YES	0.88	0.19	0.68	1.31	0.00	120.3	YES	0.63	YES	119.6	NO	0.0	0.0	0.000	0.0	119.6	24.50	0.1895	0.13	0	0.0000	119.51
7/19/64	1.08	0.36	0.73	1.300	2.08	YES	0.84	0.19	0.65	1.35	0.00	119.5	YES	0.70	YES	118.8	NO	0.0	0.0	0.000	0.0	118.8	24.51	0.1895	0.13	0	0.0000	118.68
7/20/64	1.04	0.36	0.69	1.300	2.08	YES	0.81	0.19	0.62	1.39	0.00	118.7	YES	0.77	YES	117.9	NO	0.0	0.0	0.000	0.0	117.9	24.52	0.1895	0.13	0	0.0000	117.78
7/21/64	1.08	0.36	0.73	1.300	2.08	YES	0.84	0.19	0.65	1.35	0.00	117.8	YES	0.70	YES	117.1	NO	0.0	0.0	0.000	0.0	117.1	24.52	0.1895	0.13	0.17	0.1159	117.07
7/22/64	1.08	0.36	0.73	1.300	2.08	YES	0.84	0.19	0.65	1.35	0.00	117.1	YES	0.70	YES	116.4	NO	0.0	0.0	0.000	0.0	116.4	24.52	0.1895	0.13	0.3	0.2045	116.44
7/23/64	1.04	0.36	0.69	1.300	2.08	YES	0.81	0.19	0.62	1.39	0.00	116.4	YES	0.77	YES	115.7	NO	0.0	0.0	0.000	0.0	115.7	24.52	0.1895	0.13	0	0.0000	115.54
7/24/64	1.04	0.36	0.69	1.300	2.08	YES	0.81	0.19	0.62	1.39	0.00	115.5	YES	0.77	YES	114.8	NO	0.0	0.0	0.000	0.0	114.8	24.52	0.1895	0.13	0	0.0000	114.64
7/25/64	1.08	0.36	0.73	1.300	2.08	YES	0.84	0.19	0.65	1.35	0.00	114.6	YES	0.70	YES	113.9	NO	0.0	0.0	0.000	0.0	113.9	24.52	0.1895	0.13	0	0.0000	113.81
7/26/64	1.04	0.36	0.69	1.300	2.08	YES	0.81	0.19	0.62	1.39	0.00	113.8	YES	0.77	YES	113.0	NO	0.0	0.0	0.000	0.0	113.0	24.51	0.1895	0.13	0	0.0000	112.91
7/27/64	1.04	0.36	0.69	1.300	2.08	YES	0.81	0.19	0.62	1.39	0.00	112.9	YES	0.77	YES	112.1	NO	0.0	0.0	0.000	0.0	112.1	24.50	0.1895	0.13	0	0.0000	112.01
7/28/64	0.96	0.36	0.61	1.300	2.08	YES	0.75	0.19	0.56	1.47	0.00	112.0	YES	0.92	YES	111.1	NO	0.0	0.0	0.000	0.0	111.1	24.49	0.1895	0.13	0	0.0000	110.97
7/29/64	1.00	0.36	0.65	1.300	2.08	YES	0.78	0.19	0.59	1.43	0.00	111.0	YES	0.85	YES	110.1	NO	0.0	0.0	0.000	0.0	110.1	24.48	0.1895	0.13	0.05	0.0341	110.03
7/30/64	1.60	0.36	1.25	1.300	2.08	YES	1.25	0.19	1.06	0.83	0.22	110.0	NO	0.00	YES	110.0	YES	0.2	0.2	0.000	0.0	110.3	24.46	0.1895	0.13	0	0.0000	110.13
7/31/64	0.92	0.36	0.57	1.300	2.08	YES	0.72	0.19	0.52	1.51	0.00	110.1	YES	0.99	YES	109.1	NO	0.0	0.0	0.000	0.0	109.1	24.46	0.1895	0.13	0	0.0000	109.02
8/1/64	0.88	0.36	0.53	1.243	1.99	YES	0.69	0.19	0.49	1.46	0.00	109.0	YES	0.97	YES	108.1	NO	0.0	0.0	0.000	0.0	108.1	24.44	0.1895	0.13	0	0.0000	107.92
8/2/64	0.92	0.36	0.57	1.243	1.99	YES	0.72	0.19	0.52	1.42	0.00	107.9	YES	0.90	YES	107.0	NO	0.0	0.0	0.000	0.0	107.0	24.41	0.1895	0.13	0	0.0000	106.90
8/3/64	1.08	0.36	0.73	1.243	1.99	YES	0.84	0.19	0.65	1.26	0.00	106.9	YES	0.61	YES	106.3	NO	0.0	0.0	0.000	0.0	106.3	24.39	0.1895	0.13	0.77	0.5248	106.69
8/4/64	1.20	0.36	0.85	1.243	1.99	YES	0.94	0.19	0.74	1.14	0.00	106.7	YES	0.40	YES	106.3	NO	0.0	0.0	0.000	0.0	106.3	24.38	0.1895	0.13	0	0.0000	106.16
8/5/64	1.00	0.36	0.65	1.243	1.99	YES	0.78	0.19	0.59	1.34	0.00	106.2	YES	0.76	YES	105.4	NO	0.0	0.0	0.000	0.0	105.4	24.36	0.1895	0.13	0	0.0000	105.28
8/6/64	0.92	0.36	0.57	1.243	1.99	YES	0.72	0.19	0.52	1.42	0.00	105.3	YES	0.90	YES	104.4	NO	0.0	0.0	0.000	0.0	104.4	24.34	0.1895	0.13	0	0.0000	104.26
8/7/64	0.88	0.36	0.53	1.243	1.99	YES	0.69	0.19	0.49	1.46	0.00	104.3	YES	0.97	YES	103.3	NO	0.0	0.0	0.000	0.0	103.3	24.30	0.1895	0.13	0.8	0.5453	103.71
8/8/64	0.88	0.36	0.53	1.243	1.99	YES	0.69	0.19	0.49	1.46	0.00	103.7	YES	0.97	YES	102.7	NO	0.0	0.0	0.750	0.8	103.5	24.28	0.1895	0.12	0.04	0.0273	103.40
8/9/64	0.80	0.36	0.45	1.243	1.99	YES	0.63	0.19	0.43	1.54	0.00	103.4	YES	1.11	YES	102.3	NO	0.0	0.0	0.750	1.5	103.0	24.27	0.1895	0.12	0	0.0000	102.91
8/10/64	0.84	0.36	0.49	1.243	1.99	YES	0.66	0.19	0.46	1.50	0.00	102.9	YES	1.04	YES	101.9	NO	0.0	0.0	0.750	2.3	102.6	24.25	0.1895	0.12	0	0.0000	102.49
8/11/64	0.88	0.36	0.53	1.243	1.99	YES	0.69	0.19	0.49	1.46	0.00	102.5	YES	0.97	YES	101.5	NO	0.0	0.0	0.750	3.0	102.3	24.23	0.1895	0.12	0.01	0.0068	102.16
8/12/64	0.88	0.36	0.53	1.243	1.99	YES	0.69	0.19	0.49	1.46	0.00	102.2	YES	0.97	YES	101.2	NO	0.0	0.0	0.750	3.8	101.9	24.22	0.1895	0.12	0.04	0.0273	101.84
8/13/64	0.80	0.36	0.45	1.243	1.99	YES	0.63	0.19	0.43	1.54	0.00	101.8	YES	1.11	YES	100.7	NO	0.0	0.0	0.750	4.5	101.5	24.20	0.1895	0.12	0	0.0000	101.35
8/14/64	0.76	0.36	0.41	1.243	1.99	YES	0.59	0.19	0.40	1.58	0.00	101.4	YES	1.18	YES	100.2	NO	0.0	0.0	0.750	5.3	100.9	24.18	0.1895	0.12	0	0.0000	100.80
8/15/64	0.76	0.36	0.41	1.243	1.99	YES	0.59	0.19	0.40	1.58	0.00	100.8	YES	1.18	YES	99.6	NO	0.0	0.0	0.750	6.0	100.4	24.15	0.1895	0.12	0	0.0000	100.24
8/16/64	0.76	0.36	0.41	1.243	1.99	YES	0.59	0.19	0.40	1.58	0.00	100.2	YES	1.18	YES	99.1	NO	0.0	0.0	0.750	6.8	99.8	24.13	0.1895	0.12	0.24	0.1636	99.85
8/17/64	0.80	0.36	0.45	1.243	1.99	YES	0.63	0.19	0.43	1.54	0.00	99.8	YES	1.11	YES	98.7	NO	0.0	0.0	0.750	7.5	99.5	24.11	0.1895	0.12	0	0.0000	99.36
8/18/64	0.80	0.36	0.45	1.243	1.99	YES	0.63	0.19	0.43	1.54	0.00	99.4	YES	1.11	YES	98.2	NO	0.0	0.0	0.750	8.3	99.0	24.08	0.1895	0.12	0.06	0.0409	98.92
8/19/64	0.84	0.36	0.49	1.243	1.99	YES	0.66	0.19	0.46	1.50	0.00	98.9	YES	1.04	YES	97.9	NO	0.0	0.0	0.750	9.0	98.6	24.06	0.1895	0.12	0	0.0000	98.50
8/20/64	0.76	0.36	0.41	1.243	1.99	YES	0.59	0.19	0.40	1.58	0.00	98.5	YES	1.18	YES	97.3	NO	0.0	0.0	0.750	9.8	98.1	24.04	0.1895	0.12	0	0.0000	97.94
8/21/64	0.76	0.36	0.41	1.243	1.99	YES	0.59	0.19	0.40	1.58	0.00	97.9	YES	1.18	YES	96.8	NO	0.0	0.0	0.750	10.5	97.5	24.01	0.1895	0.12	0	0.0000	97.39
8/22/64	0.72	0.36	0.37	1.243	1.99	YES	0.56	0.19	0.37	1.62	0.00	97.4	YES	1.25	YES	96.1	NO	0.0	0.0	0.750	11.3	96.9	23.98	0.1895	0.12	0	0.0000	96.76
8/23/64	0.68	0.36	0.33	1.243	1.99	YES	0.53	0.19	0.34	1.66	0.00	96.8	YES	1.33	YES	95.4	NO	0.0	0.0	0.750	12.0	96.2	23.94	0.1895	0.12	0	0.0000	96.06
8/24/64	0.68	0.36	0.33	1.243	1.99	YES	0.53	0.19	0.34	1.66	0.00	96.1	YES	1.33	YES	94.7	NO	0.0	0.0	0.750	12.8	95.5	23.90	0.1895	0.12	0	0.0000	95.36
8/25/64	0.64	0.36	0.29	1.243	1.99	YES	0.50	0.19	0.31	1.70	0.00	95.4	YES	1.40	YES	94.0	NO	0.0	0.0	0.750	13.5	94.7	23.85	0.1895	0.12	0	0.0000	94.59
8/26/64	0.64	0.36	0.29	1.243	1.99	YES	0.50	0.19	0.31	1.70	0.00	94.6	YES	1.40	YES	93.2	NO	0.0	0.0	0.750	14.3	93.9	23.80	0.1895	0.12	0	0.0000	93.82
8/27/64	0.60	0.36	0.25	1.243	1.99	YES	0.47	0.19	0.27	1.74	0.00	93.8	YES	1.47	YES	92.4	NO	0.0	0.0	0.750	15.0	93.1	23.75	0.1895	0.12	0	0.0000	92.98
8/28/64	0.64	0.36	0.29	1.243	1.99	YES	0.50	0.19	0.31	1.70	0.00	93.0	YES	1.40	YES	91.6	NO	0.0	0.0	0.750	15.8	92.3	23.69	0.1895	0.12	0	0.0000	92.21
8/29/64	0.68	0.36	0.33	1.243	1.99	YES	0.53	0.19	0.34	1.66	0.00	92.2	YES	1.33	YES	90.9	NO	0.0	0.0	0.750	16.5	91.6	23.64	0.1895	0.12	0	0.0000	91.52
8/30/64	0.68	0.36	0.33	1.243	1.99	YES	0.53	0.19	0.34	1.66	0.00	91.5	YES	1.33	YES	90.2	NO	0.0	0.0	0.750	17.3	90.9	23.59	0.1895	0.12	0	0.0000	90.82
8/31/64	0.76	0.36	0.41	1.243	1.99	YES	0.59	0.19	0.40	1.58	0.00	90.8	YES	1.18	YES	89.6	NO	0.0	0.0	0.750	18.0	90.4	23.53	0.1895	0.12	0	0.0000	90.26
9/1/64	0.76	0.36	0.41	1.017	1.63	YES	0.59	0.19	0.40	1.22	0.00	90.3	YES	0.82	YES	89.4	NO	0.0	0.0	0.750	18.8	90.2	23.49	0.1895	0.12	0	0.0000	90.07
9/2/64	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	90.1	YES	1.11	YES	89.0	NO	0.0	0.0	0.750	19.5	89.7	23.48	0.1895	0.12	0	0.0000	89.59
9/3/64	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	89.6	YES	1.11	YES	88.5	NO	0.0	0.0	0.750	20.3	89.2	23.44	0.1895	0.12	0	0.0000	89.12
9/4/64	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	89.1	YES	1.11	YES	88.0	NO	0.0	0.0	0.750	21.0	88.8	23.40	0.1895	0.12	0	0.0000	88.64
9/5/64	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	88.6	YES	1.18	YES	87.5	NO	0.0	0.0	0.750	21.8	88.2	23.36	0.1895	0.12	0	0.0000	88.09
9/6/64	0.52	0.36	0.17	1.017	1.63	YES	0.41	0.19	0.21	1.46	0.00	88.1	YES	1.25	YES	86.8	NO	0.0	0.0	0.750	22.5	87.6	23.31	0.1895	0.12	0	0.0000	87.47
9/7/64	0.52	0.36	0.17	1.017	1.63	YES	0.41	0.19	0.21	1.46	0.00	87.5	YES	1.25	YES	86.2	NO	0.0	0.0	0.750	23.3	87.0	23.26	0.1895	0.12	0	0.0000	86.85
9/8/64	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	86.9	YES	1.18	YES	85.7	NO	0.0	0.0	0.750	24.0	86.4	23.21	0.1895	0.12	0	0.0000	86.31

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity	1.60	mgd	Hull Creek Minimum Stream Flow-By:	0.355	mgd	Min Reservoir Level	12.6	ft	Medford Quarry Pump Rate	0.750	MGD
Reservoir Volume	121.80	MG	Cranberry Branch Minimum Stream Flow-By:	0.194	mgd				Medford Quarry Max Annual Vol	176	MG
Medford Quarry Start Setpoint	104	MG								234	days

MQ Stop Set Point 116.0 MG

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
9/9/64	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	86.3	YES	1.18	YES	85.1	NO	0.0	0.0	0.750	24.8	85.9	23.16	0.1895	0.12	0	0.0000	85.76
9/10/64	0.52	0.36	0.17	1.017	1.63	YES	0.41	0.19	0.21	1.46	0.00	85.8	YES	1.25	YES	84.5	NO	0.0	0.0	0.750	25.5	85.3	23.11	0.1895	0.12	0	0.0000	85.14
9/11/64	0.52	0.36	0.17	1.017	1.63	YES	0.41	0.19	0.21	1.46	0.00	85.1	YES	1.25	YES	83.9	NO	0.0	0.0	0.750	26.3	84.6	23.05	0.1895	0.12	0	0.0000	84.52
9/12/64	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	84.5	YES	1.18	YES	83.3	NO	0.0	0.0	0.750	27.0	84.1	22.99	0.1895	0.12	0	0.0000	83.98
9/13/64	0.64	0.36	0.29	1.017	1.63	YES	0.50	0.19	0.31	1.34	0.00	84.0	YES	1.04	YES	82.9	NO	0.0	0.0	0.750	27.8	83.7	22.94	0.1895	0.12	0.25	0.1704	83.74
9/14/64	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	83.7	YES	1.11	YES	82.6	NO	0.0	0.0	0.750	28.5	83.4	22.91	0.1895	0.12	0	0.0000	83.27
9/15/64	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	83.3	YES	1.18	YES	82.1	NO	0.0	0.0	0.750	29.3	82.8	22.87	0.1895	0.12	0	0.0000	82.72
9/16/64	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	82.7	YES	1.18	YES	81.5	NO	0.0	0.0	0.750	30.0	82.3	22.81	0.1895	0.12	0	0.0000	82.18
9/17/64	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	82.2	YES	1.18	YES	81.0	NO	0.0	0.0	0.750	30.8	81.7	22.76	0.1895	0.12	0	0.0000	81.63
9/18/64	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	81.6	YES	1.18	YES	80.5	NO	0.0	0.0	0.750	31.5	81.2	22.70	0.1895	0.12	0	0.0000	81.09
9/19/64	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	81.1	YES	1.11	YES	80.0	NO	0.0	0.0	0.750	32.3	80.7	22.64	0.1895	0.12	0.34	0.2317	80.85
9/20/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	80.8	YES	0.75	YES	80.1	NO	0.0	0.0	0.750	33.0	80.8	22.62	0.1895	0.12	0.01	0.0068	80.74
9/21/64	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	80.7	YES	0.89	YES	79.8	NO	0.0	0.0	0.750	33.8	80.6	22.61	0.1895	0.12	0	0.0000	80.48
9/22/64	0.68	0.36	0.33	1.017	1.63	YES	0.53	0.19	0.34	1.30	0.00	80.5	YES	0.96	YES	79.5	NO	0.0	0.0	0.750	34.5	80.3	22.58	0.1895	0.12	0	0.0000	80.15
9/23/64	0.68	0.36	0.33	1.017	1.63	YES	0.53	0.19	0.34	1.30	0.00	80.1	YES	0.96	YES	79.2	NO	0.0	0.0	0.750	35.3	79.9	22.54	0.1895	0.12	0	0.0000	79.82
9/24/64	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	79.8	YES	1.11	YES	78.7	NO	0.0	0.0	0.750	36.0	79.5	22.51	0.1895	0.12	0	0.0000	79.35
9/25/64	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	79.3	YES	1.18	YES	78.2	NO	0.0	0.0	0.750	36.8	78.9	22.45	0.1895	0.12	0	0.0000	78.80
9/26/64	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	78.8	YES	1.18	YES	77.6	NO	0.0	0.0	0.750	37.5	78.4	22.39	0.1895	0.12	0	0.0000	78.26
9/27/64	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	78.3	YES	1.11	YES	77.2	NO	0.0	0.0	0.750	38.3	77.9	22.33	0.1895	0.11	0	0.0000	77.79
9/28/64	0.68	0.36	0.33	1.017	1.63	YES	0.53	0.19	0.34	1.30	0.00	77.8	YES	0.96	YES	76.8	NO	0.0	0.0	0.750	39.0	77.6	22.28	0.1895	0.11	0.66	0.4498	77.91
9/29/64	1.68	0.36	1.33	1.017	1.63	YES	1.31	0.19	1.12	0.30	0.82	77.9	NO	0.00	YES	77.9	YES	0.8	0.8	0.750	39.8	79.5	22.29	0.1895	0.11	0.74	0.5044	79.87
9/30/64	1.24	0.36	0.89	1.017	1.63	YES	0.97	0.19	0.77	0.74	0.03	79.9	NO	0.00	YES	79.9	YES	0.0	0.0	0.750	40.5	80.7	22.51	0.1895	0.12	0.61	0.4158	80.95
10/1/64	0.96	0.36	0.61	1.017	1.63	YES	0.75	0.19	0.56	1.02	0.00	81.0	YES	0.46	YES	80.5	NO	0.0	0.0	0.750	41.3	81.2	22.63	0.1895	0.12	0	0.0000	81.12
10/2/64	1.16	0.36	0.81	1.017	1.63	YES	0.91	0.19	0.71	0.82	0.00	81.1	YES	0.11	YES	81.0	NO	0.0	0.0	0.750	42.0	81.8	22.65	0.1895	0.12	0.5	0.3408	81.99
10/3/64	1.16	0.36	0.81	1.017	1.63	YES	0.91	0.19	0.71	0.82	0.00	82.0	YES	0.11	YES	81.9	NO	0.0	0.0	0.750	42.8	82.6	22.74	0.1895	0.12	0	0.0000	82.51
10/4/64	0.88	0.36	0.53	1.017	1.63	YES	0.69	0.19	0.49	1.10	0.00	82.5	YES	0.61	YES	81.9	NO	0.0	0.0	0.750	43.5	82.7	22.79	0.1895	0.12	0.01	0.0068	82.55
10/5/64	0.84	0.36	0.49	1.017	1.63	YES	0.66	0.19	0.46	1.14	0.00	82.5	YES	0.68	YES	81.9	NO	0.0	0.0	0.750	44.3	82.6	22.79	0.1895	0.12	0	0.0000	82.50
10/6/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	82.5	YES	0.75	YES	81.8	NO	0.0	0.0	0.750	45.0	82.5	22.79	0.1895	0.12	0	0.0000	82.38
10/7/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	82.4	YES	0.75	YES	81.6	NO	0.0	0.0	0.750	45.8	82.4	22.78	0.1895	0.12	0	0.0000	82.27
10/8/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	82.3	YES	0.75	YES	81.5	NO	0.0	0.0	0.750	46.5	82.3	22.77	0.1895	0.12	0	0.0000	82.15
10/9/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	82.2	YES	0.75	YES	81.4	NO	0.0	0.0	0.750	47.3	82.2	22.75	0.1895	0.12	0	0.0000	82.03
10/10/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	82.0	YES	0.75	YES	81.3	NO	0.0	0.0	0.750	48.0	82.0	22.74	0.1895	0.12	0	0.0000	81.92
10/11/64	0.76	0.36	0.41	1.017	1.63	YES	0.59	0.19	0.40	1.22	0.00	81.9	YES	0.82	YES	81.1	NO	0.0	0.0	0.750	48.8	81.8	22.73	0.1895	0.12	0	0.0000	81.73
10/12/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	81.7	YES	0.75	YES	81.0	NO	0.0	0.0	0.750	49.5	81.7	22.71	0.1895	0.12	0	0.0000	81.61
10/13/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	81.6	YES	0.75	YES	80.9	NO	0.0	0.0	0.750	50.3	81.6	22.70	0.1895	0.12	0	0.0000	81.50
10/14/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	81.5	YES	0.75	YES	80.7	NO	0.0	0.0	0.750	51.0	81.5	22.69	0.1895	0.12	0	0.0000	81.38
10/15/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	81.4	YES	0.75	YES	80.6	NO	0.0	0.0	0.750	51.8	81.4	22.67	0.1895	0.12	0	0.0000	81.27
10/16/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	81.3	YES	0.75	YES	80.5	NO	0.0	0.0	0.750	52.5	81.3	22.66	0.1895	0.12	0.44	0.2999	81.45
10/17/64	0.96	0.36	0.61	1.017	1.63	YES	0.75	0.19	0.56	1.02	0.00	81.4	YES	0.46	YES	81.0	NO	0.0	0.0	0.750	53.3	81.7	22.68	0.1895	0.12	0.23	0.1568	81.78
10/18/64	0.96	0.36	0.61	1.017	1.63	YES	0.75	0.19	0.56	1.02	0.00	81.8	YES	0.46	YES	81.3	NO	0.0	0.0	0.750	54.0	82.1	22.72	0.1895	0.12	0	0.0000	81.94
10/19/64	0.84	0.36	0.49	1.017	1.63	YES	0.66	0.19	0.46	1.14	0.00	81.9	YES	0.68	YES	81.3	NO	0.0	0.0	0.750	54.8	82.0	22.73	0.1895	0.12	0.01	0.0068	81.91
10/20/64	0.88	0.36	0.53	1.017	1.63	YES	0.69	0.19	0.49	1.10	0.00	81.9	YES	0.61	YES	81.3	NO	0.0	0.0	0.750	55.5	82.0	22.73	0.1895	0.12	0	0.0000	81.93
10/21/64	0.84	0.36	0.49	1.017	1.63	YES	0.66	0.19	0.46	1.14	0.00	81.9	YES	0.68	YES	81.3	NO	0.0	0.0	0.750	56.3	82.0	22.73	0.1895	0.12	0	0.0000	81.89
10/22/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	81.9	YES	0.75	YES	81.1	NO	0.0	0.0	0.750	57.0	81.9	22.73	0.1895	0.12	0	0.0000	81.77
10/23/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	81.8	YES	0.75	YES	81.0	NO	0.0	0.0	0.750	57.8	81.8	22.71	0.1895	0.12	0	0.0000	81.66
10/24/64	0.76	0.36	0.41	1.017	1.63	YES	0.59	0.19	0.40	1.22	0.00	81.7	YES	0.82	YES	80.8	NO	0.0	0.0	0.750	58.5	81.6	22.70	0.1895	0.12	0	0.0000	81.47
10/25/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	81.5	YES	0.75	YES	80.7	NO	0.0	0.0	0.750	59.3	81.5	22.68	0.1895	0.12	0	0.0000	81.35
10/26/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	81.4	YES	0.75	YES	80.6	NO	0.0	0.0	0.750	60.0	81.4	22.67	0.1895	0.12	0	0.0000	81.24
10/27/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	81.2	YES	0.75	YES	80.5	NO	0.0	0.0	0.750	60.8	81.2	22.66	0.1895	0.12	0	0.0000	81.12
10/28/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	81.1	YES	0.75	YES	80.4	NO	0.0	0.0	0.750	61.5	81.1	22.65	0.1895	0.12	0	0.0000	81.00
10/29/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	81.0	YES	0.75	YES	80.3	NO	0.0	0.0	0.750	62.3	81.0	22.63	0.1895	0.12	0	0.0000	80.89
10/30/64	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	80.9	YES	0.75	YES	80.1	NO	0.0	0.0	0.750	63.0	80.9	22.62	0.1895	0.12	0	0.0000	80.77
10/31/64	0.76	0.36	0.41	1.017	1.63	YES	0.59	0.19	0.40	1.22	0.00	80.8	YES	0.82	YES	80.0	NO	0.0	0.0	0.750	63.8	80.7	22.61	0.1895	0.12	0	0.0000	80.58
11/1/64	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	80.6	YES	0.62	YES	80.0	NO	0.0	0.0	0.750	64.5	80.7	22.59	0.0000	0.00	0	0.0000	80.72
11/2/64	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	80.7	YES	0.62	YES	80.1	NO	0.0	0.0	0.750	65.3	80.8	22.60	0.0000	0.00	0	0.0000	80.85
11/3/64	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	80.8	YES	0.62	YES	80.2	NO	0.0	0.0	0.750	66.0	81.0	22.62	0.0000	0.00	0	0.0000	80.98
11/4/64	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	81.0	YES	0.62	YES	80.4	NO	0.0	0.0	0.750	66.8	81.1	22.63	0.0000	0.00	0	0.0000	81.12
11/5/64	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	81.1	YES	0.62	YES	80.5	NO	0.0	0.0	0.750	67.5	81.2	22.65	0.0000	0.00	0	0.0000	81.25
11/6/64	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	81.2	YES	0.62	YES	80.6	NO	0.0	0.0	0.750	68.3	81.4	22.66	0.0000	0.00	0	0.0000	81.38
11/7/64	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	81.4	YES	0.62	YES	80.8	NO	0.0	0.0	0.750	69.0	81.5	22.67	0.0000	0.00	0	0.0000	81.51
11/8/64	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	81.5	YES	0.62	YES	80.9	NO	0.0	0.0	0.750	69.8	81.6	22.69	0.0000	0.00	0	0.0000	81.65
11/9/64	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	81.6	YES	0.62	YES	81.0	NO	0.0	0.0	0.750	70.5	81.8	22.70	0.0000	0.00	0	0.0000	81.78
11/10/64	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	81.8	YES	0.62	YES	81.2	NO	0.0	0.0	0.750	71.3	81.9	22.72	0.0000	0.00	0	0.0000	81.91
11/11/64	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	81.9	YES	0.62	YES	81.3	NO	0.0	0.0	0.750	72.0	82.0	22.73	0.0000	0.00	0	0.0000	82.04
11/12/64	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	82.0	YES	0.62	YES	81.4	NO	0.0	0.0	0.750	72.8	82.2	22.74	0.0000	0.00	0	0.0000	82.18
11/13/64	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	82.2	YES	0.62	YES	81.6	NO	0.0	0.0	0.750	73.5	82.3	22.76	0.0000	0.00	0	0.0000	82.31
11/14/64	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	82.3	YES	0.62	YES	81.7	NO	0.0	0.0	0.750	74.3	82.4	22.77	0.0000	0.00	0	0.0000	82.44
11/15/64	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	82.4	YES	0.62	YES	81.8	NO	0.0	0.0	0.750	75.0	82.6	22.78	0.0000	0.00	0	0.0000	82.57
11/16/64	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	82.6	YES	0.55	YES	82.0	NO	0.0	0.0	0.750	75.8	82.8	22.80	0.0000	0.00	0.05	0.0341	82.81
11/17/64	0.84	0.36	0.49	0.890	1.42	YES	0.66	0.19	0.46	0.94	0.00	82.8	YES	0.47	YES	82.3	NO	0.0	0.0	0.750	76.5	83.1	22.82	0.0000	0.00	0	0.0000	83.09
11/18/64	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	83.1	YES	0.55	YES	82.5	NO	0.0	0.0	0.750	77.3	83.3	22.85	0.0000	0.00	0	0.0000	83.29
11/19/64	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	83.3	YES	0.55	YES	82.7	NO	0.0	0.0	0.750	78.0	83.5	22.87	0.0000	0.00	0.21	0.1431	83.64
11/20/64	0.96	0.36	0.61	0.890	1.42	YES	0.75	0.19	0.56	0.82	0.00	83.6	YES	0.26	YES	83.4	NO	0.0	0.0	0.750	78.8	84.1	22.90	0.0000	0.00	0.22	0.1499	84.28
11/21/64	0.88	0.36	0.53	0.890	1.42	YES	0.69	0.19	0.49	0.90	0.00	84.3	YES	0.40	YES	83.9	NO	0.0	0.0	0.750	79.5	84.6	22.97	0.0000	0.00	0	0.0000	84.62
11/22/64	0.84	0.36	0.49	0.890	1.42	YES	0.66	0.19	0.46	0.94	0.00	84.6	YES	0.47	YES	84.2	NO	0.0	0.0	0.750	80.3	84.9	23.00	0.0000	0.00	0	0.0000	84.90
11/23/64	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	84.9	YES	0.55	YES	84.4	NO	0.0	0.0	0.750	81.0	85.1	23.03	0.0000	0.00	0	0.0000	85.10
11/24/64	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	85.1	YES	0.55	YES	84.6	NO	0.0	0.0	0.750	81.8	85.3	23.05	0.0000	0.00	0	0.0000	85.31
11/25/64	1.80	0.36	1.45	0.890	1.42	NO	1.41	0.19	1.21	0.00	1.21	85.3	NO	0.00	YES	85.3	YES	1.2	1.2	0.750	82.5	87.3	23.06	0.0000	0.00	2.02	1.3768	88.65
11/26/64	3.29	0.36	2.93	0.890	1.42	NO	2.56	0.19	2.37	0.00	2.37	88.6	NO	0.00	YES	88.6	YES	2.4	2.4	0.750	83.3	91.8	23.36	0.0000	0.00	0	0.0000	91.77
11/27/64	1.16	0.36	0.81	0.890	1.42	YES	0.91	0.19	0.71	0.62	0.10	91.8	NO	0.00	YES	91.8	YES	0.1	0.1	0.750	84.0	92.6	23.61	0.0000	0.00	0	0.0000	92.61
11/28/64	1.00	0.36	0.65	0.890	1.42	YES	0.78	0.19	0.59	0.78	0.00	92.6	YES	0.19	YES	92.4	NO	0.0	0.0	0.750	84.8	93.2	23.67	0.0000	0.00	0	0.0000	93.17
11/29/64	0.96	0.36	0.61	0.890	1.42	YES	0.75	0.19	0.56	0.82	0.00	93.2	YES	0.26	YES	92.9	NO	0.0	0.0	0.750	85.5	93.7	23.71	0.0000	0.00	0	0.0000	93.66
11/30/64	0.92	0.36	0.57	0.890	1.42	YES	0.72	0.19	0.52	0.86	0.00	93.7	YES	0.33	YES	93.3	NO	0.0	0.0	0.750	86.3	94.1	23.74	0.0000	0.00	0.01	0.0068	94.09
12/1/64	0.88	0.36	0.53	0.814	1.30	YES	0.69	0.19	0.49	0.77	0.00	94.1	YES	0.28	YES	93.8	NO	0.0	0.0	0.750	87.0	94.6	23.77	0.0000	0.00	0	0.0000	94.56

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity	1.60	mgd	Hull Creek Minimum Stream Flow-By:	0.355	mgd	Min Reservoir Level	12.6	ft	Medford Quarry Pump Rate	0.750	MGD	`	MQ Stop Set Point	116.0 MG
Reservoir Volume	121.80	MG	Cranberry Branch Minimum Stream Flow-By:	0.194	mgd				Medford Quarry Max Annual Vol	176	MG			
Medford Quarry Start Setpoint	104	MG								234	days			

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
12/2/64	0.88	0.36	0.53	0.814	1.30	YES	0.69	0.19	0.49	0.77	0.00	94.6	YES	0.28	YES	94.3	NO	0.0	0.0	0.750	87.8	95.0	23.80	0.0000	0.00	0	0.0000	95.02
12/3/64	0.92	0.36	0.57	0.814	1.30	YES	0.72	0.19	0.52	0.73	0.00	95.0	YES	0.21	YES	94.8	NO	0.0	0.0	0.750	88.5	95.6	23.83	0.0000	0.00	0.22	0.1499	95.71
12/4/64	1.32	0.36	0.97	0.814	1.30	YES	1.03	0.19	0.84	0.33	0.50	95.7	NO	0.00	YES	95.7	YES	0.5	0.5	0.750	89.3	97.0	23.88	0.0000	0.00	0.16	0.1091	97.08
12/5/64	1.40	0.36	1.05	0.814	1.30	YES	1.09	0.19	0.90	0.25	0.65	97.1	NO	0.00	YES	97.1	YES	0.6	0.6	0.750	90.0	98.5	23.96	0.0000	0.00	0.49	0.3340	98.81
12/6/64	2.24	0.36	1.89	0.814	1.30	NO	1.75	0.19	1.56	0.00	1.56	98.8	NO	0.00	YES	98.8	YES	1.6	1.6	0.750	90.8	101.1	24.05	0.0000	0.00	0.06	0.0409	101.15
12/7/64	1.32	0.36	0.97	0.814	1.30	YES	1.03	0.19	0.84	0.33	0.50	101.2	NO	0.00	YES	101.2	YES	0.5	0.5	0.750	91.5	102.4	24.17	0.0000	0.00	0	0.0000	102.41
12/8/64	1.08	0.36	0.73	0.814	1.30	YES	0.84	0.19	0.65	0.57	0.08	102.4	NO	0.00	YES	102.4	YES	0.1	0.1	0.750	92.3	103.2	24.23	0.0000	0.00	0	0.0000	103.23
12/9/64	1.08	0.36	0.73	0.814	1.30	YES	0.84	0.19	0.65	0.57	0.08	103.2	NO	0.00	YES	103.2	YES	0.1	0.1	0.750	93.0	104.1	24.26	0.0000	0.00	0	0.0000	104.06
12/10/64	1.00	0.36	0.65	0.814	1.30	YES	0.78	0.19	0.59	0.65	0.00	104.1	YES	0.07	YES	104.0	NO	0.0	0.0	0.750	93.8	104.7	24.29	0.0000	0.00	0	0.0000	104.74
12/11/64	0.96	0.36	0.61	0.814	1.30	YES	0.75	0.19	0.56	0.69	0.00	104.7	YES	0.14	YES	104.6	NO	0.0	0.0	0.750	94.5	105.4	24.32	0.0000	0.00	0	0.0000	105.35
12/12/64	3.37	0.36	3.01	0.814	1.30	NO	2.63	0.19	2.43	0.00	2.43	105.4	NO	0.00	YES	105.4	YES	2.4	2.4	0.750	95.3	108.5	24.34	0.0000	0.00	1.33	0.9065	109.44
12/13/64	2.16	0.36	1.81	0.814	1.30	NO	1.69	0.19	1.49	0.00	1.49	109.4	NO	0.00	YES	109.4	YES	1.5	1.5	0.750	96.0	111.7	24.45	0.0000	0.00	0	0.0000	111.68
12/14/64	1.52	0.36	1.17	0.814	1.30	YES	1.19	0.19	0.99	0.13	0.86	111.7	NO	0.00	YES	111.7	YES	0.9	0.9	0.750	96.8	113.3	24.49	0.0000	0.00	0	0.0000	113.29
12/15/64	1.28	0.36	0.93	0.814	1.30	YES	1.00	0.19	0.81	0.37	0.43	113.3	NO	0.00	YES	113.3	YES	0.4	0.4	0.750	97.5	114.5	24.51	0.0000	0.00	0	0.0000	114.48
12/16/64	1.00	0.36	0.65	0.814	1.30	YES	0.78	0.19	0.59	0.65	0.00	114.5	YES	0.07	YES	114.4	NO	0.0	0.0	0.750	98.3	115.2	24.52	0.0000	0.00	0	0.0000	115.16
12/17/64	1.12	0.36	0.77	0.814	1.30	YES	0.88	0.19	0.68	0.53	0.15	115.2	NO	0.00	YES	115.2	YES	0.1	0.1	0.750	99.0	116.1	24.52	0.0000	0.00	0.02	0.0136	116.07
12/18/64	1.08	0.36	0.73	0.814	1.30	YES	0.84	0.19	0.65	0.57	0.08	116.1	NO	0.00	YES	116.1	YES	0.1	0.1	0.000	99.0	116.1	24.52	0.0000	0.00	0	0.0000	116.15
12/19/64	0.88	0.36	0.53	0.814	1.30	YES	0.69	0.19	0.49	0.77	0.00	116.1	YES	0.28	YES	115.9	NO	0.0	0.0	0.000	99.0	115.9	24.52	0.0000	0.00	0	0.0000	115.86
12/20/64	1.12	0.36	0.77	0.814	1.30	YES	0.88	0.19	0.68	0.53	0.15	115.9	NO	0.00	YES	115.9	YES	0.1	0.1	0.000	99.0	116.0	24.52	0.0000	0.00	0.34	0.2317	116.24
12/21/64	1.04	0.36	0.69	0.814	1.30	YES	0.81	0.19	0.62	0.61	0.00	116.2	NO	0.00	YES	116.2	YES	0.0	0.0	0.000	99.0	116.2	24.52	0.0000	0.00	0	0.0000	116.25
12/22/64	1.04	0.36	0.69	0.814	1.30	YES	0.81	0.19	0.62	0.61	0.00	116.2	NO	0.00	YES	116.2	YES	0.0	0.0	0.000	99.0	116.3	24.52	0.0000	0.00	0	0.0000	116.25
12/23/64	1.04	0.36	0.69	0.814	1.30	YES	0.81	0.19	0.62	0.61	0.00	116.3	NO	0.00	YES	116.3	YES	0.0	0.0	0.000	99.0	116.3	24.52	0.0000	0.00	0	0.0000	116.25
12/24/64	1.04	0.36	0.69	0.814	1.30	YES	0.81	0.19	0.62	0.61	0.00	116.3	NO	0.00	YES	116.3	YES	0.0	0.0	0.000	99.0	116.3	24.52	0.0000	0.00	0.01	0.0068	116.27
12/25/64	1.12	0.36	0.77	0.814	1.30	YES	0.88	0.19	0.68	0.53	0.15	116.3	NO	0.00	YES	116.3	YES	0.1	0.1	0.000	99.0	116.4	24.52	0.0000	0.00	0	0.0000	116.41
12/26/64	1.16	0.36	0.81	0.814	1.30	YES	0.91	0.19	0.71	0.49	0.22	116.4	NO	0.00	YES	116.4	YES	0.2	0.2	0.000	99.0	116.6	24.52	0.0000	0.00	0.39	0.2658	116.90
12/27/64	3.01	0.36	2.65	0.814	1.30	NO	2.34	0.19	2.15	0.00	2.15	116.9	NO	0.00	YES	116.9	YES	2.2	2.2	0.000	99.0	119.0	24.52	0.0000	0.00	0.92	0.6270	119.67
12/28/64	4.09	0.36	3.73	0.814	1.30	NO	3.19	0.19	2.99	0.00	2.99	119.7	NO	0.00	YES	119.7	YES	3.0	3.0	0.000	99.0	121.8	24.51	0.0000	0.00	0	0.0000	121.80
12/29/64	1.92	0.36	1.57	0.814	1.30	NO	1.50	0.19	1.31	0.00	1.31	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	99.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/30/64	1.60	0.36	1.25	0.814	1.30	YES	1.25	0.19	1.06	0.05	1.00	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	99.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/31/64	1.44	0.36	1.09	0.814	1.30	YES	1.13	0.19	0.93	0.21	0.72	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	99.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/1/65	1.28	0.36	0.93	0.814	1.30	YES	1.00	0.19	0.81	0.37	0.43	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/2/65	1.32	0.36	0.97	0.814	1.30	YES	1.03	0.19	0.84	0.33	0.50	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.08	0.0545	121.80
1/3/65	1.36	0.36	1.01	0.814	1.30	YES	1.06	0.19	0.87	0.29	0.57	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/4/65	1.20	0.36	0.85	0.814	1.30	YES	0.94	0.19	0.74	0.45	0.29	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/5/65	1.16	0.36	0.81	0.814	1.30	YES	0.91	0.19	0.71	0.49	0.22	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/6/65	1.16	0.36	0.81	0.814	1.30	YES	0.91	0.19	0.71	0.49	0.22	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/7/65	1.12	0.36	0.77	0.814	1.30	YES	0.88	0.19	0.68	0.53	0.15	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.04	0.0273	121.80
1/8/65	1.64	0.36	1.29	0.814	1.30	YES	1.28	0.19	1.09	0.01	1.07	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.39	0.2658	121.80
1/9/65	1.68	0.36	1.33	0.814	1.30	NO	1.31	0.19	1.12	0.00	1.12	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.36	0.2454	121.80
1/10/65	2.33	0.36	1.97	0.814	1.30	NO	1.81	0.19	1.62	0.00	1.62	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.97	0.6611	121.80
1/11/65	1.92	0.36	1.57	0.814	1.30	NO	1.50	0.19	1.31	0.00	1.31	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/12/65	1.80	0.36	1.45	0.814	1.30	NO	1.41	0.19	1.21	0.00	1.21	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/13/65	1.64	0.36	1.29	0.814	1.30	YES	1.28	0.19	1.09	0.01	1.07	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/14/65	1.44	0.36	1.09	0.814	1.30	YES	1.13	0.19	0.93	0.21	0.72	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/15/65	1.40	0.36	1.05	0.814	1.30	YES	1.09	0.19	0.90	0.25	0.65	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/16/65	1.20	0.36	0.85	0.814	1.30	YES	0.94	0.19	0.74	0.45	0.29	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.26	0.1772	121.80
1/17/65	1.40	0.36	1.05	0.814	1.30	YES	1.09	0.19	0.90	0.25	0.65	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.02	0.0136	121.80
1/18/65	1.40	0.36	1.05	0.814	1.30	YES	1.09	0.19	0.90	0.25	0.65	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/19/65	1.20	0.36	0.85	0.814	1.30	YES	0.94	0.19	0.74	0.45	0.29	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/20/65	1.20	0.36	0.85	0.814	1.30	YES	0.94	0.19	0.74	0.45	0.29	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/21/65	1.40	0.36	1.05	0.814	1.30	YES	1.09	0.19	0.90	0.25	0.65	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/22/65	1.60	0.36	1.25	0.814	1.30	YES	1.25	0.19	1.06	0.05	1.00	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/23/65	1.80	0.36	1.45	0.814	1.30	NO	1.41	0.19	1.21	0.00	1.21	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.58	0.3953	121.80
1/24/65	4.77	0.36	4.42	0.814	1.30	NO	3.72	0.19	3.53	0.00	3.53	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.33	0.2249	121.80
1/25/65	2.93	0.36	2.57	0.814	1.30	NO	2.28	0.19	2.09	0.00	2.09	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/26/65	2.77	0.36	2.41	0.814	1.30	NO	2.16	0.19	1.96	0.00	1.96	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/27/65	2.45	0.36	2.09	0.814	1.30	NO	1.91	0.19	1.71	0.00	1.71	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/28/65	1.96	0.36	1.61	0.814	1.30	NO	1.53	0.19	1.34	0.00	1.34	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/29/65	1.80	0.36	1.45	0.814	1.30	NO	1.41	0.19	1.21	0.00	1.21	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/30/65	1.60	0.36	1.25	0.814	1.30	YES	1.25	0.19	1.06	0.05	1.00	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.06	0.0409	121.80
1/31/65	1.40	0.36	1.05	0.814	1.30	YES	1.09	0.19	0.90	0.25	0.65	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/1/65	1.40	0.36	1.05	0.788	1.26	YES	1.09	0.19	0.90	0.21	0.69	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/2/65	1.28	0.36	0.93	0.788	1.26	YES	1.00	0.19	0.81	0.33	0.47	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/3/65	1.20	0.36	0.85	0.788	1.26	YES	0.94	0.19	0.74	0.41	0.33	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/4/65	1.12	0.36	0.77	0.788	1.26	YES	0.88	0.19	0.68	0.49	0.19	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/5/65	1.08	0.36	0.73	0.788	1.26	YES	0.84	0.19	0.65	0.53	0.12	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/6/65	1.40	0.36	1.05	0.788	1.26	YES	1.09	0.19	0.90	0.21	0.69	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/7/65	12.11	0.36	11.75	0.788	1.26	NO	9.44	0.19	9.24	0.00	9.24	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	1.64	1.1178	121.80
2/8/65	11.83	0.36	11.47	0.788	1.26	NO	9.22	0.19	9.03	0.00	9.03	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/9/65	4.41	0.36	4.05	0.788	1.26	NO	3.44	0.19	3.24	0.00	3.24	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.06	0.0409	121.80
2/10/65	4.33	0.36	3.97	0.788	1.26	NO	3.38	0.19	3.18	0.00	3.18	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.17	0.1159	121.80
2/11/65	3.85	0.36	3.49	0.788	1.26	NO	3.00	0.19	2.81	0.00	2.81	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/12/65	3.53	0.36	3.17	0.788	1.26	NO	2.75	0.19	2.56	0.00	2.56	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.04	0.0273	121.80
2/13/65	3.05	0.36	2.69	0.788	1.26	NO	2.38	0.19	2.18	0.00	2.18	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/14/65	2.69	0.36	2.33	0.788	1.26	NO	2.09	0.19	1.90	0.00	1.90	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.12	0.0818	121.80
2/15/65	2.57	0.36	2.21	0.788	1.26	NO	2.00	0.19	1.81	0.00	1.81	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/16/65	2.41	0.36	2.05	0.788	1.26	NO	1.88	0.19	1.68	0.00	1.68	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/17/65	2.37	0.36	2.01	0.788	1.26	NO	1.84	0.19	1.65	0.00	1.65	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/18/65	2.24	0.36	1.89	0.788	1.26	NO	1.75	0.19	1.56	0.00	1.56	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/19/65	2.08	0.36	1.73	0.788	1.26	NO	1.63	0.19	1.43	0.00	1.43	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/20/65	1.80	0.36	1.45	0.788	1.26	NO	1.41	0.19	1.21	0.00	1.21	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/21/65	1.96	0.36	1.61	0.788	1.26	NO	1.53	0.19	1.34	0.00	1.34	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/22/65	1.92	0.36	1.57	0.788	1.26	NO	1.50	0.19	1.31	0.00	1.31	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/23/65	1.72	0.36	1.37	0.788	1.26	NO	1.34	0.19	1.15	0.00	1.15	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity	1.60	mgd	Hull Creek Minimum Stream Flow-By:	0.355	mgd	Min Reservoir Level	12.6	ft	
Reservoir Volume	121.80	MG	Cranberry Branch Minimum Stream Flow-By:	0.194	mgd				
Medford Quarry Start Setpoint	104	MG							
Medford Quarry Pump Rate	0.750	MGD	`	MQ Stop Set Point	116.0	MG			
Medford Quarry Max Annual Vol	176	MG							
	234	days							

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
2/24/65	1.72	0.36	1.37	0.788	1.26	NO	1.34	0.19	1.15	0.00	1.15	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.01	0.0068	121.80
2/25/65	4.65	0.36	4.30	0.788	1.26	NO	3.63	0.19	3.43	0.00	3.43	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.85	0.5793	121.80
2/26/65	3.05	0.36	2.69	0.788	1.26	NO	2.38	0.19	2.18	0.00	2.18	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/27/65	2.37	0.36	2.01	0.788	1.26	NO	1.84	0.19	1.65	0.00	1.65	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/28/65	2.24	0.36	1.89	0.788	1.26	NO	1.75	0.19	1.56	0.00	1.56	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/1/65	2.20	0.36	1.85	0.915	1.46	NO	1.72	0.19	1.52	0.00	1.52	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/2/65	2.04	0.36	1.69	0.915	1.46	NO	1.59	0.19	1.40	0.00	1.40	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/3/65	2.04	0.36	1.69	0.915	1.46	NO	1.59	0.19	1.40	0.00	1.40	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/4/65	1.96	0.36	1.61	0.915	1.46	NO	1.53	0.19	1.34	0.00	1.34	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.18	0.1227	121.80
3/5/65	12.39	0.36	12.03	0.915	1.46	NO	9.66	0.19	9.46	0.00	9.46	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	1.62	1.1041	121.80
3/6/65	5.01	0.36	4.66	0.915	1.46	NO	3.91	0.19	3.71	0.00	3.71	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/7/65	3.57	0.36	3.21	0.915	1.46	NO	2.78	0.19	2.59	0.00	2.59	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/8/65	3.05	0.36	2.69	0.915	1.46	NO	2.38	0.19	2.18	0.00	2.18	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/9/65	2.77	0.36	2.41	0.915	1.46	NO	2.16	0.19	1.96	0.00	1.96	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/10/65	2.53	0.36	2.17	0.915	1.46	NO	1.97	0.19	1.77	0.00	1.77	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/11/65	2.29	0.36	1.93	0.915	1.46	NO	1.78	0.19	1.59	0.00	1.59	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/12/65	2.20	0.36	1.85	0.915	1.46	NO	1.72	0.19	1.52	0.00	1.52	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/13/65	2.16	0.36	1.81	0.915	1.46	NO	1.69	0.19	1.49	0.00	1.49	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/14/65	2.08	0.36	1.73	0.915	1.46	NO	1.63	0.19	1.43	0.00	1.43	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/15/65	2.04	0.36	1.69	0.915	1.46	NO	1.59	0.19	1.40	0.00	1.40	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.01	0.0068	121.80
3/16/65	1.96	0.36	1.61	0.915	1.46	NO	1.53	0.19	1.34	0.00	1.34	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/17/65	2.04	0.36	1.69	0.915	1.46	NO	1.59	0.19	1.40	0.00	1.40	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.72	0.4907	121.80
3/18/65	2.37	0.36	2.01	0.915	1.46	NO	1.84	0.19	1.65	0.00	1.65	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.01	0.0068	121.80
3/19/65	2.65	0.36	2.29	0.915	1.46	NO	2.06	0.19	1.87	0.00	1.87	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.02	0.0136	121.80
3/20/65	2.49	0.36	2.13	0.915	1.46	NO	1.94	0.19	1.74	0.00	1.74	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.27	0.1840	121.80
3/21/65	2.20	0.36	1.85	0.915	1.46	NO	1.72	0.19	1.52	0.00	1.52	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/22/65	2.20	0.36	1.85	0.915	1.46	NO	1.72	0.19	1.52	0.00	1.52	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/23/65	2.20	0.36	1.85	0.915	1.46	NO	1.72	0.19	1.52	0.00	1.52	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.01	0.0068	121.80
3/24/65	2.16	0.36	1.81	0.915	1.46	NO	1.69	0.19	1.49	0.00	1.49	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.02	0.0136	121.80
3/25/65	2.65	0.36	2.29	0.915	1.46	NO	2.06	0.19	1.87	0.00	1.87	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.38	0.2590	121.80
3/26/65	5.33	0.36	4.98	0.915	1.46	NO	4.16	0.19	3.96	0.00	3.96	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.75	0.5112	121.80
3/27/65	3.65	0.36	3.29	0.915	1.46	NO	2.84	0.19	2.65	0.00	2.65	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/28/65	2.89	0.36	2.53	0.915	1.46	NO	2.25	0.19	2.06	0.00	2.06	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/29/65	3.01	0.36	2.65	0.915	1.46	NO	2.34	0.19	2.15	0.00	2.15	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0.32	0.2181	121.80
3/30/65	2.65	0.36	2.29	0.915	1.46	NO	2.06	0.19	1.87	0.00	1.87	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/31/65	2.41	0.36	2.05	0.915	1.46	NO	1.88	0.19	1.68	0.00	1.68	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.0000	0.00	0	0.0000	121.80
4/1/65	2.29	0.36	1.93	0.992	1.59	NO	1.78	0.19	1.59	0.00	1.59	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0.01	0.0068	121.68
4/2/65	2.37	0.36	2.01	0.992	1.59	NO	1.84	0.19	1.65	0.00	1.65	121.7	NO	0.00	YES	121.7	YES	1.6	1.6	0.000	0.0	121.8	24.48	0.1895	0.13	0.16	0.1091	121.78
4/3/65	2.20	0.36	1.85	0.992	1.59	NO	1.72	0.19	1.52	0.00	1.52	121.8	NO	0.00	YES	121.8	YES	1.5	1.5	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/4/65	2.08	0.36	1.73	0.992	1.59	NO	1.63	0.19	1.43	0.00	1.43	121.7	NO	0.00	YES	121.7	YES	1.4	1.4	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/5/65	2.04	0.36	1.69	0.992	1.59	NO	1.59	0.19	1.40	0.00	1.40	121.7	NO	0.00	YES	121.7	YES	1.4	1.4	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/6/65	2.04	0.36	1.69	0.992	1.59	NO	1.59	0.19	1.40	0.00	1.40	121.7	NO	0.00	YES	121.7	YES	1.4	1.4	0.000	0.0	121.8	24.48	0.1895	0.13	0.35	0.2386	121.80
4/7/65	2.24	0.36	1.89	0.992	1.59	NO	1.75	0.19	1.56	0.00	1.56	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0.13	0.0886	121.76
4/8/65	2.16	0.36	1.81	0.992	1.59	NO	1.69	0.19	1.49	0.00	1.49	121.8	NO	0.00	YES	121.8	YES	1.5	1.5	0.000	0.0	121.8	24.48	0.1895	0.13	0.03	0.0204	121.69
4/9/65	2.08	0.36	1.73	0.992	1.59	NO	1.63	0.19	1.43	0.00	1.43	121.7	NO	0.00	YES	121.7	YES	1.4	1.4	0.000	0.0	121.8	24.48	0.1895	0.13	0.1	0.0682	121.74
4/10/65	1.96	0.36	1.61	0.992	1.59	NO	1.53	0.19	1.34	0.00	1.34	121.7	NO	0.00	YES	121.7	YES	1.3	1.3	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/11/65	1.92	0.36	1.57	0.992	1.59	YES	1.50	0.19	1.31	0.02	1.29	121.7	NO	0.00	YES	121.7	YES	1.3	1.3	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/12/65	1.84	0.36	1.49	0.992	1.59	YES	1.44	0.19	1.24	0.10	1.15	121.7	NO	0.00	YES	121.7	YES	1.1	1.1	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/13/65	1.72	0.36	1.37	0.992	1.59	YES	1.34	0.19	1.15	0.22	0.93	121.7	NO	0.00	YES	121.7	YES	0.9	0.9	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/14/65	1.72	0.36	1.37	0.992	1.59	YES	1.34	0.19	1.15	0.22	0.93	121.7	NO	0.00	YES	121.7	YES	0.9	0.9	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/15/65	1.96	0.36	1.61	0.992	1.59	NO	1.53	0.19	1.34	0.00	1.34	121.7	NO	0.00	YES	121.7	YES	1.3	1.3	0.000	0.0	121.8	24.48	0.1895	0.13	0.32	0.2181	121.80
4/16/65	2.41	0.36	2.05	0.992	1.59	NO	1.88	0.19	1.68	0.00	1.68	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0.01	0.0068	121.68
4/17/65	1.96	0.36	1.61	0.992	1.59	NO	1.53	0.19	1.34	0.00	1.34	121.7	NO	0.00	YES	121.7	YES	1.3	1.3	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/18/65	1.88	0.36	1.53	0.992	1.59	YES	1.47	0.19	1.27	0.06	1.22	121.7	NO	0.00	YES	121.7	YES	1.2	1.2	0.000	0.0	121.8	24.48	0.1895	0.13	0.02	0.0136	121.69
4/19/65	2.29	0.36	1.93	0.992	1.59	NO	1.78	0.19	1.59	0.00	1.59	121.7	NO	0.00	YES	121.7	YES	1.6	1.6	0.000	0.0	121.8	24.48	0.1895	0.13	0.32	0.2181	121.80
4/20/65	2.04	0.36	1.69	0.992	1.59	NO	1.59	0.19	1.40	0.00	1.40	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/21/65	1.92	0.36	1.57	0.992	1.59	YES	1.50	0.19	1.31	0.02	1.29	121.7	NO	0.00	YES	121.7	YES	1.3	1.3	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/22/65	1.84	0.36	1.49	0.992	1.59	YES	1.44	0.19	1.24	0.10	1.15	121.7	NO	0.00	YES	121.7	YES	1.1	1.1	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/23/65	1.84	0.36	1.49	0.992	1.59	YES	1.44	0.19	1.24	0.10	1.15	121.7	NO	0.00	YES	121.7	YES	1.1	1.1	0.000	0.0	121.8	24.48	0.1895	0.13	0.02	0.0136	121.69
4/24/65	1.84	0.36	1.49	0.992	1.59	YES	1.44	0.19	1.24	0.10	1.15	121.7	NO	0.00	YES	121.7	YES	1.1	1.1	0.000	0.0	121.8	24.48	0.1895	0.13	0.08	0.0545	121.73
4/25/65	1.92	0.36	1.57	0.992	1.59	YES	1.50	0.19	1.31	0.02	1.29	121.7	NO	0.00	YES	121.7	YES	1.3	1.3	0.000	0.0	121.8	24.48	0.1895	0.13	0.09	0.0613	121.74
4/26/65	2.08	0.36	1.73	0.992	1.59	NO	1.63	0.19	1.43	0.00	1.43	121.7	NO	0.00	YES	121.7	YES	1.4	1.4	0.000	0.0	121.8	24.48	0.1895	0.13	0.05	0.0341	121.71
4/27/65	2.00	0.36	1.65	0.992	1.59	NO	1.56	0.19	1.37	0.00	1.37	121.7	NO	0.00	YES	121.7	YES	1.4	1.4	0.000	0.0	121.8	24.48	0.1895	0.13	0.02	0.0136	121.69
4/28/65	1.88	0.36	1.53	0.992	1.59	YES	1.47	0.19	1.27	0.06	1.22	121.7	NO	0.00	YES	121.7	YES	1.2	1.2	0.000	0.0	121.8	24.48	0.1895	0.13	0.01	0.0068	121.68
4/29/65	1.80	0.36	1.45	0.992	1.59	YES	1.41	0.19	1.21	0.14	1.07	121.7	NO	0.00	YES	121.7	YES	1.1	1.1	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/30/65	1.72	0.36	1.37	0.992	1.59	YES	1.34	0.19	1.15	0.22	0.93	121.7	NO	0.00	YES	121.7	YES	0.9	0.9	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/1/65	1.68	0.36	1.33	1.051	1.68	YES	1.31	0.19	1.12	0.35	0.77	121.7	NO	0.00	YES	121.7	YES	0.8	0.8	0.000	0.0	121.8	24.48	0.1895	0.13	0.01	0.0068	121.68
5/2/65	1.68	0.36	1.33	1.051	1.68	YES	1.31	0.19	1.12	0.35	0.77	121.7	NO	0.00	YES	121.7	YES	0.8	0.8	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/3/65	1.64	0.36	1.29	1.051	1.68	YES	1.28	0.19	1.09	0.39	0.69	121.7	NO	0.00	YES	121.7	YES	0.7	0.7	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/4/65	1.56	0.36	1.21	1.051	1.68	YES	1.22	0.19	1.02	0.47	0.55	121.7	NO	0.00	YES	121.7	YES	0.6	0.6	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/5/65	1.56	0.36	1.21	1.051	1.68	YES	1.22	0.19	1.02	0.47	0.55	121.7	NO	0.00	YES	121.7	YES	0.6	0.6	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/6/65	1.60	0.36	1.25	1.051	1.68	YES	1.25	0.19	1.06	0.43	0.62	121.7	NO	0.00	YES	121.7	YES	0.6	0.6	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/7/65	1.92	0.36	1.57	1.051	1.68	YES	1.50	0.19	1.31	0.11	1.19	121.7	NO	0.00	YES	121.7	YES	1.2	1.2	0.000	0.0	121.8	24.48	0.1895	0.13	0.43	0.2931	121.80
5/8/65	2.00	0.36	1.65	1.051	1.68	YES	1.56	0.19	1.37	0.03	1.34	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/9/65	1.80	0.36	1.45	1.051	1.68	YES	1.41	0.19	1.21	0.23	0.98	121.7	NO	0.00	YES	121.7	YES	1.0	1.0	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/10/65	1.68	0.36	1.33	1.051	1.68	YES	1.31	0.19	1.12	0.35	0.77	121.7	NO	0.00	YES	121.7	YES	0.8	0.8	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/11/65	1.60	0.36	1.25	1.051	1.68	YES	1.25	0.19	1.06	0.43	0.62	121.7	NO	0.00	YES	121.7	YES	0.6	0.6	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/12/65	1.52	0.36	1.17	1.051	1.68	YES	1.19	0.19	0.99	0.51	0.48	121.7	NO	0.00	YES	121.7	YES	0.5	0.5	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/13/65	1.48	0.36	1.13	1.051	1.68	YES	1.16	0.19	0.96	0.55	0.41	121.7	NO	0.00	YES	121.7	YES	0.4	0.4	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/14/65	1.40	0.36	1.05	1.051	1.68	YES	1.09	0.19	0.90	0.63	0.27	121.7	NO	0.00	YES	121.7	YES	0.3	0.3	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/15/65	1.40	0.36	1.05	1.051	1.68	YES	1.09	0.19	0.90	0.63	0.27	121.7	NO	0.00	YES	121.7	YES	0.3	0.3	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/16/65	1.44	0.36	1.09	1.051	1.68	YES	1.13	0.19	0.93	0.59	0.34	121.7	NO	0.00	YES	121.7	YES	0.3	0.3	0.000	0.0	121.8	24.48	0.1895	0.13	0.3	0.2045	121.80
5/17/65	1.84	0.36	1.49	1.051	1.68	YES	1.44	0.19	1.24	0.19	1.05	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0.01	0.0068	121.68
5/18/65	1.40	0.36	1.05	1.051	1.68	YES	1.09	0.19	0.90	0.63	0.27	121.7	NO	0.00	YES	121.7	YES	0.3	0.3	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity	1.60	mgd	Hull Creek Minimum Stream Flow-By:	0.355	mgd	Min Reservoir Level	12.6	ft	Medford Quarry Pump Rate	0.750	MGD
Reservoir Volume	121.80	MG	Cranberry Branch Minimum Stream Flow-By:	0.194	mgd				Medford Quarry Max Annual Vol	176	MG
Medford Quarry Start Setpoint	104	MG								234	days

` MQ Stop Set Point 116.0 MG

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
5/19/65	1.36	0.36	1.01	1.051	1.68	YES	1.06	0.19	0.87	0.67	0.19	121.7	NO	0.00	YES	121.7	YES	0.2	0.2	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/20/65	1.32	0.36	0.97	1.051	1.68	YES	1.03	0.19	0.84	0.71	0.12	121.7	NO	0.00	YES	121.7	YES	0.1	0.1	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/21/65	1.28	0.36	0.93	1.051	1.68	YES	1.00	0.19	0.81	0.75	0.05	121.7	NO	0.00	YES	121.7	YES	0.1	0.1	0.000	0.0	121.7	24.48	0.1895	0.13	0	0.0000	121.60
5/22/65	1.36	0.36	1.01	1.051	1.68	YES	1.06	0.19	0.87	0.67	0.19	121.6	NO	0.00	YES	121.6	YES	0.2	0.2	0.000	0.0	121.8	24.49	0.1895	0.13	0.01	0.0068	121.67
5/23/65	1.40	0.36	1.05	1.051	1.68	YES	1.09	0.19	0.90	0.63	0.27	121.7	NO	0.00	YES	121.7	YES	0.3	0.3	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/24/65	1.48	0.36	1.13	1.051	1.68	YES	1.16	0.19	0.96	0.55	0.41	121.7	NO	0.00	YES	121.7	YES	0.4	0.4	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/25/65	1.48	0.36	1.13	1.051	1.68	YES	1.16	0.19	0.96	0.55	0.41	121.7	NO	0.00	YES	121.7	YES	0.4	0.4	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/26/65	1.32	0.36	0.97	1.051	1.68	YES	1.03	0.19	0.84	0.71	0.12	121.7	NO	0.00	YES	121.7	YES	0.1	0.1	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/27/65	1.28	0.36	0.93	1.051	1.68	YES	1.00	0.19	0.81	0.75	0.05	121.7	NO	0.00	YES	121.7	YES	0.1	0.1	0.000	0.0	121.7	24.48	0.1895	0.13	0.1	0.0682	121.67
5/28/65	1.32	0.36	0.97	1.051	1.68	YES	1.03	0.19	0.84	0.71	0.12	121.7	NO	0.00	YES	121.7	YES	0.1	0.1	0.000	0.0	121.8	24.48	0.1895	0.13	0.11	0.0750	121.74
5/29/65	1.72	0.36	1.37	1.051	1.68	YES	1.34	0.19	1.15	0.31	0.84	121.7	NO	0.00	YES	121.7	YES	0.8	0.8	0.000	0.0	121.8	24.48	0.1895	0.13	0.82	0.5589	121.80
5/30/65	1.36	0.36	1.01	1.051	1.68	YES	1.06	0.19	0.87	0.67	0.19	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	0.0	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/31/65	1.24	0.36	0.89	1.051	1.68	YES	0.97	0.19	0.77	0.79	0.00	121.7	YES	0.02	YES	121.7	NO	0.0	0.0	0.000	0.0	121.7	24.48	0.1895	0.13	0	0.0000	121.53
6/1/65	1.20	0.36	0.85	1.164	1.86	YES	0.94	0.19	0.74	1.02	0.00	121.5	YES	0.27	YES	121.3	NO	0.0	0.0	0.000	0.0	121.3	24.49	0.1895	0.13	0	0.0000	121.13
6/2/65	1.24	0.36	0.89	1.164	1.86	YES	0.97	0.19	0.77	0.98	0.00	121.1	YES	0.20	YES	120.9	NO	0.0	0.0	0.000	0.0	120.9	24.49	0.1895	0.13	0.27	0.1840	120.99
6/3/65	2.08	0.36	1.73	1.164	1.86	YES	1.63	0.19	1.43	0.13	1.30	121.0	NO	0.00	YES	121.0	YES	1.3	1.3	0.000	0.0	121.8	24.49	0.1895	0.13	0.54	0.3680	121.80
6/4/65	1.32	0.36	0.97	1.164	1.86	YES	1.03	0.19	0.84	0.90	0.00	121.8	YES	0.06	YES	121.7	NO	0.0	0.0	0.000	0.0	121.7	24.48	0.1895	0.13	0	0.0000	121.62
6/5/65	1.20	0.36	0.85	1.164	1.86	YES	0.94	0.19	0.74	1.02	0.00	121.6	YES	0.27	YES	121.3	NO	0.0	0.0	0.000	0.0	121.3	24.48	0.1895	0.13	0	0.0000	121.22
6/6/65	1.16	0.36	0.81	1.164	1.86	YES	0.91	0.19	0.71	1.06	0.00	121.2	YES	0.34	YES	120.9	NO	0.0	0.0	0.000	0.0	120.9	24.49	0.1895	0.13	0	0.0000	120.75
6/7/65	1.12	0.36	0.77	1.164	1.86	YES	0.88	0.19	0.68	1.10	0.00	120.7	YES	0.41	YES	120.3	NO	0.0	0.0	0.000	0.0	120.3	24.50	0.1895	0.13	0	0.0000	120.21
6/8/65	1.24	0.36	0.89	1.164	1.86	YES	0.97	0.19	0.77	0.98	0.00	120.2	YES	0.20	YES	120.0	NO	0.0	0.0	0.000	0.0	120.0	24.50	0.1895	0.13	0.4	0.2726	120.16
6/9/65	1.28	0.36	0.93	1.164	1.86	YES	1.00	0.19	0.81	0.94	0.00	120.2	YES	0.13	YES	120.0	NO	0.0	0.0	0.000	0.0	120.0	24.50	0.1895	0.13	0	0.0000	119.90
6/10/65	1.12	0.36	0.77	1.164	1.86	YES	0.88	0.19	0.68	1.10	0.00	119.9	YES	0.41	YES	119.5	NO	0.0	0.0	0.000	0.0	119.5	24.51	0.1895	0.13	0	0.0000	119.36
6/11/65	1.04	0.36	0.69	1.164	1.86	YES	0.81	0.19	0.62	1.18	0.00	119.4	YES	0.56	YES	118.8	NO	0.0	0.0	0.000	0.0	118.8	24.51	0.1895	0.13	0	0.0000	118.68
6/12/65	1.00	0.36	0.65	1.164	1.86	YES	0.78	0.19	0.59	1.22	0.00	118.7	YES	0.63	YES	118.0	NO	0.0	0.0	0.000	0.0	118.0	24.52	0.1895	0.13	0	0.0000	117.92
6/13/65	0.96	0.36	0.61	1.164	1.86	YES	0.75	0.19	0.56	1.26	0.00	117.9	YES	0.70	YES	117.2	NO	0.0	0.0	0.000	0.0	117.2	24.52	0.1895	0.13	0	0.0000	117.10
6/14/65	0.96	0.36	0.61	1.164	1.86	YES	0.75	0.19	0.56	1.26	0.00	117.1	YES	0.70	YES	116.4	NO	0.0	0.0	0.000	0.0	116.4	24.52	0.1895	0.13	0	0.0000	116.27
6/15/65	0.96	0.36	0.61	1.164	1.86	YES	0.75	0.19	0.56	1.26	0.00	116.3	YES	0.70	YES	115.6	NO	0.0	0.0	0.000	0.0	115.6	24.52	0.1895	0.13	0.14	0.0954	115.54
6/16/65	1.08	0.36	0.73	1.164	1.86	YES	0.84	0.19	0.65	1.14	0.00	115.5	YES	0.49	YES	115.1	NO	0.0	0.0	0.000	0.0	115.1	24.52	0.1895	0.13	0.02	0.0136	114.94
6/17/65	1.12	0.36	0.77	1.164	1.86	YES	0.88	0.19	0.68	1.10	0.00	114.9	YES	0.41	YES	114.5	NO	0.0	0.0	0.000	0.00	114.5	24.52	0.1895	0.13	0.22	0.1499	114.55
6/18/65	1.16	0.36	0.81	1.164	1.86	YES	0.91	0.19	0.71	1.06	0.00	114.6	YES	0.34	YES	114.2	NO	0.0	0.0	0.000	0.00	114.2	24.52	0.1895	0.13	0	0.0000	114.08
6/19/65	1.04	0.36	0.69	1.164	1.86	YES	0.81	0.19	0.62	1.18	0.00	114.1	YES	0.56	YES	113.5	NO	0.0	0.0	0.000	0.0	113.5	24.52	0.1895	0.13	0.02	0.0136	113.41
6/20/65	1.00	0.36	0.65	1.164	1.86	YES	0.78	0.19	0.59	1.22	0.00	113.4	YES	0.63	YES	112.8	NO	0.0	0.0	0.000	0.0	112.8	24.51	0.1895	0.13	0	0.0000	112.66
6/21/65	0.92	0.36	0.57	1.164	1.86	YES	0.72	0.19	0.52	1.30	0.00	112.7	YES	0.77	YES	111.9	NO	0.0	0.0	0.000	0.0	111.9	24.50	0.1895	0.13	0	0.0000	111.76
6/22/65	0.88	0.36	0.53	1.164	1.86	YES	0.69	0.19	0.49	1.34	0.00	111.8	YES	0.84	YES	110.9	NO	0.0	0.0	0.000	0.0	110.9	24.49	0.1895	0.13	0	0.0000	110.79
6/23/65	0.84	0.36	0.49	1.164	1.86	YES	0.66	0.19	0.46	1.38	0.00	110.8	YES	0.91	YES	109.9	NO	0.0	0.0	0.000	0.0	109.9	24.48	0.1895	0.13	0	0.0000	109.75
6/24/65	0.92	0.36	0.57	1.164	1.86	YES	0.72	0.19	0.52	1.30	0.00	109.8	YES	0.77	YES	109.0	NO	0.0	0.0	0.000	0.0	109.0	24.46	0.1895	0.13	0.23	0.1568	109.01
6/25/65	0.88	0.36	0.53	1.164	1.86	YES	0.69	0.19	0.49	1.34	0.00	109.0	YES	0.84	YES	108.2	NO	0.0	0.0	0.000	0.0	108.2	24.44	0.1895	0.13	0	0.0000	108.04
6/26/65	0.80	0.36	0.45	1.164	1.86	YES	0.63	0.19	0.43	1.42	0.00	108.0	YES	0.99	YES	107.1	NO	0.0	0.0	0.000	0.0	107.1	24.42	0.1895	0.13	0	0.0000	106.93
6/27/65	0.80	0.36	0.45	1.164	1.86	YES	0.63	0.19	0.43	1.42	0.00	106.9	YES	0.99	YES	105.9	NO	0.0	0.0	0.000	0.0	105.9	24.39	0.1895	0.13	0	0.0000	105.82
6/28/65	0.80	0.36	0.45	1.164	1.86	YES	0.63	0.19	0.43	1.42	0.00	105.8	YES	0.99	YES	104.8	NO	0.0	0.0	0.000	0.0	104.8	24.35	0.1895	0.13	0	0.0000	104.71
6/29/65	0.76	0.36	0.41	1.164	1.86	YES	0.59	0.19	0.40	1.46	0.00	104.7	YES	1.06	YES	103.7	NO	0.0	0.0	0.000	0.0	103.7	24.32	0.1895	0.13	0.1	0.0682	103.60
6/30/65	0.76	0.36	0.41	1.164	1.86	YES	0.59	0.19	0.40	1.46	0.00	103.6	YES	1.06	YES	102.5	NO	0.0	0.0	0.750	0.8	103.3	24.27	0.1895	0.12	0	0.0000	103.17
7/1/65	0.76	0.36	0.41	1.300	2.08	YES	0.59	0.19	0.40	1.67	0.00	103.2	YES	1.27	YES	101.9	NO	0.0	0.0	0.750	1.5	102.6	24.26	0.1895	0.12	0	0.0000	102.52
7/2/65	0.72	0.36	0.37	1.300	2.08	YES	0.56	0.19	0.37	1.71	0.00	102.5	YES	1.34	YES	101.2	NO	0.0	0.0	0.750	2.3	101.9	24.23	0.1895	0.12	0	0.0000	101.80
7/3/65	0.72	0.36	0.37	1.300	2.08	YES	0.56	0.19	0.37	1.71	0.00	101.8	YES	1.34	YES	100.5	NO	0.0	0.0	0.750	3.0	101.2	24.20	0.1895	0.12	0.21	0.1431	101.22
7/4/65	0.72	0.36	0.37	1.300	2.08	YES	0.56	0.19	0.37	1.71	0.00	101.2	YES	1.34	YES	99.9	NO	0.0	0.0	0.750	3.8	100.6	24.17	0.1895	0.12	0	0.0000	100.50
7/5/65	0.96	0.36	0.61	1.300	2.08	YES	0.75	0.19	0.56	1.47	0.00	100.5	YES	0.92	YES	99.6	NO	0.0	0.0	0.750	4.5	100.3	24.14	0.1895	0.12	0.17	0.1159	100.33
7/6/65	0.88	0.36	0.53	1.300	2.08	YES	0.69	0.19	0.49	1.55	0.00	100.3	YES	1.06	YES	99.3	NO	0.0	0.0	0.750	5.3	100.0	24.13	0.1895	0.12	0	0.0000	99.90
7/7/65	0.76	0.36	0.41	1.300	2.08	YES	0.59	0.19	0.40	1.67	0.00	99.9	YES	1.27	YES	98.6	NO	0.0	0.0	0.750	6.0	99.4	24.11	0.1895	0.12	0	0.0000	99.25
7/8/65	0.76	0.36	0.41	1.300	2.08	YES	0.59	0.19	0.40	1.67	0.00	99.2	YES	1.27	YES	98.0	NO	0.0	0.0	0.750	6.8	98.7	24.08	0.1895	0.12	0.01	0.0068	98.61
7/9/65	0.72	0.36	0.37	1.300	2.08	YES	0.56	0.19	0.37	1.71	0.00	98.6	YES	1.34	YES	97.3	NO	0.0	0.0	0.750	7.5	98.0	24.04	0.1895	0.12	0.02	0.0136	97.90
7/10/65	0.68	0.36	0.33	1.300	2.08	YES	0.53	0.19	0.34	1.75	0.00	97.9	YES	1.42	YES	96.5	NO	0.0	0.0	0.750	8.3	97.2	24.01	0.1895	0.12	0.38	0.2590	97.37
7/11/65	4.65	0.36	4.30	1.300	2.08	NO	3.63	0.19	3.43	0.00	3.43	97.4	NO	0.00	YES	97.4	YES	3.4	3.0	0.750	9.0	101.1	23.98	0.1895	0.12	1.45	0.9883	101.99
7/12/65	1.56	0.36	1.21	1.300	2.08	YES	1.22	0.19	1.02	0.87	0.15	102.0	NO	0.00	YES	102.0	YES	0.2	0.2	0.750	9.8	102.9	24.21	0.1895	0.12	0	0.0000	102.77
7/13/65	1.00	0.36	0.65	1.300	2.08	YES	0.78	0.19	0.59	1.43	0.00	102.8	YES	0.85	YES	101.9	NO	0.0	0.0	0.750	10.5	102.7	24.24	0.1895	0.12	0	0.0000	102.54
7/14/65	0.92	0.36	0.57	1.300	2.08	YES	0.72	0.19	0.52	1.51	0.00	102.5	YES	0.99	YES	101.6	NO	0.0	0.0	0.750	11.3	102.3	24.23	0.1895	0.12	0	0.0000	102.18
7/15/65	0.96	0.36	0.61	1.300	2.08	YES	0.75	0.19	0.56	1.47	0.00	102.2	YES	0.92	YES	101.3	NO	0.0	0.0	0.750	12.0	102.0	24.22	0.1895	0.12	0	0.0000	101.89
7/16/65	1.28	0.36	0.93	1.300	2.08	YES	1.00	0.19	0.81	1.15	0.00	101.9	YES	0.35	YES	101.5	NO	0.0	0.0	0.750	12.8	102.3	24.20	0.1895	0.12	0	0.0000	102.17
7/17/65	0.88	0.36	0.53	1.300	2.08	YES	0.69	0.19	0.49	1.55	0.00	102.2	YES	1.06	YES	101.1	NO	0.0	0.0	0.750	13.5	101.9	24.22	0.1895	0.12	0	0.0000	101.74
7/18/65	0.84	0.36	0.49	1.300	2.08	YES	0.66	0.19	0.46	1.59	0.00	101.7	YES	1.13	YES	100.6	NO	0.0	0.0	0.750	14.3	101.4	24.20	0.1895	0.12	0.37	0.2522	101.48
7/19/65	0.84	0.36	0.49	1.300	2.08	YES	0.66	0.19	0.46	1.59	0.00	101.5	YES	1.13	YES	100.4	NO	0.0	0.0	0.750	15.0	101.1	24.19	0.1895	0.12	0	0.0000	100.98
7/20/65	0.76	0.36	0.41	1.300	2.08	YES	0.59	0.19	0.40	1.67	0.00	101.0	YES	1.27	YES	99.7	NO	0.0	0.0	0.750	15.8	100.5	24.16	0.1895	0.12	0	0.0000	100.33
7/21/65	0.72	0.36	0.37	1.300	2.08	YES	0.56	0.19	0.37	1.71	0.00	100.3	YES	1.34	YES	99.0	NO	0.0	0.0	0.750	16.5	99.7	24.13	0.1895	0.12	0	0.0000	99.61
7/22/65	0.72	0.36	0.37	1.300	2.08	YES	0.56	0.19	0.37	1.71	0.00	99.6	YES	1.34	YES	98.3	NO	0.0	0.0	0.750	17.3	99.0	24.10	0.1895	0.12	0	0.0000	98.89
7/23/65	0.80	0.36	0.45	1.300	2.08	YES	0.63	0.19	0.43	1.63	0.00	98.9	YES	1.20	YES	97.7	NO	0.0	0.0	0.750	18.0	98.4	24.06	0.1895	0.12	0	0.0000	98.32
7/24/65	0.80	0.36	0.45	1.300	2.08	YES	0.63	0.19	0.43	1.63	0.00	98.3	YES	1.20	YES	97.1	NO	0.0	0.0	0.750	18.8	97.9	24.03	0.1895	0.12	0	0.0000	97.74
7/25/65	0.72	0.36	0.37	1.300	2.08	YES	0.56	0.19	0.37	1.71	0.00	97.7	YES	1.34	YES	96.4	NO	0.0	0.0	0.750	19.5	97.1	24.00	0.1895	0.12	0	0.0000	97.02
7/26/65	0.68	0.36	0.33	1.300	2.08	YES	0.53	0.19	0.34	1.75	0.00	97.0	YES	1.42	YES	95.6	NO	0.0	0.0	0.750	20.3	96.4	23.95	0.1895	0.12	0	0.0000	96.23
7/27/65	0.64	0.36	0.29	1.300	2.08	YES	0.50	0.19	0.31	1.79	0.00	96.2	YES	1.49	YES	94.7	NO	0.0	0.0	0.750	21.0	95.5	23.91	0.1895	0.12	0	0.0000	95.37
7/28/65	0.64	0.36	0.29	1.300	2.08	YES	0.50	0.19	0.31	1.79	0.00	95.4	YES	1.49	YES	93.9	NO	0.0	0.0	0.750	21.8	94.6	23.85	0.1895	0.12	0	0.0000	94.51
7/29/65	0.64	0.36	0.29	1.300	2.08	YES	0.50	0.19	0.31	1.79	0.00	94.5	YES	1.49	YES	93.0	NO	0.0	0.0	0.750	22.5	93.8	23.80	0.1895	0.12	0	0.0000	93.65
7/30/65	0.64	0.36	0.29	1.300	2.08	YES	0.50	0.19	0.31	1.79	0.00	93.7	YES	1.49	YES	92.2	NO	0.0	0.0	0.750	23.3	92.9	23.74	0.1895	0.12	0	0.0000	92.79
7/31/65	0.64	0.36	0.29	1.300	2.08	YES	0.50	0.19	0.31	1.79	0.00	92.8	YES	1.49	YES	91.3	NO	0.0	0.0	0.750	24.0	92.1	23.68	0.1895	0.12	0	0.0000	91.93
8/1/65	1.60	0.36	1.25	1.243	1.99	YES	1.25	0.19	1.06	0.74	0.32	91.9	NO	0.00	YES	91.9	YES	0.3	0.3	0.750	24.8	93.0	23.62	0.1895	0.12	0.89	0.6066	93.48
8/2/65	0.96	0.36	0.61	1.243	1.99	YES	0.75	0.19	0.56	1.38	0.00	93.5	YES	0.83	YES	92.7	NO	0.0	0.0	0.750	25.5	93.4	23.73	0.1895	0.12	0	0.0000	93.28
8/3/65	0.72	0.36	0.37	1.243	1.99	YES	0.56	0.19	0.37	1.62	0.00	93.3	YES	1.25	YES	92.0	NO	0.0	0.0	0.750	26.3	92.8	23.72	0.1895	0.12	0	0.0000	92.66
8/4/65	0.68	0.36	0.33	1.243	1.99	YES	0.53	0.19	0.34	1.66	0.00	92.7	YES	1.33	YES	91.3	NO	0.0	0.0	0.750	27.0	92.1	23.67	0.1895	0.12	1.12	0.7634	92.72
8/5/65	1.40	0.36	1.05	1.243	1.99	YES	1.09	0.19	0.90	0.94	0.00	92.7	YES	0.04	YES	92.7	NO	0.0	0.0	0.750	27.8	93.4	23.68	0.1895	0.12	0	0.0000	93.31
8/6/65	0.80	0.36	0.45	1.243	1.99	YES	0.63	0.19	0.43	1.54	0.00	93.3	YES	1.11	YES	92.2	NO	0.0	0.0	0.750	28.5	92.9	23.72	0.1895	0.12	0	0.0000	92.83
8/7/65	0.72	0.36	0.37	1.243	1.99	YES	0.56	0.19	0.37	1.62	0.00	92.8	YES	1.25	YES	91.6	NO	0.0	0.0	0.750	29.3	92.3	23.68	0.1895	0.12	0	0.0000	92.20
8/8/65	0.72	0.36	0.37	1.243	1.99	YES	0.56	0.19	0.37	1.62	0.00	92.2	YES	1.25	YES	90.9	NO	0.0	0.0	0.750	30.0	91.7	23.64	0.1895	0.12	0.58	0.3953	91.97
8/9/65	0.84	0.36	0.49	1.243	1.99	YES	0.66	0.19	0.46	1.50	0.00	92.0	YES	1.04	YES	90.9	NO	0.0	0.0	0.750	30.8	91.7	23.62	0.1895	0.12	0	0.0000	91.56
8/10/65	0.76	0.36	0.41	1.243	1.99	YES	0.59	0.19	0.40	1.58	0.00	91.6	YES	1.18	YES	90.4	NO	0.0	0.0	0.750	31.5	91.1	23.59	0.1895	0.12	0	0.0000	91.00

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity	1.60	mgd	
Reservoir Volume	121.80	MG	
Medford Quarry Start Setpoint	104	MG	
Hull Creek Minimum Stream Flow-By:	0.355	mgd	
Cranberry Branch Minimum Stream Flow-By:	0.194	mgd	
Min Reservoir Level	12.6	ft	
Medford Quarry Pump Rate	0.750	MGD	
Medford Quarry Max Annual Vol	176	MG	
	234	days	
MQ Stop Set Point	116.0	MG	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
8/11/65	0.64	0.36	0.29	1.243	1.99	YES	0.50	0.19	0.31	1.70	0.00	91.0	YES	1.40	YES	89.6	NO	0.0	0.0	0.750	32.3	90.4	23.55	0.1895	0.12	0	0.0000	90.23
8/12/65	0.64	0.36	0.29	1.243	1.99	YES	0.50	0.19	0.31	1.70	0.00	90.2	YES	1.40	YES	88.8	NO	0.0	0.0	0.750	33.0	89.6	23.49	0.1895	0.12	0	0.0000	89.47
8/13/65	0.60	0.36	0.25	1.243	1.99	YES	0.47	0.19	0.27	1.74	0.00	89.5	YES	1.47	YES	88.0	NO	0.0	0.0	0.750	33.8	88.7	23.43	0.1895	0.12	0	0.0000	88.63
8/14/65	0.60	0.36	0.25	1.243	1.99	YES	0.47	0.19	0.27	1.74	0.00	88.6	YES	1.47	YES	87.2	NO	0.0	0.0	0.750	34.5	87.9	23.36	0.1895	0.12	0	0.0000	87.79
8/15/65	0.56	0.36	0.21	1.243	1.99	YES	0.44	0.19	0.24	1.78	0.00	87.8	YES	1.54	YES	86.2	NO	0.0	0.0	0.750	35.3	87.0	23.29	0.1895	0.12	0	0.0000	86.88
8/16/65	0.56	0.36	0.21	1.243	1.99	YES	0.44	0.19	0.24	1.78	0.00	86.9	YES	1.54	YES	85.3	NO	0.0	0.0	0.750	36.0	86.1	23.21	0.1895	0.12	0	0.0000	85.97
8/17/65	0.56	0.36	0.21	1.243	1.99	YES	0.44	0.19	0.24	1.78	0.00	86.0	YES	1.54	YES	84.4	NO	0.0	0.0	0.750	36.8	85.2	23.13	0.1895	0.12	0	0.0000	85.06
8/18/65	0.52	0.36	0.17	1.243	1.99	YES	0.41	0.19	0.21	1.82	0.00	85.1	YES	1.61	YES	83.5	NO	0.0	0.0	0.750	37.5	84.2	23.04	0.1895	0.12	0.59	0.4021	84.48
8/19/65	0.56	0.36	0.21	1.243	1.99	YES	0.44	0.19	0.24	1.78	0.00	84.5	YES	1.54	YES	82.9	NO	0.0	0.0	0.750	38.3	83.7	22.99	0.1895	0.12	0.34	0.2317	83.81
8/20/65	0.52	0.36	0.17	1.243	1.99	YES	0.41	0.19	0.21	1.82	0.00	83.8	YES	1.61	YES	82.2	NO	0.0	0.0	0.750	39.0	82.9	22.92	0.1895	0.12	0	0.0000	82.83
8/21/65	0.48	0.36	0.13	1.243	1.99	YES	0.38	0.19	0.18	1.86	0.00	82.8	YES	1.68	YES	81.1	NO	0.0	0.0	0.750	39.8	81.9	22.82	0.1895	0.12	0.41	0.2794	82.06
8/22/65	0.92	0.36	0.57	1.243	1.99	YES	0.72	0.19	0.52	1.42	0.00	82.1	YES	0.90	YES	81.2	NO	0.0	0.0	0.750	40.5	81.9	22.74	0.1895	0.12	0.67	0.4567	82.25
8/23/65	0.76	0.36	0.41	1.243	1.99	YES	0.59	0.19	0.40	1.58	0.00	82.3	YES	1.18	YES	81.1	NO	0.0	0.0	0.750	41.3	81.8	22.76	0.1895	0.12	0	0.0000	81.70
8/24/65	0.64	0.36	0.29	1.243	1.99	YES	0.50	0.19	0.31	1.70	0.00	81.7	YES	1.40	YES	80.3	NO	0.0	0.0	0.750	42.0	81.1	22.71	0.1895	0.12	0	0.0000	80.94
8/25/65	0.64	0.36	0.29	1.243	1.99	YES	0.50	0.19	0.31	1.70	0.00	80.9	YES	1.40	YES	79.5	NO	0.0	0.0	0.750	42.8	80.3	22.63	0.1895	0.12	0.01	0.0068	80.18
8/26/65	0.68	0.36	0.33	1.243	1.99	YES	0.53	0.19	0.34	1.66	0.00	80.2	YES	1.33	YES	78.9	NO	0.0	0.0	0.750	43.5	79.6	22.55	0.1895	0.12	0.11	0.0750	79.56
8/27/65	0.68	0.36	0.33	1.243	1.99	YES	0.53	0.19	0.34	1.66	0.00	79.6	YES	1.33	YES	78.2	NO	0.0	0.0	0.750	44.3	79.0	22.48	0.1895	0.12	0	0.0000	78.87
8/28/65	0.60	0.36	0.25	1.243	1.99	YES	0.47	0.19	0.27	1.74	0.00	78.9	YES	1.47	YES	77.4	NO	0.0	0.0	0.750	45.0	78.2	22.40	0.1895	0.12	0	0.0000	78.04
8/29/65	0.52	0.36	0.17	1.243	1.99	YES	0.41	0.19	0.21	1.82	0.00	78.0	YES	1.61	YES	76.4	NO	0.0	0.0	0.750	45.8	77.2	22.30	0.1895	0.11	0	0.0000	77.06
8/30/65	0.52	0.36	0.17	1.243	1.99	YES	0.41	0.19	0.21	1.82	0.00	77.1	YES	1.61	YES	75.5	NO	0.0	0.0	0.750	46.5	76.2	22.19	0.1895	0.11	0	0.0000	76.09
8/31/65	0.56	0.36	0.21	1.243	1.99	YES	0.44	0.19	0.24	1.78	0.00	76.1	YES	1.54	YES	74.5	NO	0.0	0.0	0.750	47.3	75.3	22.07	0.1895	0.11	0	0.0000	75.18
9/1/65	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	75.2	YES	1.18	YES	74.0	NO	0.0	0.0	0.750	48.0	74.8	21.96	0.1895	0.11	0.21	0.1431	74.79
9/2/65	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	74.8	YES	0.75	YES	74.0	NO	0.0	0.0	0.750	48.8	74.8	21.91	0.1895	0.11	0	0.0000	74.67
9/3/65	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	74.7	YES	1.11	YES	73.6	NO	0.0	0.0	0.750	49.5	74.3	21.90	0.1895	0.11	0	0.0000	74.20
9/4/65	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	74.2	YES	1.18	YES	73.0	NO	0.0	0.0	0.750	50.3	73.8	21.84	0.1895	0.11	0	0.0000	73.66
9/5/65	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	73.7	YES	1.18	YES	72.5	NO	0.0	0.0	0.750	51.0	73.2	21.77	0.1895	0.11	0	0.0000	73.12
9/6/65	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	73.1	YES	1.18	YES	71.9	NO	0.0	0.0	0.750	51.8	72.7	21.70	0.1895	0.11	0	0.0000	72.58
9/7/65	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	72.6	YES	1.18	YES	71.4	NO	0.0	0.0	0.750	52.5	72.2	21.63	0.1895	0.11	0	0.0000	72.04
9/8/65	0.52	0.36	0.17	1.017	1.63	YES	0.41	0.19	0.21	1.46	0.00	72.0	YES	1.25	YES	70.8	NO	0.0	0.0	0.750	53.3	71.5	21.56	0.1895	0.11	0	0.0000	71.43
9/9/65	0.52	0.36	0.17	1.017	1.63	YES	0.41	0.19	0.21	1.46	0.00	71.4	YES	1.25	YES	70.2	NO	0.0	0.0	0.750	54.0	70.9	21.48	0.1895	0.11	0	0.0000	70.82
9/10/65	0.52	0.36	0.17	1.017	1.63	YES	0.41	0.19	0.21	1.46	0.00	70.8	YES	1.25	YES	69.6	NO	0.0	0.0	0.750	54.8	70.3	21.39	0.1895	0.11	0	0.0000	70.21
9/11/65	0.48	0.36	0.13	1.017	1.63	YES	0.38	0.19	0.18	1.50	0.00	70.2	YES	1.32	YES	68.9	NO	0.0	0.0	0.750	55.5	69.6	21.31	0.1895	0.11	0	0.0000	69.53
9/12/65	0.64	0.36	0.29	1.017	1.63	YES	0.50	0.19	0.31	1.34	0.00	69.5	YES	1.04	YES	68.5	NO	0.0	0.0	0.750	56.3	69.2	21.22	0.1895	0.11	0.58	0.3953	69.53
9/13/65	1.28	0.36	0.93	1.017	1.63	YES	1.00	0.19	0.81	0.70	0.11	69.5	NO	0.00	YES	69.5	YES	0.1	0.1	0.750	57.0	70.4	21.22	0.1895	0.11	1	0.6816	70.96
9/14/65	0.84	0.36	0.49	1.017	1.63	YES	0.66	0.19	0.46	1.14	0.00	71.0	YES	0.68	YES	70.3	NO	0.0	0.0	0.750	57.8	71.0	21.41	0.1895	0.11	0.01	0.0068	70.93
9/15/65	0.68	0.36	0.33	1.017	1.63	YES	0.53	0.19	0.34	1.30	0.00	70.9	YES	0.96	YES	70.0	NO	0.0	0.0	0.750	58.5	70.7	21.41	0.1895	0.11	0	0.0000	70.61
9/16/65	0.68	0.36	0.33	1.017	1.63	YES	0.53	0.19	0.34	1.30	0.00	70.6	YES	0.96	YES	69.6	NO	0.0	0.0	0.750	59.3	70.4	21.36	0.1895	0.11	0	0.0000	70.28
9/17/65	0.64	0.36	0.29	1.017	1.63	YES	0.50	0.19	0.31	1.34	0.00	70.3	YES	1.04	YES	69.2	NO	0.0	0.0	0.750	60.0	70.0	21.32	0.1895	0.11	0	0.0000	69.89
9/18/65	0.64	0.36	0.29	1.017	1.63	YES	0.50	0.19	0.31	1.34	0.00	69.9	YES	1.04	YES	68.9	NO	0.0	0.0	0.750	60.8	69.6	21.26	0.1895	0.11	0	0.0000	69.49
9/19/65	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	69.5	YES	1.11	YES	68.4	NO	0.0	0.0	0.750	61.5	69.1	21.21	0.1895	0.11	0	0.0000	69.03
9/20/65	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	69.0	YES	1.11	YES	67.9	NO	0.0	0.0	0.750	62.3	68.7	21.14	0.1895	0.11	0	0.0000	68.56
9/21/65	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	68.6	YES	1.11	YES	67.5	NO	0.0	0.0	0.750	63.0	68.2	21.08	0.1895	0.11	0	0.0000	68.10
9/22/65	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	68.1	YES	1.18	YES	66.9	NO	0.0	0.0	0.750	63.8	67.7	21.01	0.1895	0.11	0	0.0000	67.56
9/23/65	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	67.6	YES	1.18	YES	66.4	NO	0.0	0.0	0.750	64.5	67.1	20.93	0.1895	0.11	0	0.0000	67.02
9/24/65	0.68	0.36	0.33	1.017	1.63	YES	0.53	0.19	0.34	1.30	0.00	67.0	YES	0.96	YES	66.1	NO	0.0	0.0	0.750	65.3	66.8	20.85	0.1895	0.11	0.14	0.0954	66.80
9/25/65	0.92	0.36	0.57	1.017	1.63	YES	0.72	0.19	0.52	1.06	0.00	66.8	YES	0.54	YES	66.3	NO	0.0	0.0	0.750	66.0	67.0	20.82	0.1895	0.11	0	0.0000	66.91
9/26/65	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	66.9	YES	1.11	YES	65.8	NO	0.0	0.0	0.750	66.8	66.5	20.83	0.1895	0.11	0	0.0000	66.44
9/27/65	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	66.4	YES	1.18	YES	65.3	NO	0.0	0.0	0.750	67.5	66.0	20.77	0.1895	0.11	0	0.0000	65.91
9/28/65	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	65.9	YES	1.18	YES	64.7	NO	0.0	0.0	0.750	68.3	65.5	20.68	0.1895	0.11	0	0.0000	65.37
9/29/65	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	65.4	YES	1.18	YES	64.2	NO	0.0	0.0	0.750	69.0	64.9	20.60	0.1895	0.11	0	0.0000	64.84
9/30/65	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	64.8	YES	1.18	YES	63.7	NO	0.0	0.0	0.750	69.8	64.4	20.52	0.1895	0.11	0	0.0000	64.30
10/1/65	0.92	0.36	0.57	1.017	1.63	YES	0.72	0.19	0.52	1.06	0.00	64.3	YES	0.54	YES	63.8	NO	0.0	0.0	0.750	70.5	64.5	20.44	0.1895	0.11	0.36	0.2454	64.66
10/2/65	1.12	0.36	0.77	1.017	1.63	YES	0.88	0.19	0.68	0.86	0.00	64.7	YES	0.18	YES	64.5	NO	0.0	0.0	0.750	71.3	65.2	20.49	0.1895	0.11	0	0.0000	65.13
10/3/65	0.68	0.36	0.33	1.017	1.63	YES	0.53	0.19	0.34	1.30	0.00	65.1	YES	0.96	YES	64.2	NO	0.0	0.0	0.750	72.0	64.9	20.56	0.1895	0.11	0	0.0000	64.81
10/4/65	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	64.8	YES	1.11	YES	63.7	NO	0.0	0.0	0.750	72.8	64.4	20.52	0.1895	0.11	0	0.0000	64.34
10/5/65	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	64.3	YES	1.11	YES	63.2	NO	0.0	0.0	0.750	73.5	64.0	20.44	0.1895	0.11	0	0.0000	63.88
10/6/65	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	63.9	YES	1.11	YES	62.8	NO	0.0	0.0	0.750	74.3	63.5	20.37	0.1895	0.10	0	0.0000	63.42
10/7/65	2.00	0.36	1.65	1.017	1.63	NO	1.56	0.19	1.37	0.00	1.37	63.4	NO	0.00	YES	63.4	YES	1.4	1.4	0.750	75.0	65.5	20.30	0.1895	0.10	1.18	0.8043	66.24
10/8/65	3.69	0.36	3.33	1.017	1.63	NO	2.88	0.19	2.68	0.00	2.68	66.2	NO	0.00	YES	66.2	YES	2.7	2.7	0.750	75.8	69.7	20.73	0.1895	0.11	0.01	0.0068	69.57
10/9/65	1.08	0.36	0.73	1.017	1.63	YES	0.84	0.19	0.65	0.90	0.00	69.6	YES	0.25	YES	69.3	NO	0.0	0.0	0.750	76.5	70.1	21.22	0.1895	0.11	0.03	0.0204	69.98
10/10/65	0.88	0.36	0.53	1.017	1.63	YES	0.69	0.19	0.49	1.10	0.00	70.0	YES	0.61	YES	69.4	NO	0.0	0.0	0.750	77.3	70.1	21.28	0.1895	0.11	0	0.0000	70.02
10/11/65	0.84	0.36	0.49	1.017	1.63	YES	0.66	0.19	0.46	1.14	0.00	70.0	YES	0.68	YES	69.3	NO	0.0	0.0	0.750	78.0	70.1	21.28	0.1895	0.11	0	0.0000	69.98
10/12/65	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	70.0	YES	0.75	YES	69.2	NO	0.0	0.0	0.750	78.8	70.0	21.28	0.1895	0.11	0.07	0.0477	69.92
10/13/65	0.76	0.36	0.41	1.017	1.63	YES	0.59	0.19	0.40	1.22	0.00	69.9	YES	0.82	YES	69.1	NO	0.0	0.0	0.750	79.5	69.8	21.27	0.1895	0.11	0	0.0000	69.74
10/14/65	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	69.7	YES	0.89	YES	68.8	NO	0.0	0.0	0.750	80.3	69.6	21.24	0.1895	0.11	0	0.0000	69.49
10/15/65	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	69.5	YES	0.89	YES	68.6	NO	0.0	0.0	0.750	81.0	69.3	21.21	0.1895	0.11	0.02	0.0136	69.25
10/16/65	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	69.2	YES	0.89	YES	68.4	NO	0.0	0.0	0.750	81.8	69.1	21.17	0.1895	0.11	0	0.0000	69.00
10/17/65	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	69.0	YES	0.89	YES	68.1	NO	0.0	0.0	0.750	82.5	68.9	21.14	0.1895	0.11	0	0.0000	68.75
10/18/65	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	68.7	YES	0.89	YES	67.9	NO	0.0	0.0	0.750	83.3	68.6	21.10	0.1895	0.11	0	0.0000	68.50
10/19/65	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	68.5	YES	0.89	YES	67.6	NO	0.0	0.0	0.750	84.0	68.4	21.07	0.1895	0.11	0	0.0000	68.25
10/20/65	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	68.2	YES	0.89	YES	67.4	NO	0.0	0.0	0.750	84.8	68.1	21.03	0.1895	0.11	0	0.0000	68.00
10/21/65	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	68.0	YES	0.89	YES	67.1	NO	0.0	0.0	0.750	85.5	67.9	20.99	0.1895	0.11	0	0.0000	67.75
10/22/65	0.76	0.36	0.41	1.017	1.63	YES	0.59	0.19	0.40	1.22	0.00	67.7	YES	0.82	YES	66.9	NO	0.0	0.0	0.750	86.3	67.7	20.96	0.1895	0.11	0.23	0.1568	67.72
10/23/65	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	67.7	YES	0.75	YES	67.0	NO	0.0	0.0	0.750	87.0	67.7	20.96	0.1895	0.11	0	0.0000	67.62
10/24/65	0.76	0.36	0.41	1.017	1.63	YES	0.59	0.19	0.40	1.22	0.00	67.6	YES	0.82	YES	66.8	NO	0.0	0.0	0.750	87.8	67.5	20.94	0.1895	0.11	0	0.0000	67.44
10/25/65	0.76	0.36	0.41	1.017	1.63	YES	0.59	0.19	0.40	1.22	0.00	67.4	YES	0.82	YES	66.6	NO	0.0	0.0	0.750	88.5	67.4	20.91	0.1895	0.11	0	0.0000	67.26
10/26/65	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	67.3	YES	0.89	YES	66.4	NO	0.0	0.0	0.750	89.3	67.1	20.89	0.1895	0.11	0	0.0000	67.01
10/27/65	0.76	0.36	0.41	1.017	1.63	YES	0.59	0.19	0.40	1.22	0.00	67.0	YES	0.82	YES	66.2	NO	0.0	0.0	0.750	90.0	66.9	20.85	0.1895	0.11	0	0.0000	66.83
10/28/65	0.76	0.36	0.41	1.017	1.63	YES	0.59	0.19	0.40	1.22	0.00	66.8	YES	0.82	YES	66.0	NO	0.0	0.0	0.750	90.8	66.8	20.82	0.1895	0.11	0	0.0000	66.65
10/29/65	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	66.7	YES	0.89	YES	65.8	NO	0.0	0.0	0.750	91.5	66.5	20.80	0.1895	0.11	0	0.0000	66.40
10/30/65	0.76	0.36	0.41	1.017	1.63	YES	0.59	0.19	0.40	1.22	0.00	66.4	YES	0.82	YES	65.6	NO	0.0	0.0	0.750	92.3	66.3	20.76	0.1895	0.11	0	0.0000	66.23
10/31/65	0.76	0.36	0.41	1.017	1.63	YES	0.59	0.19	0.40	1.22	0.00	66.2	YES	0.82	YES	65.4	NO	0.0	0.0	0.750	93.0	66.2	20.73	0.1895	0.11	0	0.0000	66.05
11/1/65	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	66.0	YES	0.62	YES	65.4	NO	0.0	0.0	0.750	93.8	66.2	20.71	0.0000	0.00	0	0.0000	66.18
11/2/65	0.72	0.36	0.37	0.890	1.42	YES	0.56	0.19	0.37	1.06	0.00	66.2	YES	0.69	YES	65.5	NO	0.0	0.0	0.750	94.5	66.2	20.73	0.0000	0.00	0	0.0000	66.24

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity	1.60	mgd	**Hull Creek Minimum Stream Flow-By:**	0.355	mgd	**Min Reservoir Level**	12.6	ft	**Medford Quarry Pump Rate**	0.750	MGD
Reservoir Volume	121.80	MG	**Cranberry Branch Minimum Stream Flow-By:**	0.194	mgd				**Medford Quarry Max Annual Vol**	176	MG
Medford Quarry Start Setpoint	104	MG								234	days
MQ Stop Set Point	116.0	MG									

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
11/3/65	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	66.2	YES	0.62	YES	65.6	NO	0.0	0.0	0.750	95.3	66.4	20.74	0.0000	0.00	0	0.0000	66.38
11/4/65	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	66.4	YES	0.62	YES	65.8	NO	0.0	0.0	0.750	96.0	66.5	20.76	0.0000	0.00	0	0.0000	66.51
11/5/65	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	66.5	YES	0.62	YES	65.9	NO	0.0	0.0	0.750	96.8	66.6	20.78	0.0000	0.00	0	0.0000	66.64
11/6/65	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	66.6	YES	0.62	YES	66.0	NO	0.0	0.0	0.750	97.5	66.8	20.80	0.0000	0.00	0	0.0000	66.77
11/7/65	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	66.8	YES	0.62	YES	66.2	NO	0.0	0.0	0.750	98.3	66.9	20.81	0.0000	0.00	0	0.0000	66.91
11/8/65	0.84	0.36	0.49	0.890	1.42	YES	0.66	0.19	0.46	0.94	0.00	66.9	YES	0.47	YES	66.4	NO	0.0	0.0	0.750	99.0	67.2	20.83	0.0000	0.00	0.07	0.0477	67.23
11/9/65	0.84	0.36	0.49	0.890	1.42	YES	0.66	0.19	0.46	0.94	0.00	67.2	YES	0.47	YES	66.8	NO	0.0	0.0	0.750	99.8	67.5	20.88	0.0000	0.00	0	0.0000	67.51
11/10/65	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	67.5	YES	0.55	YES	67.0	NO	0.0	0.0	0.750	100.5	67.7	20.92	0.0000	0.00	0.03	0.0204	67.73
11/11/65	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	67.7	YES	0.55	YES	67.2	NO	0.0	0.0	0.750	101.3	67.9	20.96	0.0000	0.00	0.02	0.0136	67.95
11/12/65	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	67.9	YES	0.55	YES	67.4	NO	0.0	0.0	0.750	102.0	68.2	20.99	0.0000	0.00	0	0.0000	68.15
11/13/65	0.88	0.36	0.53	0.890	1.42	YES	0.69	0.19	0.49	0.90	0.00	68.2	YES	0.40	YES	67.7	NO	0.0	0.0	0.750	102.8	68.5	21.02	0.0000	0.00	0.06	0.0409	68.54
11/14/65	0.88	0.36	0.53	0.890	1.42	YES	0.69	0.19	0.49	0.90	0.00	68.5	YES	0.40	YES	68.1	NO	0.0	0.0	0.750	103.5	68.9	21.07	0.0000	0.00	0	0.0000	68.89
11/15/65	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	68.9	YES	0.55	YES	68.3	NO	0.0	0.0	0.750	104.3	69.1	21.12	0.0000	0.00	0	0.0000	69.09
11/16/65	0.84	0.36	0.49	0.890	1.42	YES	0.66	0.19	0.46	0.94	0.00	69.1	YES	0.47	YES	68.6	NO	0.0	0.0	0.750	105.0	69.4	21.15	0.0000	0.00	0.08	0.0545	69.42
11/17/65	0.96	0.36	0.61	0.890	1.42	YES	0.75	0.19	0.56	0.82	0.00	69.4	YES	0.26	YES	69.2	NO	0.0	0.0	0.750	105.8	69.9	21.20	0.0000	0.00	0.03	0.0204	69.93
11/18/65	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	69.9	YES	0.55	YES	69.4	NO	0.0	0.0	0.750	106.5	70.1	21.27	0.0000	0.00	0	0.0000	70.13
11/19/65	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	70.1	YES	0.55	YES	69.6	NO	0.0	0.0	0.750	107.3	70.3	21.30	0.0000	0.00	0	0.0000	70.34
11/20/65	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	70.3	YES	0.55	YES	69.8	NO	0.0	0.0	0.750	108.0	70.5	21.33	0.0000	0.00	0	0.0000	70.54
11/21/65	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	70.5	YES	0.55	YES	70.0	NO	0.0	0.0	0.750	108.8	70.7	21.36	0.0000	0.00	0.04	0.0273	70.77
11/22/65	0.92	0.36	0.57	0.890	1.42	YES	0.72	0.19	0.52	0.86	0.00	70.8	YES	0.33	YES	70.4	NO	0.0	0.0	0.750	109.5	71.2	21.39	0.0000	0.00	0.22	0.1499	71.34
11/23/65	0.96	0.36	0.61	0.890	1.42	YES	0.75	0.19	0.56	0.82	0.00	71.3	YES	0.26	YES	71.1	NO	0.0	0.0	0.750	110.3	71.8	21.46	0.0000	0.00	0	0.0000	71.83
11/24/65	0.84	0.36	0.49	0.890	1.42	YES	0.66	0.19	0.46	0.94	0.00	71.8	YES	0.47	YES	71.4	NO	0.0	0.0	0.750	111.0	72.1	21.53	0.0000	0.00	0	0.0000	72.10
11/25/65	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	72.1	YES	0.55	YES	71.6	NO	0.0	0.0	0.750	111.8	72.3	21.57	0.0000	0.00	0	0.0000	72.31
11/26/65	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	72.3	YES	0.55	YES	71.8	NO	0.0	0.0	0.750	112.5	72.5	21.59	0.0000	0.00	0	0.0000	72.51
11/27/65	0.84	0.36	0.49	0.890	1.42	YES	0.66	0.19	0.46	0.94	0.00	72.5	YES	0.47	YES	72.0	NO	0.0	0.0	0.750	113.3	72.8	21.62	0.0000	0.00	0.13	0.0886	72.88
11/28/65	0.88	0.36	0.53	0.890	1.42	YES	0.69	0.19	0.49	0.90	0.00	72.9	YES	0.40	YES	72.5	NO	0.0	0.0	0.750	114.0	73.2	21.67	0.0000	0.00	0	0.0000	73.22
11/29/65	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	73.2	YES	0.55	YES	72.7	NO	0.0	0.0	0.750	114.8	73.4	21.71	0.0000	0.00	0	0.0000	73.43
11/30/65	0.76	0.36	0.41	0.890	1.42	YES	0.59	0.19	0.40	1.02	0.00	73.4	YES	0.62	YES	72.8	NO	0.0	0.0	0.750	115.5	73.6	21.74	0.0000	0.00	0	0.0000	73.56
12/1/65	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	73.6	YES	0.50	YES	73.1	NO	0.0	0.0	0.750	116.3	73.8	21.76	0.0000	0.00	0	0.0000	73.81
12/2/65	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	73.8	YES	0.50	YES	73.3	NO	0.0	0.0	0.750	117.0	74.1	21.79	0.0000	0.00	0	0.0000	74.07
12/3/65	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	74.1	YES	0.50	YES	73.6	NO	0.0	0.0	0.750	117.8	74.3	21.82	0.0000	0.00	0	0.0000	74.32
12/4/65	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	74.3	YES	0.50	YES	73.8	NO	0.0	0.0	0.750	118.5	74.6	21.86	0.0000	0.00	0	0.0000	74.58
12/5/65	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	74.6	YES	0.50	YES	74.1	NO	0.0	0.0	0.750	119.3	74.8	21.89	0.0000	0.00	0	0.0000	74.83
12/6/65	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	74.8	YES	0.50	YES	74.3	NO	0.0	0.0	0.750	120.0	75.1	21.92	0.0000	0.00	0	0.0000	75.09
12/7/65	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	75.1	YES	0.57	YES	74.5	NO	0.0	0.0	0.750	120.8	75.3	21.95	0.0000	0.00	0	0.0000	75.27
12/8/65	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	75.3	YES	0.57	YES	74.7	NO	0.0	0.0	0.750	121.5	75.5	21.97	0.0000	0.00	0	0.0000	75.45
12/9/65	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	75.5	YES	0.57	YES	74.9	NO	0.0	0.0	0.750	122.3	75.6	22.00	0.0000	0.00	0	0.0000	75.64
12/10/65	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	75.6	YES	0.57	YES	75.1	NO	0.0	0.0	0.750	123.0	75.8	22.02	0.0000	0.00	0	0.0000	75.82
12/11/65	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	75.8	YES	0.57	YES	75.3	NO	0.0	0.0	0.750	123.8	76.0	22.04	0.0000	0.00	0	0.0000	76.00
12/12/65	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	76.0	YES	0.57	YES	75.4	NO	0.0	0.0	0.750	124.5	76.2	22.06	0.0000	0.00	0	0.0000	76.19
12/13/65	0.92	0.36	0.57	0.814	1.30	YES	0.72	0.19	0.52	0.73	0.00	76.2	YES	0.21	YES	76.0	NO	0.0	0.0	0.750	125.3	76.7	22.09	0.0000	0.00	0.32	0.2181	76.95
12/14/65	0.88	0.36	0.53	0.814	1.30	YES	0.69	0.19	0.49	0.77	0.00	76.9	YES	0.28	YES	76.7	NO	0.0	0.0	0.750	126.0	77.4	22.18	0.0000	0.00	0	0.0000	77.42
12/15/65	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	77.4	YES	0.50	YES	76.9	NO	0.0	0.0	0.750	126.8	77.7	22.23	0.0000	0.00	0	0.0000	77.67
12/16/65	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	77.7	YES	0.50	YES	77.2	NO	0.0	0.0	0.750	127.5	77.9	22.26	0.0000	0.00	0	0.0000	77.92
12/17/65	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	77.9	YES	0.50	YES	77.4	NO	0.0	0.0	0.750	128.3	78.2	22.29	0.0000	0.00	0	0.0000	78.18
12/18/65	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	78.2	YES	0.57	YES	77.6	NO	0.0	0.0	0.750	129.0	78.4	22.32	0.0000	0.00	0	0.0000	78.36
12/19/65	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	78.4	YES	0.57	YES	77.8	NO	0.0	0.0	0.750	129.8	78.5	22.34	0.0000	0.00	0	0.0000	78.55
12/20/65	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	78.5	YES	0.57	YES	78.0	NO	0.0	0.0	0.750	130.5	78.7	22.36	0.0000	0.00	0	0.0000	78.73
12/21/65	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	78.7	YES	0.57	YES	78.2	NO	0.0	0.0	0.750	131.3	78.9	22.38	0.0000	0.00	0	0.0000	78.91
12/22/65	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	78.9	YES	0.57	YES	78.3	NO	0.0	0.0	0.750	132.0	79.1	22.40	0.0000	0.00	0	0.0000	79.10
12/23/65	0.80	0.36	0.45	0.814	1.30	YES	0.63	0.19	0.43	0.86	0.00	79.1	YES	0.42	YES	78.7	NO	0.0	0.0	0.750	132.8	79.4	22.43	0.0000	0.00	0	0.0000	79.42
12/24/65	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	79.4	YES	0.57	YES	78.9	NO	0.0	0.0	0.750	133.5	79.6	22.46	0.0000	0.00	0	0.0000	79.61
12/25/65	0.84	0.36	0.49	0.814	1.30	YES	0.66	0.19	0.46	0.81	0.00	79.6	YES	0.35	YES	79.3	NO	0.0	0.0	0.750	134.3	80.0	22.48	0.0000	0.00	0.31	0.2113	80.21
12/26/65	1.00	0.36	0.65	0.814	1.30	YES	0.78	0.19	0.59	0.65	0.00	80.2	YES	0.07	YES	80.1	NO	0.0	0.0	0.750	135.0	80.9	22.55	0.0000	0.00	0	0.0000	80.90
12/27/65	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	80.9	YES	0.57	YES	80.3	NO	0.0	0.0	0.750	135.8	81.1	22.62	0.0000	0.00	0	0.0000	81.08
12/28/65	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	81.1	YES	0.50	YES	80.6	NO	0.0	0.0	0.750	136.5	81.3	22.64	0.0000	0.00	0	0.0000	81.33
12/29/65	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	81.3	YES	0.57	YES	80.8	NO	0.0	0.0	0.750	137.3	81.5	22.67	0.0000	0.00	0	0.0000	81.52
12/30/65	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	81.5	YES	0.57	YES	81.0	NO	0.0	0.0	0.750	138.0	81.7	22.69	0.0000	0.00	0	0.0000	81.70
12/31/65	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	81.7	YES	0.57	YES	81.1	NO	0.0	0.0	0.750	138.8	81.9	22.71	0.0000	0.00	0	0.0000	81.88
1/1/66	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	81.9	YES	0.57	YES	81.3	NO	0.0	0.0	0.750	0.8	82.1	22.73	0.0000	0.00	0.02	0.0136	82.08
1/2/66	0.80	0.36	0.45	0.814	1.30	YES	0.63	0.19	0.43	0.86	0.00	82.1	YES	0.42	YES	81.7	NO	0.0	0.0	0.750	1.5	82.4	22.75	0.0000	0.00	0.32	0.2181	82.63
1/3/66	1.00	0.36	0.65	0.814	1.30	YES	0.78	0.19	0.59	0.65	0.00	82.6	YES	0.07	YES	82.6	NO	0.0	0.0	0.750	2.3	83.3	22.80	0.0000	0.00	0.02	0.0136	83.32
1/4/66	0.84	0.36	0.49	0.814	1.30	YES	0.66	0.19	0.46	0.81	0.00	83.3	YES	0.35	YES	83.0	NO	0.0	0.0	0.750	3.0	83.7	22.87	0.0000	0.00	0	0.0000	83.72
1/5/66	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	83.7	YES	0.50	YES	83.2	NO	0.0	0.0	0.750	3.8	84.0	22.91	0.0000	0.00	0.19	0.1295	84.10
1/6/66	1.48	0.36	1.13	0.814	1.30	YES	1.16	0.19	0.96	0.17	0.79	84.1	NO	0.00	YES	84.1	YES	0.8	0.8	0.750	4.5	85.6	22.95	0.0000	0.00	0.69	0.4703	86.11
1/7/66	1.24	0.36	0.89	0.814	1.30	YES	0.97	0.19	0.77	0.41	0.36	86.1	NO	0.00	YES	86.1	YES	0.4	0.4	0.750	5.3	87.2	23.14	0.0000	0.00	0	0.0000	87.22
1/8/66	0.96	0.36	0.61	0.814	1.30	YES	0.75	0.19	0.56	0.69	0.00	87.2	YES	0.14	YES	87.1	NO	0.0	0.0	0.750	6.0	87.8	23.24	0.0000	0.00	0	0.0000	87.84
1/9/66	0.88	0.36	0.53	0.814	1.30	YES	0.69	0.19	0.49	0.77	0.00	87.8	YES	0.28	YES	87.6	NO	0.0	0.0	0.750	6.8	88.3	23.29	0.0000	0.00	0	0.0000	88.30
1/10/66	0.88	0.36	0.53	0.814	1.30	YES	0.69	0.19	0.49	0.77	0.00	88.3	YES	0.28	YES	88.0	NO	0.0	0.0	0.750	7.5	88.8	23.33	0.0000	0.00	0	0.0000	88.77
1/11/66	0.80	0.36	0.45	0.814	1.30	YES	0.63	0.19	0.43	0.86	0.00	88.8	YES	0.42	YES	88.3	NO	0.0	0.0	0.750	8.3	89.1	23.37	0.0000	0.00	0	0.0000	89.10
1/12/66	0.84	0.36	0.49	0.814	1.30	YES	0.66	0.19	0.46	0.81	0.00	89.1	YES	0.35	YES	88.7	NO	0.0	0.0	0.750	9.0	89.5	23.40	0.0000	0.00	0	0.0000	89.50
1/13/66	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	89.5	YES	0.50	YES	89.0	NO	0.0	0.0	0.750	9.8	89.8	23.43	0.0000	0.00	0.03	0.0204	89.77
1/14/66	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	89.8	YES	0.50	YES	89.3	NO	0.0	0.0	0.750	10.5	90.0	23.45	0.0000	0.00	0	0.0000	90.03
1/15/66	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	90.0	YES	0.50	YES	89.5	NO	0.0	0.0	0.750	11.3	90.3	23.47	0.0000	0.00	0	0.0000	90.28
1/16/66	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	90.3	YES	0.57	YES	89.7	NO	0.0	0.0	0.750	12.0	90.5	23.49	0.0000	0.00	0	0.0000	90.46
1/17/66	0.68	0.36	0.33	0.814	1.30	YES	0.53	0.19	0.34	0.98	0.00	90.5	YES	0.64	YES	89.8	NO	0.0	0.0	0.750	12.8	90.6	23.51	0.0000	0.00	0	0.0000	90.58
1/18/66	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	90.6	YES	0.57	YES	90.0	NO	0.0	0.0	0.750	13.5	90.8	23.52	0.0000	0.00	0	0.0000	90.76
1/19/66	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	90.8	YES	0.57	YES	90.2	NO	0.0	0.0	0.750	14.3	90.9	23.53	0.0000	0.00	0	0.0000	90.94
1/20/66	0.68	0.36	0.33	0.814	1.30	YES	0.53	0.19	0.34	0.98	0.00	90.9	YES	0.64	YES	90.3	NO	0.0	0.0	0.750	15.0	91.1	23.54	0.0000	0.00	0	0.0000	91.05
1/21/66	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	91.1	YES	0.57	YES	90.5	NO	0.0	0.0	0.750	15.8	91.2	23.55	0.0000	0.00	0	0.0000	91.24
1/22/66	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	91.2	YES	0.50	YES	90.7	NO	0.0	0.0	0.750	16.5	91.5	23.57	0.0000	0.00	0.3	0.2045	91.70
1/23/66	0.92	0.36	0.57	0.814	1.30	YES	0.72	0.19	0.52	0.73	0.00	91.7	YES	0.21	YES	91.5	NO	0.0	0.0	0.750	17.3	92.2	23.60	0.0000	0.00	0.99	0.6748	92.91
1/24/66	0.80	0.36	0.45	0.814	1.30	YES	0.63	0.19	0.43	0.86	0.00	92.9	YES	0.42	YES	92.5	NO	0.0	0.0	0.750	18.0	93.2	23.69	0.0000	0.00	0	0.0000	93.24
1/25/66	0.80	0.36	0.45	0.814	1.30	YES	0.63	0.19	0.43	0.86	0.00	93.2	YES	0.42	YES	92.8	NO	0.0	0.0	0.750	18.8	93.6	23.71	0.0000	0.00	0	0.0000	93.56

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity	1.60	mgd	Hull Creek Minimum Stream Flow-By:	0.355	mgd	Min Reservoir Level	12.6	ft	Medford Quarry Pump Rate	0.750	MGD	MQ Stop Set Point	116.0	MG								
Reservoir Volume	121.80	MG	Cranberry Branch Minimum Stream Flow-By:	0.194	mgd				Medford Quarry Max Annual Vol	176	MG											
Medford Quarry Start Setpoint	104	MG								234	days											

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
1/26/66	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	93.6	YES	0.50	YES	93.1	NO	0.0	0.0	0.750	19.5	93.8	23.73	0.0000	0.00	0.64	0.4362	94.26
1/27/66	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	94.3	YES	0.50	YES	93.8	NO	0.0	0.0	0.750	20.3	94.5	23.78	0.0000	0.00	0.08	0.0545	94.56
1/28/66	0.76	0.36	0.41	0.814	1.30	YES	0.59	0.19	0.40	0.90	0.00	94.6	YES	0.50	YES	94.1	NO	0.0	0.0	0.750	21.0	94.8	23.80	0.0000	0.00	0	0.0000	94.82
1/29/66	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	94.8	YES	0.57	YES	94.3	NO	0.0	0.0	0.750	21.8	95.0	23.82	0.0000	0.00	0.68	0.4635	95.47
1/30/66	0.72	0.36	0.37	0.814	1.30	YES	0.56	0.19	0.37	0.94	0.00	95.5	YES	0.57	YES	94.9	NO	0.0	0.0	0.750	22.5	95.6	23.86	0.0000	0.00	0.19	0.1295	95.78
1/31/66	0.64	0.36	0.29	0.814	1.30	YES	0.50	0.19	0.31	1.02	0.00	95.8	YES	0.71	YES	95.1	NO	0.0	0.0	0.750	23.3	95.8	23.88	0.0000	0.00	0	0.0000	95.82
2/1/66	1.60	0.36	1.25	0.788	1.26	YES	1.25	0.19	1.06	0.01	1.04	95.8	NO	0.00	YES	95.8	YES	1.0	1.0	0.750	24.0	97.6	23.88	0.0000	0.00	0.13	0.0886	97.70
2/2/66	2.16	0.36	1.81	0.788	1.26	NO	1.69	0.19	1.49	0.00	1.49	97.7	NO	0.00	YES	97.7	YES	1.5	1.5	0.750	24.8	99.9	23.99	0.0000	0.00	0.12	0.0818	100.03
2/3/66	1.92	0.36	1.57	0.788	1.26	NO	1.50	0.19	1.31	0.00	1.31	100.0	NO	0.00	YES	100.0	YES	1.3	1.3	0.750	25.5	102.1	24.12	0.0000	0.00	0	0.0000	102.08
2/4/66	1.72	0.36	1.37	0.788	1.26	NO	1.34	0.19	1.15	0.00	1.15	102.1	NO	0.00	YES	102.1	YES	1.1	1.1	0.750	26.3	104.0	24.21	0.0000	0.00	0	0.0000	103.98
2/5/66	1.64	0.36	1.29	0.788	1.26	NO	1.28	0.19	1.09	0.00	1.09	104.0	NO	0.00	YES	104.0	YES	1.1	1.1	0.750	27.0	105.8	24.29	0.0000	0.00	0	0.0000	105.82
2/6/66	1.60	0.36	1.25	0.788	1.26	YES	1.25	0.19	1.06	0.01	1.04	105.8	NO	0.00	YES	105.8	YES	1.0	1.0	0.750	27.8	107.6	24.35	0.0000	0.00	0	0.0000	107.61
2/7/66	1.64	0.36	1.29	0.788	1.26	NO	1.28	0.19	1.09	0.00	1.09	107.6	NO	0.00	YES	107.6	YES	1.1	1.1	0.750	28.5	109.5	24.41	0.0000	0.00	0	0.0000	109.45
2/8/66	1.56	0.36	1.21	0.788	1.26	YES	1.22	0.19	1.02	0.05	0.97	109.5	NO	0.00	YES	109.5	YES	1.0	1.0	0.750	29.3	111.2	24.45	0.0000	0.00	0	0.0000	111.17
2/9/66	1.44	0.36	1.09	0.788	1.26	YES	1.13	0.19	0.93	0.17	0.76	111.2	NO	0.00	YES	111.2	YES	0.8	0.8	0.750	30.0	112.7	24.48	0.0000	0.00	0	0.0000	112.68
2/10/66	1.44	0.36	1.09	0.788	1.26	YES	1.13	0.19	0.93	0.17	0.76	112.7	NO	0.00	YES	112.7	YES	0.8	0.8	0.750	30.8	114.2	24.50	0.0000	0.00	0	0.0000	114.19
2/11/66	4.21	0.36	3.85	0.788	1.26	NO	3.28	0.19	3.09	0.00	3.09	114.2	NO	0.00	YES	114.2	YES	3.1	3.0	0.000	30.8	117.2	24.52	0.0000	0.00	0	0.0000	117.19
2/12/66	3.97	0.36	3.61	0.788	1.26	NO	3.09	0.19	2.90	0.00	2.90	117.2	NO	0.00	YES	117.2	YES	2.9	2.9	0.000	30.8	120.1	24.52	0.0000	0.00	0.09	0.0613	120.15
2/13/66	29.38	0.36	29.03	0.788	1.26	NO	22.91	0.19	22.72	0.00	22.72	120.2	NO	0.00	YES	120.2	YES	22.7	3.0	0.000	30.8	121.8	24.50	0.0000	0.00	1.65	1.1246	121.80
2/14/66	9.66	0.36	9.31	0.788	1.26	NO	7.53	0.19	7.34	0.00	7.34	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/15/66	3.69	0.36	3.33	0.788	1.26	NO	2.88	0.19	2.68	0.00	2.68	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/16/66	2.97	0.36	2.61	0.788	1.26	NO	2.31	0.19	2.12	0.00	2.12	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0.24	0.1636	121.80
2/17/66	2.77	0.36	2.41	0.788	1.26	NO	2.16	0.19	1.96	0.00	1.96	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/18/66	2.29	0.36	1.93	0.788	1.26	NO	1.78	0.19	1.59	0.00	1.59	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/19/66	2.08	0.36	1.73	0.788	1.26	NO	1.63	0.19	1.43	0.00	1.43	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/20/66	1.84	0.36	1.49	0.788	1.26	NO	1.44	0.19	1.24	0.00	1.24	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/21/66	1.72	0.36	1.37	0.788	1.26	NO	1.34	0.19	1.15	0.00	1.15	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/22/66	1.60	0.36	1.25	0.788	1.26	YES	1.25	0.19	1.06	0.01	1.04	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/23/66	1.52	0.36	1.17	0.788	1.26	YES	1.19	0.19	0.99	0.09	0.90	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/24/66	1.56	0.36	1.21	0.788	1.26	YES	1.22	0.19	1.02	0.05	0.97	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	1	0.6816	121.80
2/25/66	1.64	0.36	1.29	0.788	1.26	NO	1.28	0.19	1.09	0.00	1.09	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0.07	0.0477	121.80
2/26/66	1.56	0.36	1.21	0.788	1.26	YES	1.22	0.19	1.02	0.05	0.97	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/27/66	1.52	0.36	1.17	0.788	1.26	YES	1.19	0.19	0.99	0.09	0.90	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/28/66	3.57	0.36	3.21	0.788	1.26	NO	2.78	0.19	2.59	0.00	2.59	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0.94	0.6407	121.80
3/1/66	11.71	0.36	11.35	0.915	1.46	NO	9.13	0.19	8.93	0.00	8.93	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0.01	0.0068	121.80
3/2/66	3.41	0.36	3.05	0.915	1.46	NO	2.66	0.19	2.46	0.00	2.46	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/3/66	2.53	0.36	2.17	0.915	1.46	NO	1.97	0.19	1.77	0.00	1.77	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/4/66	2.37	0.36	2.01	0.915	1.46	NO	1.84	0.19	1.65	0.00	1.65	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0.01	0.0068	121.80
3/5/66	2.37	0.36	2.01	0.915	1.46	NO	1.84	0.19	1.65	0.00	1.65	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0.09	0.0613	121.80
3/6/66	2.12	0.36	1.77	0.915	1.46	NO	1.66	0.19	1.46	0.00	1.46	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/7/66	1.88	0.36	1.53	0.915	1.46	NO	1.47	0.19	1.27	0.00	1.27	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/8/66	1.72	0.36	1.37	0.915	1.46	YES	1.34	0.19	1.15	0.10	1.05	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/9/66	1.64	0.36	1.29	0.915	1.46	YES	1.28	0.19	1.09	0.18	0.91	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/10/66	1.60	0.36	1.25	0.915	1.46	YES	1.25	0.19	1.06	0.22	0.84	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/11/66	1.56	0.36	1.21	0.915	1.46	YES	1.22	0.19	1.02	0.26	0.77	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/12/66	1.52	0.36	1.17	0.915	1.46	YES	1.19	0.19	0.99	0.30	0.70	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/13/66	1.48	0.36	1.13	0.915	1.46	YES	1.16	0.19	0.96	0.34	0.63	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/14/66	1.44	0.36	1.09	0.915	1.46	YES	1.13	0.19	0.93	0.38	0.55	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/15/66	1.40	0.36	1.05	0.915	1.46	YES	1.09	0.19	0.90	0.42	0.48	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/16/66	1.36	0.36	1.01	0.915	1.46	YES	1.06	0.19	0.87	0.46	0.41	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/17/66	1.32	0.36	0.97	0.915	1.46	YES	1.03	0.19	0.84	0.50	0.34	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/18/66	1.32	0.36	0.97	0.915	1.46	YES	1.03	0.19	0.84	0.50	0.34	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/19/66	1.32	0.36	0.97	0.915	1.46	YES	1.03	0.19	0.84	0.50	0.34	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0.07	0.0477	121.80
3/20/66	1.28	0.36	0.93	0.915	1.46	YES	1.00	0.19	0.81	0.54	0.27	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/21/66	1.24	0.36	0.89	0.915	1.46	YES	0.97	0.19	0.77	0.58	0.20	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/22/66	1.24	0.36	0.89	0.915	1.46	YES	0.97	0.19	0.77	0.58	0.20	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0.01	0.0068	121.80
3/23/66	1.24	0.36	0.89	0.915	1.46	YES	0.97	0.19	0.77	0.58	0.20	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/24/66	1.48	0.36	1.13	0.915	1.46	YES	1.16	0.19	0.96	0.34	0.63	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0.65	0.4430	121.80
3/25/66	1.64	0.36	1.29	0.915	1.46	YES	1.28	0.19	1.09	0.18	0.91	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/26/66	1.32	0.36	0.97	0.915	1.46	YES	1.03	0.19	0.84	0.50	0.34	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/27/66	1.28	0.36	0.93	0.915	1.46	YES	1.00	0.19	0.81	0.54	0.27	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/28/66	1.20	0.36	0.85	0.915	1.46	YES	0.94	0.19	0.74	0.62	0.13	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/29/66	1.20	0.36	0.85	0.915	1.46	YES	0.94	0.19	0.74	0.62	0.13	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/30/66	1.20	0.36	0.85	0.915	1.46	YES	0.94	0.19	0.74	0.62	0.13	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0.09	0.0613	121.80
3/31/66	1.24	0.36	0.89	0.915	1.46	YES	0.97	0.19	0.77	0.58	0.20	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.0000	0.00	0	0.0000	121.80
4/1/66	1.20	0.36	0.85	0.992	1.59	YES	0.94	0.19	0.74	0.74	0.00	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/2/66	1.16	0.36	0.81	0.992	1.59	YES	0.91	0.19	0.71	0.78	0.00	121.7	YES	0.07	YES	121.6	NO	0.0	0.0	0.000	30.8	121.6	24.48	0.1895	0.13	0	0.0000	121.48
4/3/66	1.16	0.36	0.81	0.992	1.59	YES	0.91	0.19	0.71	0.78	0.00	121.5	YES	0.07	YES	121.4	NO	0.0	0.0	0.000	30.8	121.4	24.49	0.1895	0.13	0.01	0.0068	121.30
4/4/66	1.16	0.36	0.81	0.992	1.59	YES	0.91	0.19	0.71	0.78	0.00	121.3	YES	0.07	YES	121.2	NO	0.0	0.0	0.000	30.8	121.2	24.49	0.1895	0.13	0.06	0.0409	121.14
4/5/66	1.12	0.36	0.77	0.992	1.59	YES	0.88	0.19	0.68	0.82	0.00	121.1	YES	0.14	YES	121.0	NO	0.0	0.0	0.000	30.8	121.0	24.49	0.1895	0.13	0	0.0000	120.88
4/6/66	1.12	0.36	0.77	0.992	1.59	YES	0.88	0.19	0.68	0.82	0.00	120.9	YES	0.14	YES	120.7	NO	0.0	0.0	0.000	30.8	120.7	24.50	0.1895	0.13	0	0.0000	120.62
4/7/66	1.12	0.36	0.77	0.992	1.59	YES	0.88	0.19	0.68	0.82	0.00	120.6	YES	0.14	YES	120.5	NO	0.0	0.0	0.000	30.8	120.5	24.50	0.1895	0.13	0	0.0000	120.35
4/8/66	1.12	0.36	0.77	0.992	1.59	YES	0.88	0.19	0.68	0.82	0.00	120.4	YES	0.14	YES	120.2	NO	0.0	0.0	0.000	30.8	120.2	24.50	0.1895	0.13	0	0.0000	120.09
4/9/66	1.08	0.36	0.73	0.992	1.59	YES	0.84	0.19	0.65	0.86	0.00	120.1	YES	0.21	YES	119.9	NO	0.0	0.0	0.000	30.8	119.9	24.50	0.1895	0.13	0.01	0.0068	119.76
4/10/66	1.08	0.36	0.73	0.992	1.59	YES	0.84	0.19	0.65	0.86	0.00	119.8	YES	0.21	YES	119.5	NO	0.0	0.0	0.000	30.8	119.5	24.51	0.1895	0.13	0	0.0000	119.42
4/11/66	1.08	0.36	0.73	0.992	1.59	YES	0.84	0.19	0.65	0.86	0.00	119.4	YES	0.21	YES	119.2	NO	0.0	0.0	0.000	30.8	119.2	24.51	0.1895	0.13	0	0.0000	119.09
4/12/66	1.16	0.36	0.81	0.992	1.59	YES	0.91	0.19	0.71	0.78	0.00	119.1	YES	0.07	YES	119.0	NO	0.0	0.0	0.000	30.8	119.0	24.51	0.1895	0.13	1.42	0.9678	119.86
4/13/66	3.33	0.36	2.97	0.992	1.59	NO	2.59	0.19	2.40	0.00	2.40	119.9	NO	0.00	YES	119.9	YES	2.4	2.4	0.000	30.8	121.8	24.51	0.1895	0.13	0.87	0.5930	121.80
4/14/66	2.45	0.36	2.09	0.992	1.59	NO	1.91	0.19	1.71	0.00	1.71	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/15/66	1.72	0.36	1.37	0.992	1.59	YES	1.34	0.19	1.15	0.22	0.93	121.7	NO	0.00	YES	121.7	YES	0.9	0.9	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/16/66	1.48	0.36	1.13	0.992	1.59	YES	1.16	0.19	0.96	0.46	0.50	121.7	NO	0.00	YES	121.7	YES	0.5	0.5	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/17/66	1.32	0.36	0.97	0.992	1.59	YES	1.03	0.19	0.84	0.62	0.22	121.7	NO	0.00	YES	121.7	YES	0.2	0.2	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/18/66	1.40	0.36	1.05	0.992	1.59	YES	1.09	0.19	0.90	0.54	0.36	121.7	NO	0.00	YES	121.7	YES	0.4	0.4	0.000	30.8	121.8	24.48	0.1895	0.13	0.01	0.0068	121.68
4/19/66	1.36	0.36	1.01	0.992	1.59	YES	1.06	0.19	0.87	0.58	0.29	121.7	NO	0.00	YES	121.7	YES	0.3	0.3	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity	1.60	mgd	Hull Creek Minimum Stream Flow-By:	0.355	mgd	Min Reservoir Level	12.6	ft	Medford Quarry Pump Rate	0.750	MGD
Reservoir Volume	121.80	MG	Cranberry Branch Minimum Stream Flow-By:	0.194	mgd				Medford Quarry Max Annual Vol	176	MG
Medford Quarry Start Setpoint	104	MG								234	days

MQ Stop Set Point: 116.0 MG

Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
4/20/66	1.32	0.36	0.97	0.992	1.59	YES	1.03	0.19	0.84	0.62	0.22	121.7	NO	0.00	YES	121.7	YES	0.2	0.2	0.000	30.8	121.8	24.48	0.1895	0.13	0.03	0.0204	121.69
4/21/66	1.32	0.36	0.97	0.992	1.59	YES	1.03	0.19	0.84	0.62	0.22	121.7	NO	0.00	YES	121.7	YES	0.2	0.2	0.000	30.8	121.8	24.48	0.1895	0.13	0.1	0.0682	121.74
4/22/66	1.64	0.36	1.29	0.992	1.59	YES	1.28	0.19	1.09	0.30	0.79	121.7	NO	0.00	YES	121.7	YES	0.8	0.8	0.000	30.8	121.8	24.48	0.1895	0.13	0.4	0.2726	121.80
4/23/66	1.48	0.36	1.13	0.992	1.59	YES	1.16	0.19	0.96	0.46	0.50	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.1895	0.13	0.02	0.0136	121.69
4/24/66	1.68	0.36	1.33	0.992	1.59	YES	1.31	0.19	1.12	0.26	0.86	121.7	NO	0.00	YES	121.7	YES	0.9	0.9	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/25/66	2.53	0.36	2.17	0.992	1.59	NO	1.97	0.19	1.77	0.00	1.77	121.7	NO	0.00	YES	121.7	YES	1.8	1.8	0.000	30.8	121.8	24.48	0.1895	0.13	0.28	0.1908	121.80
4/26/66	1.88	0.36	1.53	0.992	1.59	YES	1.47	0.19	1.27	0.06	1.22	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/27/66	1.80	0.36	1.45	0.992	1.59	YES	1.41	0.19	1.21	0.14	1.07	121.7	NO	0.00	YES	121.7	YES	1.1	1.1	0.000	30.8	121.8	24.48	0.1895	0.13	0.37	0.2522	121.80
4/28/66	3.21	0.36	2.85	0.992	1.59	NO	2.50	0.19	2.31	0.00	2.31	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.1895	0.13	0.08	0.0545	121.73
4/29/66	2.33	0.36	1.97	0.992	1.59	NO	1.81	0.19	1.62	0.00	1.62	121.7	NO	0.00	YES	121.7	YES	1.6	1.6	0.000	30.8	121.8	24.48	0.1895	0.13	0.02	0.0136	121.69
4/30/66	2.57	0.36	2.21	0.992	1.59	NO	2.00	0.19	1.81	0.00	1.81	121.7	NO	0.00	YES	121.7	YES	1.8	1.8	0.000	30.8	121.8	24.48	0.1895	0.13	0.71	0.4839	121.80
5/1/66	3.29	0.36	2.93	1.051	1.68	NO	2.56	0.19	2.37	0.00	2.37	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.1895	0.13	0.06	0.0409	121.71
5/2/66	2.45	0.36	2.09	1.051	1.68	NO	1.91	0.19	1.71	0.00	1.71	121.7	NO	0.00	YES	121.7	YES	1.7	1.7	0.000	30.8	121.8	24.48	0.1895	0.13	0.07	0.0477	121.72
5/3/66	2.12	0.36	1.77	1.051	1.68	NO	1.66	0.19	1.46	0.00	1.46	121.7	NO	0.00	YES	121.7	YES	1.5	1.5	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/4/66	1.92	0.36	1.57	1.051	1.68	YES	1.50	0.19	1.31	0.11	1.19	121.7	NO	0.00	YES	121.7	YES	1.2	1.2	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/5/66	1.76	0.36	1.41	1.051	1.68	YES	1.38	0.19	1.18	0.27	0.91	121.7	NO	0.00	YES	121.7	YES	0.9	0.9	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/6/66	1.68	0.36	1.33	1.051	1.68	YES	1.31	0.19	1.12	0.35	0.77	121.7	NO	0.00	YES	121.7	YES	0.8	0.8	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/7/66	1.56	0.36	1.21	1.051	1.68	YES	1.22	0.19	1.02	0.47	0.55	121.7	NO	0.00	YES	121.7	YES	0.6	0.6	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/8/66	1.52	0.36	1.17	1.051	1.68	YES	1.19	0.19	0.99	0.51	0.48	121.7	NO	0.00	YES	121.7	YES	0.5	0.5	0.000	30.8	121.8	24.48	0.1895	0.13	0.02	0.0136	121.69
5/9/66	1.48	0.36	1.13	1.051	1.68	YES	1.16	0.19	0.96	0.55	0.41	121.7	NO	0.00	YES	121.7	YES	0.4	0.4	0.000	30.8	121.8	24.48	0.1895	0.13	0.03	0.0204	121.69
5/10/66	1.44	0.36	1.09	1.051	1.68	YES	1.13	0.19	0.93	0.59	0.34	121.7	NO	0.00	YES	121.7	YES	0.3	0.3	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/11/66	1.40	0.36	1.05	1.051	1.68	YES	1.09	0.19	0.90	0.63	0.27	121.7	NO	0.00	YES	121.7	YES	0.3	0.3	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/12/66	1.40	0.36	1.05	1.051	1.68	YES	1.09	0.19	0.90	0.63	0.27	121.7	NO	0.00	YES	121.7	YES	0.3	0.3	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/13/66	1.44	0.36	1.09	1.051	1.68	YES	1.13	0.19	0.93	0.59	0.34	121.7	NO	0.00	YES	121.7	YES	0.3	0.3	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/14/66	1.44	0.36	1.09	1.051	1.68	YES	1.13	0.19	0.93	0.59	0.34	121.7	NO	0.00	YES	121.7	YES	0.3	0.3	0.000	30.8	121.8	24.48	0.1895	0.13	0.28	0.1908	121.80
5/15/66	1.36	0.36	1.01	1.051	1.68	YES	1.06	0.19	0.87	0.67	0.19	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/16/66	1.28	0.36	0.93	1.051	1.68	YES	1.00	0.19	0.81	0.75	0.05	121.7	NO	0.00	YES	121.7	YES	0.1	0.1	0.000	30.8	121.7	24.48	0.1895	0.13	0	0.0000	121.60
5/17/66	1.28	0.36	0.93	1.051	1.68	YES	1.00	0.19	0.81	0.75	0.05	121.6	NO	0.00	YES	121.6	YES	0.1	0.1	0.000	30.8	121.7	24.48	0.1895	0.13	0.5	0.3408	121.80
5/18/66	1.40	0.36	1.05	1.051	1.68	YES	1.09	0.19	0.90	0.63	0.27	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.1895	0.13	0.58	0.3953	121.80
5/19/66	3.65	0.36	3.29	1.051	1.68	NO	2.84	0.19	2.65	0.00	2.65	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.1895	0.13	0.63	0.4294	121.80
5/20/66	1.72	0.36	1.37	1.051	1.68	YES	1.34	0.19	1.15	0.31	0.84	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/21/66	1.44	0.36	1.09	1.051	1.68	YES	1.13	0.19	0.93	0.59	0.34	121.7	NO	0.00	YES	121.7	YES	0.3	0.3	0.000	30.8	121.8	24.48	0.1895	0.13	0.23	0.1568	121.80
5/22/66	1.72	0.36	1.37	1.051	1.68	YES	1.34	0.19	1.15	0.31	0.84	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/23/66	1.36	0.36	1.01	1.051	1.68	YES	1.06	0.19	0.87	0.67	0.19	121.7	NO	0.00	YES	121.7	YES	0.2	0.2	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/24/66	1.28	0.36	0.93	1.051	1.68	YES	1.00	0.19	0.81	0.75	0.05	121.7	NO	0.00	YES	121.7	YES	0.1	0.1	0.000	30.8	121.7	24.48	0.1895	0.13	0	0.0000	121.60
5/25/66	1.32	0.36	0.97	1.051	1.68	YES	1.03	0.19	0.84	0.71	0.12	121.6	NO	0.00	YES	121.6	YES	0.1	0.1	0.000	30.8	121.7	24.48	0.1895	0.13	0	0.0000	121.60
5/26/66	1.28	0.36	0.93	1.051	1.68	YES	1.00	0.19	0.81	0.75	0.05	121.6	NO	0.00	YES	121.6	YES	0.1	0.1	0.000	30.8	121.6	24.49	0.1895	0.13	0.22	0.1499	121.67
5/27/66	1.24	0.36	0.89	1.051	1.68	YES	0.97	0.19	0.77	0.79	0.00	121.7	YES	0.02	YES	121.7	NO	0.0	0.0	0.000	30.8	121.7	24.48	0.1895	0.13	1.42	0.9678	121.80
5/28/66	1.28	0.36	0.93	1.051	1.68	YES	1.00	0.19	0.81	0.75	0.05	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.1895	0.13	0.37	0.2522	121.80
5/29/66	1.56	0.36	1.21	1.051	1.68	YES	1.22	0.19	1.02	0.47	0.55	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	30.8	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/30/66	1.20	0.36	0.85	1.051	1.68	YES	0.94	0.19	0.74	0.83	0.00	121.7	YES	0.09	YES	121.6	NO	0.0	0.0	0.000	30.8	121.6	24.48	0.1895	0.13	0	0.0000	121.46
5/31/66	1.16	0.36	0.81	1.051	1.68	YES	0.91	0.19	0.71	0.87	0.00	121.5	YES	0.16	YES	121.3	NO	0.0	0.0	0.000	30.8	121.3	24.49	0.1895	0.13	0.12	0.0818	121.25
6/1/66	1.12	0.36	0.77	1.164	1.86	YES	0.88	0.19	0.68	1.10	0.00	121.3	YES	0.41	YES	120.8	NO	0.0	0.0	0.000	30.8	120.8	24.49	0.1895	0.13	0	0.0000	120.71
6/2/66	1.08	0.36	0.73	1.164	1.86	YES	0.84	0.19	0.65	1.14	0.00	120.7	YES	0.49	YES	120.2	NO	0.0	0.0	0.000	30.8	120.2	24.50	0.1895	0.13	0	0.0000	120.10
6/3/66	1.04	0.36	0.69	1.164	1.86	YES	0.81	0.19	0.62	1.18	0.00	120.1	YES	0.56	YES	119.5	NO	0.0	0.0	0.000	30.8	119.5	24.50	0.1895	0.13	0	0.0000	119.42
6/4/66	1.04	0.36	0.69	1.164	1.86	YES	0.81	0.19	0.62	1.18	0.00	119.4	YES	0.56	YES	118.9	NO	0.0	0.0	0.000	30.8	118.9	24.51	0.1895	0.13	0	0.0000	118.73
6/5/66	1.00	0.36	0.65	1.164	1.86	YES	0.78	0.19	0.59	1.22	0.00	118.7	YES	0.63	YES	118.1	NO	0.0	0.0	0.000	30.8	118.1	24.52	0.1895	0.13	0	0.0000	117.98
6/6/66	0.96	0.36	0.61	1.164	1.86	YES	0.75	0.19	0.56	1.26	0.00	118.0	YES	0.70	YES	117.3	NO	0.0	0.0	0.000	30.8	117.3	24.52	0.1895	0.13	0	0.0000	117.15
6/7/66	0.96	0.36	0.61	1.164	1.86	YES	0.75	0.19	0.56	1.26	0.00	117.2	YES	0.70	YES	116.5	NO	0.0	0.0	0.000	30.8	116.5	24.52	0.1895	0.13	0.01	0.0068	116.33
6/8/66	0.96	0.36	0.61	1.164	1.86	YES	0.75	0.19	0.56	1.26	0.00	116.3	YES	0.70	YES	115.6	NO	0.0	0.0	0.000	30.8	115.6	24.52	0.1895	0.13	0.19	0.1295	115.64
6/9/66	0.96	0.36	0.61	1.164	1.86	YES	0.75	0.19	0.56	1.26	0.00	115.6	YES	0.70	YES	114.9	NO	0.0	0.0	0.000	30.8	114.9	24.52	0.1895	0.13	0	0.0000	114.81
6/10/66	0.92	0.36	0.57	1.164	1.86	YES	0.72	0.19	0.52	1.30	0.00	114.8	YES	0.77	YES	114.0	NO	0.0	0.0	0.000	30.8	114.0	24.52	0.1895	0.13	0.01	0.0068	113.92
6/11/66	0.88	0.36	0.53	1.164	1.86	YES	0.69	0.19	0.49	1.34	0.00	113.9	YES	0.84	YES	113.1	NO	0.0	0.0	0.000	30.8	113.1	24.51	0.1895	0.13	0	0.0000	112.95
6/12/66	0.84	0.36	0.49	1.164	1.86	YES	0.66	0.19	0.46	1.38	0.00	113.0	YES	0.91	YES	112.0	NO	0.0	0.0	0.000	30.8	112.0	24.51	0.1895	0.13	0	0.0000	111.91
6/13/66	0.84	0.36	0.49	1.164	1.86	YES	0.66	0.19	0.46	1.38	0.00	111.9	YES	0.91	YES	111.0	NO	0.0	0.0	0.000	30.8	111.0	24.49	0.1895	0.13	0	0.0000	110.87
6/14/66	0.88	0.36	0.53	1.164	1.86	YES	0.69	0.19	0.49	1.34	0.00	110.9	YES	0.84	YES	110.0	NO	0.0	0.0	0.000	30.8	110.0	24.48	0.1895	0.13	0.08	0.0545	109.96
6/15/66	0.96	0.36	0.61	1.164	1.86	YES	0.75	0.19	0.56	1.26	0.00	110.0	YES	0.70	YES	109.3	NO	0.0	0.0	0.000	30.8	109.3	24.46	0.1895	0.13	0	0.0000	109.13
6/16/66	0.84	0.36	0.49	1.164	1.86	YES	0.66	0.19	0.46	1.38	0.00	109.1	YES	0.91	YES	108.2	NO	0.0	0.0	0.000	30.8	108.2	24.44	0.1895	0.13	0.45	0.3067	108.40
6/17/66	0.88	0.36	0.53	1.164	1.86	YES	0.69	0.19	0.49	1.34	0.00	108.4	YES	0.84	YES	107.6	NO	0.0	0.0	0.000	30.8	107.6	24.43	0.1895	0.13	0	0.0000	107.43
6/18/66	0.84	0.36	0.49	1.164	1.86	YES	0.66	0.19	0.46	1.38	0.00	107.4	YES	0.91	YES	106.5	NO	0.0	0.0	0.000	30.8	106.5	24.40	0.1895	0.13	0	0.0000	106.39
6/19/66	0.80	0.36	0.45	1.164	1.86	YES	0.63	0.19	0.43	1.42	0.00	106.4	YES	0.99	YES	105.4	NO	0.0	0.0	0.000	30.8	105.4	24.37	0.1895	0.13	0.12	0.0818	105.36
6/20/66	0.80	0.36	0.45	1.164	1.86	YES	0.63	0.19	0.43	1.42	0.00	105.4	YES	0.99	YES	104.4	NO	0.0	0.0	0.000	30.8	104.4	24.34	0.1895	0.13	0	0.0000	104.25
6/21/66	0.76	0.36	0.41	1.164	1.86	YES	0.59	0.19	0.40	1.46	0.00	104.3	YES	1.06	YES	103.2	NO	0.0	0.0	0.000	30.8	103.2	24.30	0.1895	0.13	0	0.0000	103.07
6/22/66	0.72	0.36	0.37	1.164	1.86	YES	0.56	0.19	0.37	1.50	0.00	103.1	YES	1.13	YES	101.9	NO	0.0	0.0	0.750	31.5	102.7	24.25	0.1895	0.12	0	0.0000	102.57
6/23/66	0.72	0.36	0.37	1.164	1.86	YES	0.56	0.19	0.37	1.50	0.00	102.6	YES	1.13	YES	101.4	NO	0.0	0.0	0.750	32.3	102.2	24.23	0.1895	0.12	0	0.0000	102.07
6/24/66	0.68	0.36	0.33	1.164	1.86	YES	0.53	0.19	0.34	1.54	0.00	102.1	YES	1.20	YES	100.9	NO	0.0	0.0	0.750	33.0	101.6	24.21	0.1895	0.12	0	0.0000	101.49
6/25/66	0.64	0.36	0.29	1.164	1.86	YES	0.50	0.19	0.31	1.58	0.00	101.5	YES	1.27	YES	100.2	NO	0.0	0.0	0.750	33.8	101.0	24.19	0.1895	0.12	0	0.0000	100.85
6/26/66	0.64	0.36	0.29	1.164	1.86	YES	0.50	0.19	0.31	1.58	0.00	100.8	YES	1.27	YES	99.6	NO	0.0	0.0	0.750	34.5	100.3	24.16	0.1895	0.12	0	0.0000	100.20
6/27/66	0.68	0.36	0.33	1.164	1.86	YES	0.53	0.19	0.34	1.54	0.00	100.2	YES	1.20	YES	99.0	NO	0.0	0.0	0.750	35.3	99.8	24.13	0.1895	0.12	0	0.0000	99.63
6/28/66	0.68	0.36	0.33	1.164	1.86	YES	0.53	0.19	0.34	1.54	0.00	99.6	YES	1.20	YES	98.4	NO	0.0	0.0	0.750	36.0	99.2	24.10	0.1895	0.12	0.32	0.2181	99.27
6/29/66	0.64	0.36	0.29	1.164	1.86	YES	0.50	0.19	0.31	1.58	0.00	99.3	YES	1.27	YES	98.0	NO	0.0	0.0	0.750	36.8	98.8	24.08	0.1895	0.12	0	0.0000	98.63
6/30/66	0.60	0.36	0.25	1.164	1.86	YES	0.47	0.19	0.27	1.62	0.00	98.6	YES	1.34	YES	97.3	NO	0.0	0.0	0.750	37.5	98.0	24.04	0.1895	0.12	0	0.0000	97.91
7/1/66	0.60	0.36	0.25	1.300	2.08	YES	0.47	0.19	0.27	1.83	0.00	97.9	YES	1.56	YES	96.4	NO	0.0	0.0	0.750	38.3	97.1	24.01	0.1895	0.12	0	0.0000	96.98
7/2/66	0.56	0.36	0.21	1.300	2.08	YES	0.44	0.19	0.24	1.87	0.00	97.0	YES	1.63	YES	95.4	NO	0.0	0.0	0.750	39.0	96.1	23.95	0.1895	0.12	0	0.0000	95.98
7/3/66	0.52	0.36	0.17	1.300	2.08	YES	0.41	0.19	0.21	1.91	0.00	96.0	YES	1.70	YES	94.3	NO	0.0	0.0	0.750	39.8	95.0	23.89	0.1895	0.12	0	0.0000	94.90
7/4/66	0.52	0.36	0.17	1.300	2.08	YES	0.41	0.19	0.21	1.91	0.00	94.9	YES	1.70	YES	93.2	NO	0.0	0.0	0.750	40.5	94.0	23.82	0.1895	0.12	0	0.0000	93.83
7/5/66	0.68	0.36	0.33	1.300	2.08	YES	0.53	0.19	0.34	1.75	0.00	93.8	YES	1.42	YES	92.4	NO	0.0	0.0	0.750	41.3	93.2	23.75	0.1895	0.12	1.09	0.7429	93.78
7/6/66	0.76	0.36	0.41	1.300	2.08	YES	0.59	0.19	0.40	1.67	0.00	93.8	YES	1.27	YES	92.5	NO	0.0	0.0	0.750	42.0	93.3	23.75	0.1895	0.12	0	0.0000	93.14
7/7/66	0.64	0.36	0.29	1.300	2.08	YES	0.50	0.19	0.31	1.79	0.00	93.1	YES	1.49	YES	91.7	NO	0.0	0.0	0.750	42.8	92.4	23.71	0.1895	0.12	0	0.0000	92.28
7/8/66	0.56	0.36	0.21	1.300	2.08	YES	0.44	0.19	0.24	1.87	0.00	92.3	YES	1.63	YES	90.6	NO	0.0	0.0	0.750	43.5	91.4	23.64	0.1895	0.12	0	0.0000	91.28
7/9/66	0.52	0.36	0.17	1.300	2.08	YES	0.41	0.19	0.21	1.91	0.00	91.3	YES	1.70	YES	89.6	NO	0.0	0.0	0.750	44.3	90.3	23.57	0.1895	0.12	0	0.0000	90.20
7/10/66	0.52	0.36	0.17	1.300	2.08	YES	0.41	0.19	0.21	1.91	0.00	90.2	YES	1.70	YES	88.5	NO	0.0	0.0	0.750	45.0	89.3	23.49	0.1895	0.12	0	0.0000	89.13
7/11/66	0.48	0.36	0.13	1.300	2.08	YES	0.38	0.19	0.18	1.95	0.00	89.1	YES	1.77	YES	87.4	NO	0.0	0.0	0.750	45.8	88.1	23.40	0.1895	0.12	0.04	0.0273	88.02
7/12/66	0.44	0.36	0.09	1.300	2.08	YES	0.34	0.19	0.15	1.99	0.00	88.0	YES	1.84	YES	86.2	NO	0.0	0.0	0.750	46.5	86.9	23.31	0.1895	0.12	0	0.0000	86.80

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity	1.60	mgd	Hull Creek Minimum Stream Flow-By:	0.355	mgd	Min Reservoir Level	12.6	ft	Medford Quarry Pump Rate	0.750	MGD	`
Reservoir Volume	121.80	MG	Cranberry Branch Minimum Stream Flow-By:	0.194	mgd				Medford Quarry Max Annual Vol	176	MG	
Medford Quarry Start Setpoint	104	MG								234	days	
MQ Stop Set Point	116.0	MG										

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
7/13/66	0.44	0.36	0.09	1.300	2.08	YES	0.34	0.19	0.15	1.99	0.00	86.8	YES	1.84	YES	85.0	NO	0.0	0.0	0.750	47.3	85.7	23.20	0.1895	0.12	0	0.0000	85.59
7/14/66	0.40	0.36	0.05	1.300	2.08	YES	0.31	0.19	0.12	2.03	0.00	85.6	YES	1.92	YES	83.7	NO	0.0	0.0	0.750	48.0	84.4	23.09	0.1895	0.12	0.09	0.0613	84.37
7/15/66	0.48	0.36	0.13	1.300	2.08	YES	0.38	0.19	0.18	1.95	0.00	84.4	YES	1.77	YES	82.6	NO	0.0	0.0	0.750	48.8	83.3	22.98	0.1895	0.12	0.06	0.0409	83.27
7/16/66	0.44	0.36	0.09	1.300	2.08	YES	0.34	0.19	0.15	1.99	0.00	83.3	YES	1.84	YES	81.4	NO	0.0	0.0	0.750	49.5	82.2	22.87	0.1895	0.12	0	0.0000	82.05
7/17/66	0.40	0.36	0.05	1.300	2.08	YES	0.31	0.19	0.12	2.03	0.00	82.1	YES	1.92	YES	80.1	NO	0.0	0.0	0.750	50.3	80.9	22.74	0.1895	0.12	0	0.0000	80.77
7/18/66	0.40	0.36	0.05	1.300	2.08	YES	0.31	0.19	0.12	2.03	0.00	80.8	YES	1.92	YES	78.9	NO	0.0	0.0	0.750	51.0	79.6	22.61	0.1895	0.12	0	0.0000	79.49
7/19/66	0.39	0.36	0.03	1.300	2.08	YES	0.30	0.19	0.11	2.05	0.00	79.5	YES	1.94	YES	77.6	NO	0.0	0.0	0.750	51.8	78.3	22.47	0.1895	0.12	0	0.0000	78.19
7/20/66	0.36	0.36	0.00	1.300	2.08	YES	0.28	0.19	0.08	2.08	0.00	78.2	YES	1.99	YES	76.2	NO	0.0	0.0	0.750	52.5	76.9	22.32	0.1895	0.11	0	0.0000	76.83
7/21/66	0.34	0.36	0.00	1.300	2.08	YES	0.26	0.19	0.07	2.08	0.00	76.8	YES	2.01	YES	74.8	NO	0.0	0.0	0.750	53.3	75.6	22.16	0.1895	0.11	0	0.0000	75.45
7/22/66	0.34	0.36	0.00	1.300	2.08	YES	0.26	0.19	0.07	2.08	0.00	75.5	YES	2.01	YES	73.4	NO	0.0	0.0	0.750	54.0	74.2	22.00	0.1895	0.11	0	0.0000	74.08
7/23/66	0.32	0.36	0.00	1.300	2.08	YES	0.25	0.19	0.06	2.08	0.00	74.1	YES	2.02	YES	72.1	NO	0.0	0.0	0.750	54.8	72.8	21.82	0.1895	0.11	0	0.0000	72.69
7/24/66	0.33	0.36	0.00	1.300	2.08	YES	0.26	0.19	0.07	2.08	0.00	72.7	YES	2.01	YES	70.7	NO	0.0	0.0	0.750	55.5	71.4	21.65	0.1895	0.11	0	0.0000	71.32
7/25/66	0.34	0.36	0.00	1.300	2.08	YES	0.26	0.19	0.07	2.08	0.00	71.3	YES	2.01	YES	69.3	NO	0.0	0.0	0.750	56.3	70.1	21.46	0.1895	0.11	0	0.0000	69.95
7/26/66	0.32	0.36	0.00	1.300	2.08	YES	0.25	0.19	0.06	2.08	0.00	69.9	YES	2.02	YES	67.9	NO	0.0	0.0	0.750	57.0	68.7	21.27	0.1895	0.11	0	0.0000	68.57
7/27/66	0.31	0.36	0.00	1.300	2.08	YES	0.24	0.19	0.05	2.08	0.00	68.6	YES	2.03	YES	66.5	NO	0.0	0.0	0.750	57.8	67.3	21.08	0.1895	0.11	0.16	0.1091	67.28
7/28/66	0.34	0.36	0.00	1.300	2.08	YES	0.27	0.19	0.07	2.08	0.00	67.3	YES	2.01	YES	65.3	NO	0.0	0.0	0.750	58.5	66.0	20.89	0.1895	0.11	0.02	0.0136	65.93
7/29/66	0.44	0.36	0.09	1.300	2.08	YES	0.34	0.19	0.15	1.99	0.00	65.9	YES	1.84	YES	64.1	NO	0.0	0.0	0.750	59.3	64.8	20.69	0.1895	0.11	0.02	0.0136	64.74
7/30/66	0.39	0.36	0.04	1.300	2.08	YES	0.31	0.19	0.11	2.04	0.00	64.7	YES	1.93	YES	62.8	NO	0.0	0.0	0.750	60.0	63.6	20.51	0.1895	0.11	0	0.0000	63.46
7/31/66	0.38	0.36	0.03	1.300	2.08	YES	0.30	0.19	0.11	2.05	0.00	63.5	YES	1.94	YES	61.5	NO	0.0	0.0	0.750	60.8	62.3	20.30	0.1895	0.10	0	0.0000	62.16
8/1/66	0.34	0.36	0.00	1.243	1.99	YES	0.27	0.19	0.07	1.99	0.00	62.2	YES	1.92	YES	60.2	NO	0.0	0.0	0.750	61.5	61.0	20.09	0.1895	0.10	0	0.0000	60.89
8/2/66	0.30	0.36	0.00	1.243	1.99	YES	0.24	0.19	0.04	1.99	0.00	60.9	YES	1.95	YES	58.9	NO	0.0	0.0	0.750	62.3	59.7	19.89	0.1895	0.10	0	0.0000	59.59
8/3/66	0.32	0.36	0.00	1.243	1.99	YES	0.25	0.19	0.06	1.99	0.00	59.6	YES	1.93	YES	57.7	NO	0.0	0.0	0.750	63.0	58.4	19.67	0.1895	0.10	0	0.0000	58.31
8/4/66	0.30	0.36	0.00	1.243	1.99	YES	0.24	0.19	0.04	1.99	0.00	58.3	YES	1.95	YES	56.4	NO	0.0	0.0	0.750	63.8	57.1	19.44	0.1895	0.10	0.04	0.0273	57.04
8/5/66	0.37	0.36	0.01	1.243	1.99	YES	0.29	0.19	0.09	1.98	0.00	57.0	YES	1.88	YES	55.2	NO	0.0	0.0	0.750	64.5	55.9	19.22	0.1895	0.10	0.48	0.3272	56.14
8/6/66	0.40	0.36	0.05	1.243	1.99	YES	0.31	0.19	0.12	1.94	0.00	56.1	YES	1.83	YES	54.3	NO	0.0	0.0	0.750	65.3	55.1	19.06	0.1895	0.10	0	0.0000	54.96
8/7/66	0.34	0.36	0.00	1.243	1.99	YES	0.27	0.19	0.07	1.99	0.00	55.0	YES	1.91	YES	53.0	NO	0.0	0.0	0.750	66.0	53.8	18.84	0.1895	0.10	0	0.0000	53.70
8/8/66	0.34	0.36	0.00	1.243	1.99	YES	0.27	0.19	0.07	1.99	0.00	53.7	YES	1.92	YES	51.8	NO	0.0	0.0	0.750	66.8	52.5	18.61	0.1895	0.10	0	0.0000	52.44
8/9/66	0.32	0.36	0.00	1.243	1.99	YES	0.25	0.19	0.05	1.99	0.00	52.4	YES	1.94	YES	50.5	NO	0.0	0.0	0.750	67.5	51.3	18.37	0.1895	0.09	0.13	0.0886	51.24
8/10/66	0.39	0.36	0.03	1.243	1.99	YES	0.30	0.19	0.11	1.96	0.00	51.2	YES	1.85	YES	49.4	NO	0.0	0.0	0.750	68.3	50.1	18.14	0.1895	0.09	0	0.0000	50.05
8/11/66	0.38	0.36	0.03	1.243	1.99	YES	0.30	0.19	0.11	1.96	0.00	50.1	YES	1.85	YES	48.2	NO	0.0	0.0	0.750	69.0	49.0	17.90	0.1895	0.09	0.77	0.5248	49.38
8/12/66	0.52	0.36	0.17	1.243	1.99	YES	0.41	0.19	0.21	1.82	0.00	49.4	YES	1.61	YES	47.8	NO	0.0	0.0	0.750	69.8	48.5	17.77	0.1895	0.09	0	0.0000	48.43
8/13/66	0.36	0.36	0.01	1.243	1.99	YES	0.28	0.19	0.09	1.98	0.00	48.4	YES	1.89	YES	46.5	NO	0.0	0.0	0.750	70.5	47.3	17.57	0.1895	0.09	0	0.0000	47.20
8/14/66	0.36	0.36	0.00	1.243	1.99	YES	0.28	0.19	0.08	1.99	0.00	47.2	YES	1.90	YES	45.3	NO	0.0	0.0	0.750	71.3	46.0	17.32	0.1895	0.09	0.04	0.0273	45.99
8/15/66	0.44	0.36	0.09	1.243	1.99	YES	0.34	0.19	0.15	1.90	0.00	46.0	YES	1.75	YES	44.2	NO	0.0	0.0	0.750	72.0	45.0	17.07	0.1895	0.09	0.04	0.0273	44.92
8/16/66	0.44	0.36	0.09	1.243	1.99	YES	0.34	0.19	0.15	1.90	0.00	44.9	YES	1.75	YES	43.2	NO	0.0	0.0	0.750	72.8	43.9	16.84	0.1895	0.09	0.37	0.2522	44.08
8/17/66	0.39	0.36	0.03	1.243	1.99	YES	0.30	0.19	0.11	1.96	0.00	44.1	YES	1.85	YES	42.2	NO	0.0	0.0	0.750	73.5	43.0	16.66	0.1895	0.09	0	0.0000	42.90
8/18/66	0.32	0.36	0.00	1.243	1.99	YES	0.25	0.19	0.06	1.99	0.00	42.9	YES	1.93	YES	41.0	NO	0.0	0.0	0.750	74.3	41.7	16.40	0.1895	0.08	0	0.0000	41.63
8/19/66	0.28	0.36	0.00	1.243	1.99	YES	0.22	0.19	0.03	1.99	0.00	41.6	YES	1.96	YES	39.7	NO	0.0	0.0	0.750	75.0	40.4	16.12	0.1895	0.08	0	0.0000	40.34
8/20/66	0.25	0.36	0.00	1.243	1.99	YES	0.19	0.19	0.00	1.99	0.00	40.3	YES	1.99	YES	38.3	NO	0.0	0.0	0.750	75.8	39.1	15.82	0.1895	0.08	0	0.0000	39.02
8/21/66	0.24	0.36	0.00	1.243	1.99	YES	0.19	0.19	0.00	1.99	0.00	39.0	YES	1.99	YES	37.0	NO	0.0	0.0	0.750	76.5	37.8	15.52	0.1895	0.08	0	0.0000	37.70
8/22/66	0.27	0.36	0.00	1.243	1.99	YES	0.21	0.19	0.02	1.99	0.00	37.7	YES	1.97	YES	35.7	NO	0.0	0.0	0.750	77.3	36.5	15.21	0.1895	0.08	0	0.0000	36.40
8/23/66	0.26	0.36	0.00	1.243	1.99	YES	0.21	0.19	0.01	1.99	0.00	36.4	YES	1.98	YES	34.4	NO	0.0	0.0	0.750	78.0	35.2	14.90	0.1895	0.08	0	0.0000	35.09
8/24/66	0.26	0.36	0.00	1.243	1.99	YES	0.20	0.19	0.01	1.99	0.00	35.1	YES	1.98	YES	33.1	NO	0.0	0.0	0.750	78.8	33.9	14.58	0.1895	0.08	0	0.0000	33.78
8/25/66	0.22	0.36	0.00	1.243	1.99	YES	0.18	0.19	0.00	1.99	0.00	33.8	YES	1.99	YES	31.8	NO	0.0	0.0	0.750	79.5	32.5	14.26	0.1895	0.07	0	0.0000	32.47
8/26/66	0.22	0.36	0.00	1.243	1.99	YES	0.18	0.19	0.00	1.99	0.00	32.5	YES	1.99	YES	30.5	NO	0.0	0.0	0.750	80.3	31.2	13.93	0.1895	0.07	0	0.0000	31.16
8/27/66	0.21	0.36	0.00	1.243	1.99	YES	0.16	0.19	0.00	1.99	0.00	31.2	YES	1.99	YES	29.2	NO	0.0	0.0	0.750	81.0	29.9	13.60	0.1895	0.07	0	0.0000	29.85
8/28/66	0.21	0.36	0.00	1.243	1.99	YES	0.16	0.19	0.00	1.99	0.00	29.8	YES	1.99	YES	27.9	NO	0.0	0.0	0.750	81.8	28.6	13.26	0.1895	0.07	0	0.0000	28.54
8/29/66	0.20	0.36	0.00	1.243	1.99	YES	0.15	0.19	0.00	1.99	0.00	28.5	YES	1.99	YES	26.6	NO	0.0	0.0	0.750	82.5	27.3	12.92	0.1895	0.07	0	0.0000	27.24
8/30/66	0.20	0.36	0.00	1.243	1.99	YES	0.15	0.19	0.00	1.99	0.00	27.2	YES	1.99	YES	25.2	NO	0.0	0.0	0.750	83.3	26.0	12.57	0.1895	0.06	0	0.0000	25.93
8/31/66	0.20	0.36	0.00	1.243	1.99	YES	0.15	0.19	0.00	1.99	0.00	25.9	YES	1.99	YES	23.9	NO	0.0	0.0	0.750	84.0	24.7	12.22	0.1895	0.06	0	0.0000	24.63
9/1/66	0.18	0.36	0.00	1.017	1.63	YES	0.14	0.19	0.00	1.63	0.00	24.6	YES	1.63	YES	23.0	NO	0.0	0.0	0.750	84.8	23.8	11.86	0.1895	0.06	0	0.0000	23.69
9/2/66	0.16	0.36	0.00	1.017	1.63	YES	0.13	0.19	0.00	1.63	0.00	23.7	YES	1.63	YES	22.1	NO	0.0	0.0	0.750	85.5	22.8	11.60	0.1895	0.06	0	0.0000	22.75
9/3/66	0.15	0.36	0.00	1.017	1.63	YES	0.12	0.19	0.00	1.63	0.00	22.8	YES	1.63	YES	21.1	NO	0.0	0.0	0.750	86.3	21.9	11.34	0.1895	0.06	0	0.0000	21.82
9/4/66	0.18	0.36	0.00	1.017	1.63	YES	0.14	0.19	0.00	1.63	0.00	21.8	YES	1.63	YES	20.2	NO	0.0	0.0	0.750	87.0	20.9	11.08	0.1895	0.06	0	0.0000	20.88
9/5/66	0.23	0.36	0.00	1.017	1.63	YES	0.18	0.19	0.00	1.63	0.00	20.9	YES	1.63	YES	19.3	NO	0.0	0.0	0.750	87.8	20.0	10.81	0.1895	0.06	0	0.0000	19.95
9/6/66	0.22	0.36	0.00	1.017	1.63	YES	0.17	0.19	0.00	1.63	0.00	19.9	YES	1.63	YES	18.3	NO	0.0	0.0	0.750	88.5	19.1	10.54	0.1895	0.05	0	0.0000	19.02
9/7/66	0.18	0.36	0.00	1.017	1.63	YES	0.14	0.19	0.00	1.63	0.00	19.0	YES	1.63	YES	17.4	NO	0.0	0.0	0.750	89.3	18.1	10.27	0.1895	0.05	0	0.0000	18.09
9/8/66	0.16	0.36	0.00	1.017	1.63	YES	0.13	0.19	0.00	1.63	0.00	18.1	YES	1.63	YES	16.5	NO	0.0	0.0	0.750	90.0	17.2	10.00	0.1895	0.05	0	0.0000	17.16
9/9/66	0.16	0.36	0.00	1.017	1.63	YES	0.13	0.19	0.00	1.63	0.00	17.2	YES	1.63	YES	15.5	NO	0.0	0.0	0.750	90.8	16.3	9.72	0.1895	0.05	0	0.0000	16.23
9/10/66	0.12	0.36	0.00	1.017	1.63	YES	0.09	0.19	0.00	1.63	0.00	16.2	YES	1.63	YES	14.6	NO	0.0	0.0	0.750	91.5	15.4	9.44	0.1895	0.05	0	0.0000	15.30
9/11/66	0.14	0.36	0.00	1.017	1.63	YES	0.11	0.19	0.00	1.63	0.00	15.3	YES	1.63	YES	13.7	NO	0.0	0.0	0.750	92.3	14.4	9.16	0.1895	0.05	0	0.0000	14.38
9/12/66	0.10	0.36	0.00	1.017	1.63	YES	0.08	0.19	0.00	1.63	0.00	14.4	YES	1.63	YES	12.7	NO	0.0	0.0	0.750	93.0	13.5	8.88	0.1895	0.05	0	0.0000	13.45
9/13/66	0.25	0.36	0.00	1.017	1.63	YES	0.19	0.19	0.00	1.63	0.00	13.5	YES	1.63	YES	11.8	NO	0.0	0.0	0.750	93.8	12.6	8.60	0.1895	0.04	0.22	0.1499	12.68
9/14/66	3.53	0.36	3.17	1.017	1.63	NO	2.75	0.19	2.56	0.00	2.56	12.7	NO	0.00	YES	12.7	YES	2.6	2.6	0.750	94.5	16.0	8.36	0.1895	0.04	3.82	2.6036	18.55
9/15/66	1.84	0.36	1.49	1.017	1.63	YES	1.44	0.19	1.24	0.14	1.10	18.5	NO	0.00	YES	18.5	YES	1.1	1.1	0.750	95.3	20.4	10.13	0.1895	0.05	0.17	0.1159	20.47
9/16/66	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	20.5	YES	0.89	YES	19.6	NO	0.0	0.0	0.750	96.0	20.3	10.69	0.1895	0.06	0	0.0000	20.27
9/17/66	0.56	0.36	0.21	1.017	1.63	YES	0.44	0.19	0.24	1.42	0.00	20.3	YES	1.18	YES	19.1	NO	0.0	0.0	0.750	96.8	19.8	10.63	0.1895	0.05	0	0.0000	19.79
9/18/66	0.48	0.36	0.13	1.017	1.63	YES	0.38	0.19	0.18	1.50	0.00	19.8	YES	1.32	YES	18.5	NO	0.0	0.0	0.750	97.5	19.2	10.49	0.1895	0.05	0	0.0000	19.16
9/19/66	0.48	0.36	0.13	1.017	1.63	YES	0.38	0.19	0.18	1.50	0.00	19.2	YES	1.32	YES	17.8	NO	0.0	0.0	0.750	98.3	18.6	10.31	0.1895	0.05	0.2	0.1363	18.67
9/20/66	0.88	0.36	0.53	1.017	1.63	YES	0.69	0.19	0.49	1.10	0.00	18.7	YES	0.61	YES	18.1	NO	0.0	0.0	0.750	99.0	18.8	10.17	0.1895	0.05	1.75	1.1928	19.96
9/21/66	1.76	0.36	1.41	1.017	1.63	YES	1.38	0.19	1.18	0.22	0.96	20.0	NO	0.00	YES	20.0	YES	1.0	1.0	0.750	99.8	21.7	10.54	0.1895	0.05	1.15	0.7838	22.40
9/22/66	1.04	0.36	0.69	1.017	1.63	YES	0.81	0.19	0.62	0.94	0.00	22.4	YES	0.32	YES	22.1	NO	0.0	0.0	0.750	100.5	22.8	11.24	0.1895	0.06	0.19	0.1295	22.90
9/23/66	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	22.9	YES	0.75	YES	22.1	NO	0.0	0.0	0.750	101.3	22.9	11.38	0.1895	0.06	0	0.0000	22.84
9/24/66	0.64	0.36	0.29	1.017	1.63	YES	0.50	0.19	0.31	1.34	0.00	22.8	YES	1.04	YES	21.8	NO	0.0	0.0	0.750	102.0	22.6	11.37	0.1895	0.06	0	0.0000	22.50
9/25/66	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	22.5	YES	1.11	YES	21.4	NO	0.0	0.0	0.750	102.8	22.1	11.27	0.1895	0.06	0.05	0.0341	22.12
9/26/66	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	22.1	YES	1.11	YES	21.0	NO	0.0	0.0	0.750	103.5	21.8	11.16	0.1895	0.06	0	0.0000	21.70
9/27/66	0.60	0.36	0.25	1.017	1.63	YES	0.47	0.19	0.27	1.38	0.00	21.7	YES	1.11	YES	20.6	NO	0.0	0.0	0.750	104.3	21.3	11.04	0.1895	0.06	0.27	0.1840	21.47
9/28/66	0.68	0.36	0.33	1.017	1.63	YES	0.53	0.19	0.34	1.30	0.00	21.5	YES	0.96	YES	20.5	NO	0.0	0.0	0.750	105.0	21.3	10.98	0.1895	0.06	0.29	0.1977	21.40
9/29/66	0.84	0.36	0.49	1.017	1.63	YES	0.66	0.19	0.46	1.14	0.00	21.4	YES	0.68	YES	20.7	NO	0.0	0.0	0.750	105.8	21.5	10.96	0.1895	0.06	0.4	0.2726	21.69
9/30/66	0.88	0.36	0.53	1.017	1.63	YES	0.69	0.19	0.49	1.10	0.00	21.7	YES	0.61	YES	21.1	NO	0.0	0.0	0.750	106.5	21.8	11.04	0.1895	0.06	0	0.0000	21.77
10/1/66	1.08	0.36	0.73	1.017	1.63	YES	0.84	0.19	0.65	0.90	0.00	21.8	YES	0.25	YES	21.5	NO	0.0	0.0	0.750	107.3	22.3	11.06	0.1895	0.06	0.94	0.6407	22.86
10/2/66	1.52	0.36	1.17	1.017	1.63	YES	1.19	0.19	0.99	0.46	0.53	22.9	NO	0.00	YES	22.9	YES	0.5	0.5	0.750	108.0	24.1	11.37	0.1895	0.06	0	0.0000	24.08
10/3/66	0.96	0.36	0.61	1.017	1.63	YES	0.75	0.19	0.56	1.02	0.00	24.1	YES	0.46	YES	23.6	NO	0.0	0.0	0.750	108.8	24.4	11.71	0.1895	0.06	0	0.0000	24.31
10/4/66	0.84	0.36	0.49	1.017	1.63	YES	0.66	0.19	0.46	1.14	0.00	24.3	YES	0.68	YES	23.6	NO	0.0	0.0	0.750	109.5	24.4	11.78	0.1895	0.06	0	0.0000	24.32

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity	1.60	mgd	Hull Creek Minimum Stream Flow-By:	0.355	mgd	Min Reservoir Level	12.6	ft	Medford Quarry Pump Rate	0.750	MGD	`	MQ Stop Set Point	116.0 MG
Reservoir Volume	121.80	MG	Cranberry Branch Minimum Stream Flow-By:	0.194	mgd				Medford Quarry Max Annual Vol	176	MG			
Medford Quarry Start Setpoint	104	MG								234	days			

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
10/5/66	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	24.3	YES	0.75	YES	23.6	NO	0.0	0.0	0.750	110.3	24.3	11.78	0.1895	0.06	0.19	0.1295	24.39
10/6/66	0.76	0.36	0.41	1.017	1.63	YES	0.59	0.19	0.40	1.22	0.00	24.4	YES	0.82	YES	23.6	NO	0.0	0.0	0.750	111.0	24.3	11.80	0.1895	0.06	0	0.0000	24.26
10/7/66	0.76	0.36	0.41	1.017	1.63	YES	0.59	0.19	0.40	1.22	0.00	24.3	YES	0.82	YES	23.4	NO	0.0	0.0	0.750	111.8	24.2	11.76	0.1895	0.06	0	0.0000	24.13
10/8/66	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	24.1	YES	0.89	YES	23.2	NO	0.0	0.0	0.750	112.5	24.0	11.72	0.1895	0.06	0	0.0000	23.92
10/9/66	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	23.9	YES	0.89	YES	23.0	NO	0.0	0.0	0.750	113.3	23.8	11.67	0.1895	0.06	0	0.0000	23.72
10/10/66	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	23.7	YES	0.89	YES	22.8	NO	0.0	0.0	0.750	114.0	23.6	11.61	0.1895	0.06	0	0.0000	23.52
10/11/66	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	23.5	YES	0.89	YES	22.6	NO	0.0	0.0	0.750	114.8	23.4	11.56	0.1895	0.06	0	0.0000	23.32
10/12/66	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	23.3	YES	0.89	YES	22.4	NO	0.0	0.0	0.750	115.5	23.2	11.50	0.1895	0.06	0	0.0000	23.12
10/13/66	0.68	0.36	0.33	1.017	1.63	YES	0.53	0.19	0.34	1.30	0.00	23.1	YES	0.96	YES	22.2	NO	0.0	0.0	0.750	116.3	22.9	11.44	0.1895	0.06	0	0.0000	22.84
10/14/66	0.72	0.36	0.37	1.017	1.63	YES	0.56	0.19	0.37	1.26	0.00	22.8	YES	0.89	YES	22.0	NO	0.0	0.0	0.750	117.0	22.7	11.37	0.1895	0.06	0	0.0000	22.64
10/15/66	0.76	0.36	0.41	1.017	1.63	YES	0.59	0.19	0.40	1.22	0.00	22.6	YES	0.82	YES	21.8	NO	0.0	0.0	0.750	117.8	22.6	11.31	0.1895	0.06	0.01	0.0068	22.52
10/16/66	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	22.5	YES	0.75	YES	21.8	NO	0.0	0.0	0.750	118.5	22.5	11.28	0.1895	0.06	0.18	0.1227	22.59
10/17/66	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	22.6	YES	0.75	YES	21.8	NO	0.0	0.0	0.750	119.3	22.6	11.29	0.1895	0.06	0	0.0000	22.53
10/18/66	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	22.5	YES	0.75	YES	21.8	NO	0.0	0.0	0.750	120.0	22.5	11.28	0.1895	0.06	0.9	0.6134	23.09
10/19/66	3.21	0.36	2.85	1.017	1.63	NO	2.50	0.19	2.31	0.00	2.31	23.1	NO	0.00	YES	23.1	YES	2.3	2.3	0.750	120.8	26.1	11.43	0.1895	0.06	2.58	1.7585	27.84
10/20/66	1.72	0.36	1.37	1.017	1.63	YES	1.34	0.19	1.15	0.26	0.89	27.8	NO	0.00	YES	27.8	YES	0.9	0.9	0.750	121.5	29.5	12.73	0.1895	0.07	0	0.0000	29.42
10/21/66	1.12	0.36	0.77	1.017	1.63	YES	0.88	0.19	0.68	0.86	0.00	29.4	YES	0.18	YES	29.2	NO	0.0	0.0	0.750	122.3	30.0	13.15	0.1895	0.07	0	0.0000	29.92
10/22/66	1.00	0.36	0.65	1.017	1.63	YES	0.78	0.19	0.59	0.98	0.00	29.9	YES	0.39	YES	29.5	NO	0.0	0.0	0.750	123.0	30.3	13.28	0.1895	0.07	0	0.0000	30.21
10/23/66	0.92	0.36	0.57	1.017	1.63	YES	0.72	0.19	0.52	1.06	0.00	30.2	YES	0.54	YES	29.7	NO	0.0	0.0	0.750	123.8	30.4	13.36	0.1895	0.07	0	0.0000	30.36
10/24/66	0.88	0.36	0.53	1.017	1.63	YES	0.69	0.19	0.49	1.10	0.00	30.4	YES	0.61	YES	29.7	NO	0.0	0.0	0.750	124.5	30.5	13.39	0.1895	0.07	0	0.0000	30.43
10/25/66	0.84	0.36	0.49	1.017	1.63	YES	0.66	0.19	0.46	1.14	0.00	30.4	YES	0.68	YES	29.8	NO	0.0	0.0	0.750	125.3	30.5	13.41	0.1895	0.07	0	0.0000	30.43
10/26/66	0.84	0.36	0.49	1.017	1.63	YES	0.66	0.19	0.46	1.14	0.00	30.4	YES	0.68	YES	29.8	NO	0.0	0.0	0.750	126.0	30.5	13.41	0.1895	0.07	0	0.0000	30.44
10/27/66	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	30.4	YES	0.75	YES	29.7	NO	0.0	0.0	0.750	126.8	30.4	13.41	0.1895	0.07	0	0.0000	30.37
10/28/66	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	30.4	YES	0.75	YES	29.6	NO	0.0	0.0	0.750	127.5	30.4	13.40	0.1895	0.07	0	0.0000	30.30
10/29/66	0.80	0.36	0.45	1.017	1.63	YES	0.63	0.19	0.43	1.18	0.00	30.3	YES	0.75	YES	29.6	NO	0.0	0.0	0.750	128.3	30.3	13.38	0.1895	0.07	0	0.0000	30.23
10/30/66	0.84	0.36	0.49	1.017	1.63	YES	0.66	0.19	0.46	1.14	0.00	30.2	YES	0.68	YES	29.6	NO	0.0	0.0	0.750	129.0	30.3	13.36	0.1895	0.07	0	0.0000	30.23
10/31/66	0.84	0.36	0.49	1.017	1.63	YES	0.66	0.19	0.46	1.14	0.00	30.2	YES	0.68	YES	29.6	NO	0.0	0.0	0.750	129.8	30.3	13.36	0.1895	0.07	0	0.0000	30.24
11/1/66	0.88	0.36	0.53	0.890	1.42	YES	0.69	0.19	0.49	0.90	0.00	30.2	YES	0.40	YES	29.8	NO	0.0	0.0	0.750	130.5	30.6	13.36	0.0000	0.00	0	0.0000	30.58
11/2/66	1.12	0.36	0.77	0.890	1.42	YES	0.88	0.19	0.68	0.66	0.02	30.6	NO	0.00	YES	30.6	YES	0.0	0.0	0.750	131.3	31.4	13.45	0.0000	0.00	1.42	0.9678	32.33
11/3/66	2.20	0.36	1.85	0.890	1.42	NO	1.72	0.19	1.52	0.00	1.52	32.3	NO	0.00	YES	32.3	YES	1.5	1.5	0.750	132.0	34.6	13.90	0.0000	0.00	0	0.0000	34.60
11/4/66	1.12	0.36	0.77	0.890	1.42	YES	0.88	0.19	0.68	0.66	0.02	34.6	NO	0.00	YES	34.6	YES	0.0	0.0	0.750	132.8	35.4	14.46	0.0000	0.00	0	0.0000	35.38
11/5/66	1.00	0.36	0.65	0.890	1.42	YES	0.78	0.19	0.59	0.78	0.00	35.4	YES	0.19	YES	35.2	NO	0.0	0.0	0.750	133.5	35.9	14.65	0.0000	0.00	0	0.0000	35.94
11/6/66	0.92	0.36	0.57	0.890	1.42	YES	0.72	0.19	0.52	0.86	0.00	35.9	YES	0.33	YES	35.6	NO	0.0	0.0	0.750	134.3	36.4	14.79	0.0000	0.00	0	0.0000	36.36
11/7/66	0.88	0.36	0.53	0.890	1.42	YES	0.69	0.19	0.49	0.90	0.00	36.4	YES	0.40	YES	36.0	NO	0.0	0.0	0.750	135.0	36.7	14.89	0.0000	0.00	0	0.0000	36.70
11/8/66	0.88	0.36	0.53	0.890	1.42	YES	0.69	0.19	0.49	0.90	0.00	36.7	YES	0.40	YES	36.3	NO	0.0	0.0	0.750	135.8	37.0	14.97	0.0000	0.00	0.01	0.0068	37.06
11/9/66	0.88	0.36	0.53	0.890	1.42	YES	0.69	0.19	0.49	0.90	0.00	37.1	YES	0.40	YES	36.7	NO	0.0	0.0	0.750	136.5	37.4	15.06	0.0000	0.00	0	0.0000	37.40
11/10/66	0.92	0.36	0.57	0.890	1.42	YES	0.72	0.19	0.52	0.86	0.00	37.4	YES	0.33	YES	37.1	NO	0.0	0.0	0.750	137.3	37.8	15.14	0.0000	0.00	0.27	0.1840	38.00
11/11/66	1.04	0.36	0.69	0.890	1.42	YES	0.81	0.19	0.62	0.74	0.00	38.0	YES	0.12	YES	37.9	NO	0.0	0.0	0.750	138.0	38.6	15.28	0.0000	0.00	0.02	0.0136	38.65
11/12/66	0.96	0.36	0.61	0.890	1.42	YES	0.75	0.19	0.56	0.82	0.00	38.6	YES	0.26	YES	38.4	NO	0.0	0.0	0.750	138.8	39.1	15.43	0.0000	0.00	0.06	0.0409	39.18
11/13/66	0.92	0.36	0.57	0.890	1.42	YES	0.72	0.19	0.52	0.86	0.00	39.2	YES	0.33	YES	38.8	NO	0.0	0.0	0.750	139.5	39.6	15.56	0.0000	0.00	0	0.0000	39.60
11/14/66	0.88	0.36	0.53	0.890	1.42	YES	0.69	0.19	0.49	0.90	0.00	39.6	YES	0.40	YES	39.2	NO	0.0	0.0	0.750	140.3	39.9	15.65	0.0000	0.00	0	0.0000	39.94
11/15/66	0.88	0.36	0.53	0.890	1.42	YES	0.69	0.19	0.49	0.90	0.00	39.9	YES	0.40	YES	39.5	NO	0.0	0.0	0.750	141.0	40.3	15.73	0.0000	0.00	0	0.0000	40.29
11/16/66	0.84	0.36	0.49	0.890	1.42	YES	0.66	0.19	0.46	0.94	0.00	40.3	YES	0.47	YES	39.8	NO	0.0	0.0	0.750	141.8	40.6	15.81	0.0000	0.00	0	0.0000	40.57
11/17/66	0.84	0.36	0.49	0.890	1.42	YES	0.66	0.19	0.46	0.94	0.00	40.6	YES	0.47	YES	40.1	NO	0.0	0.0	0.750	142.5	40.8	15.88	0.0000	0.00	0	0.0000	40.84
11/18/66	0.84	0.36	0.49	0.890	1.42	YES	0.66	0.19	0.46	0.94	0.00	40.8	YES	0.47	YES	40.4	NO	0.0	0.0	0.750	143.3	41.1	15.94	0.0000	0.00	0.01	0.0068	41.12
11/19/66	0.84	0.36	0.49	0.890	1.42	YES	0.66	0.19	0.46	0.94	0.00	41.1	YES	0.47	YES	40.6	NO	0.0	0.0	0.750	144.0	41.4	16.00	0.0000	0.00	0	0.0000	41.40
11/20/66	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	41.4	YES	0.55	YES	40.9	NO	0.0	0.0	0.750	144.8	41.6	16.06	0.0000	0.00	0	0.0000	41.60
11/21/66	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	41.6	YES	0.55	YES	41.1	NO	0.0	0.0	0.750	145.5	41.8	16.11	0.0000	0.00	0	0.0000	41.81
11/22/66	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	41.8	YES	0.55	YES	41.3	NO	0.0	0.0	0.750	146.3	42.0	16.16	0.0000	0.00	0	0.0000	42.01
11/23/66	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	42.0	YES	0.55	YES	41.5	NO	0.0	0.0	0.750	147.0	42.2	16.20	0.0000	0.00	0	0.0000	42.22
11/24/66	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	42.2	YES	0.55	YES	41.7	NO	0.0	0.0	0.750	147.8	42.4	16.25	0.0000	0.00	0	0.0000	42.42
11/25/66	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	42.4	YES	0.55	YES	41.9	NO	0.0	0.0	0.750	148.5	42.6	16.29	0.0000	0.00	0.01	0.0068	42.63
11/26/66	0.88	0.36	0.53	0.890	1.42	YES	0.69	0.19	0.49	0.90	0.00	42.6	YES	0.40	YES	42.2	NO	0.0	0.0	0.750	149.3	43.0	16.34	0.0000	0.00	0.12	0.0818	43.06
11/27/66	0.80	0.36	0.45	0.890	1.42	YES	0.63	0.19	0.43	0.98	0.00	43.1	YES	0.55	YES	42.5	NO	0.0	0.0	0.750	150.0	43.3	16.43	0.0000	0.00	0	0.0000	43.26
11/28/66	2.24	0.36	1.89	0.890	1.42	NO	1.75	0.19	1.56	0.00	1.56	43.3	NO	0.00	YES	43.3	YES	1.6	1.6	0.750	150.8	45.6	16.48	0.0000	0.00	0.86	0.5862	46.16
11/29/66	2.12	0.36	1.77	0.890	1.42	NO	1.66	0.19	1.46	0.00	1.46	46.2	NO	0.00	YES	46.2	YES	1.5	1.5	0.750	151.5	48.4	17.10	0.0000	0.00	0	0.0000	48.37
11/30/66	1.36	0.36	1.01	0.890	1.42	YES	1.06	0.19	0.87	0.42	0.45	48.4	NO	0.00	YES	48.4	YES	0.5	0.5	0.750	152.3	49.6	17.56	0.0000	0.00	0	0.0000	49.57
12/1/66	1.16	0.36	0.81	0.814	1.30	YES	0.91	0.19	0.71	0.49	0.22	49.6	NO	0.00	YES	49.6	YES	0.2	0.2	0.750	153.0	50.5	17.80	0.0000	0.00	0	0.0000	50.54
12/2/66	1.08	0.36	0.73	0.814	1.30	YES	0.84	0.19	0.65	0.57	0.08	50.5	NO	0.00	YES	50.5	YES	0.1	0.1	0.750	153.8	51.4	18.00	0.0000	0.00	0	0.0000	51.36
12/3/66	0.96	0.36	0.61	0.814	1.30	YES	0.75	0.19	0.56	0.69	0.00	51.4	YES	0.14	YES	51.2	NO	0.0	0.0	0.750	154.5	52.0	18.16	0.0000	0.00	0	0.0000	51.98
12/4/66	0.88	0.36	0.53	0.814	1.30	YES	0.69	0.19	0.49	0.77	0.00	52.0	YES	0.28	YES	51.7	NO	0.0	0.0	0.750	155.3	52.4	18.28	0.0000	0.00	0	0.0000	52.44
12/5/66	0.92	0.36	0.57	0.814	1.30	YES	0.72	0.19	0.52	0.73	0.00	52.4	YES	0.21	YES	52.2	NO	0.0	0.0	0.750	156.0	53.0	18.37	0.0000	0.00	0.01	0.0068	52.99
12/6/66	0.96	0.36	0.61	0.814	1.30	YES	0.75	0.19	0.56	0.69	0.00	53.0	YES	0.14	YES	52.9	NO	0.0	0.0	0.750	156.8	53.6	18.47	0.0000	0.00	0	0.0000	53.60
12/7/66	0.96	0.36	0.61	0.814	1.30	YES	0.75	0.19	0.56	0.69	0.00	53.6	YES	0.14	YES	53.5	NO	0.0	0.0	0.750	157.5	54.2	18.59	0.0000	0.00	0	0.0000	54.21
12/8/66	0.92	0.36	0.57	0.814	1.30	YES	0.72	0.19	0.52	0.73	0.00	54.2	YES	0.21	YES	54.0	NO	0.0	0.0	0.750	158.3	54.8	18.70	0.0000	0.00	0	0.0000	54.75
12/9/66	0.88	0.36	0.53	0.814	1.30	YES	0.69	0.19	0.49	0.77	0.00	54.8	YES	0.28	YES	54.5	NO	0.0	0.0	0.750	159.0	55.2	18.81	0.0000	0.00	0	0.0000	55.22
12/10/66	0.92	0.36	0.57	0.814	1.30	YES	0.72	0.19	0.52	0.73	0.00	55.2	YES	0.21	YES	55.0	NO	0.0	0.0	0.750	159.8	55.8	18.89	0.0000	0.00	0.42	0.2863	56.05
12/11/66	1.16	0.36	0.81	0.814	1.30	YES	0.91	0.19	0.71	0.49	0.22	56.0	NO	0.00	YES	56.0	YES	0.2	0.2	0.750	160.5	57.0	19.04	0.0000	0.00	0.02	0.0136	57.03
12/12/66	1.00	0.36	0.65	0.814	1.30	YES	0.78	0.19	0.59	0.65	0.00	57.0	YES	0.07	YES	57.0	NO	0.0	0.0	0.750	161.3	57.7	19.22	0.0000	0.00	0	0.0000	57.71
12/13/66	1.00	0.36	0.65	0.814	1.30	YES	0.78	0.19	0.59	0.65	0.00	57.7	YES	0.07	YES	57.6	NO	0.0	0.0	0.750	162.0	58.4	19.34	0.0000	0.00	1.02	0.6952	59.09
12/14/66	1.08	0.36	0.73	0.814	1.30	YES	0.84	0.19	0.65	0.57	0.08	59.1	NO	0.00	YES	59.1	YES	0.1	0.1	0.750	162.8	59.9	19.58	0.0000	0.00	0.02	0.0136	59.93
12/15/66	1.08	0.36	0.73	0.814	1.30	YES	0.84	0.19	0.65	0.57	0.08	59.9	NO	0.00	YES	59.9	YES	0.1	0.1	0.750	163.5	60.8	19.72	0.0000	0.00	0	0.0000	60.76
12/16/66	1.00	0.36	0.65	0.814	1.30	YES	0.78	0.19	0.59	0.65	0.00	60.8	YES	0.07	YES	60.7	NO	0.0	0.0	0.750	164.3	61.4	19.86	0.0000	0.00	0	0.0000	61.44
12/17/66	1.00	0.36	0.65	0.814	1.30	YES	0.78	0.19	0.59	0.65	0.00	61.4	YES	0.07	YES	61.4	NO	0.0	0.0	0.750	165.0	62.1	19.98	0.0000	0.00	0	0.0000	62.12
12/18/66	1.08	0.36	0.73	0.814	1.30	YES	0.84	0.19	0.65	0.57	0.08	62.1	NO	0.00	YES	62.1	YES	0.1	0.1	0.750	165.8	62.9	20.09	0.0000	0.00	0	0.0000	62.95
12/19/66	1.16	0.36	0.81	0.814	1.30	YES	0.91	0.19	0.71	0.49	0.22	62.9	NO	0.00	YES	62.9	YES	0.2	0.2	0.750	166.5	63.9	20.22	0.0000	0.00	0	0.0000	63.91
12/20/66	1.12	0.36	0.77	0.814	1.30	YES	0.88	0.19	0.68	0.53	0.15	63.9	NO	0.00	YES	63.9	YES	0.1	0.1	0.750	167.3	64.8	20.38	0.0000	0.00	0.3	0.2045	65.02
12/21/66	1.08	0.36	0.73	0.814	1.30	YES	0.84	0.19	0.65	0.57	0.08	65.0	NO	0.00	YES	65.0	YES	0.1	0.1	0.750	168.0	65.8	20.55	0.0000	0.00	0	0.0000	65.84
12/22/66	1.04	0.36	0.69	0.814	1.30	YES	0.81	0.19	0.62	0.61	0.00	65.8	NO	0.00	YES	65.8	YES	0.0	0.0	0.750	168.8	66.6	20.67	0.0000	0.00	0	0.0000	66.60
12/23/66	1.00	0.36	0.65	0.814	1.30	YES	0.78	0.19	0.59	0.65	0.00	66.6	YES	0.07	YES	66.5	NO	0.0	0.0	0.750	169.5	67.3	20.79	0.0000	0.00	0.01	0.0068	67.28
12/24/66	0.88	0.36	0.53	0.814	1.30	YES	0.69	0.19	0.49	0.77	0.00	67.3	YES	0.28	YES	67.0	NO	0.0	0.0	0.750	170.3	67.8	20.89	0.0000	0.00	0.79	0.5384	68.29
12/25/66	1.20	0.36	0.85	0.814	1.30	YES	0.94	0.19	0.74	0.45	0.29	68.3	NO	0.00	YES	68.3	YES	0.3	0.3	0.750	171.0	69.3	21.04	0.0000	0.00	0	0.0000	69.33
12/26/66	1.28	0.36	0.93	0.814	1.30	YES	1.00	0.19	0.81	0.37	0.43	69.3	NO	0.00	YES	69.3	YES	0.4	0.4	0.750	171.8	70.5	21.19	0.0000	0.00	0	0.0000	70.51
12/27/66	1.16	0.36	0.81	0.814	1.30	YES	0.91	0.19	0.71	0.49	0.22	70.5	NO	0.00	YES	70.5	YES	0.2	0.2	0.750	172.5	71.5	21.35	0.0000	0.00	0	0.0000	71.48

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity	1.60	mgd	Hull Creek Minimum Stream Flow-By:	0.355	mgd	Min Reservoir Level	12.6	ft	Medford Quarry Pump Rate	0.750	MGD
Reservoir Volume	121.80	MG	Cranberry Branch Minimum Stream Flow-By:	0.194	mgd				Medford Quarry Max Annual Vol	176	MG
Medford Quarry Start Setpoint	104	MG								234	days
MQ Stop Set Point	116.0	MG									

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
12/28/66	1.00	0.36	0.65	0.814	1.30	YES	0.78	0.19	0.59	0.65	0.00	71.5	YES	0.07	YES	71.4	NO	0.0	0.0	0.750	173.3	72.2	21.48	0.0000	0.00	0.6	0.4089	72.57
12/29/66	2.49	0.36	2.13	0.814	1.30	NO	1.94	0.19	1.74	0.00	1.74	72.6	NO	0.00	YES	72.6	YES	1.7	1.7	0.750	174.0	75.1	21.63	0.0000	0.00	0.34	0.2317	75.30
12/30/66	2.04	0.36	1.69	0.814	1.30	NO	1.59	0.19	1.40	0.00	1.40	75.3	NO	0.00	YES	75.3	YES	1.4	1.4	0.750	174.8	77.4	21.98	0.0000	0.00	0	0.0000	77.45
12/31/66	1.68	0.36	1.33	0.814	1.30	NO	1.31	0.19	1.12	0.00	1.12	77.4	NO	0.00	YES	77.4	YES	1.1	1.1	0.750	175.5	79.3	22.24	0.0000	0.00	0	0.0000	79.32
1/1/67	1.44	0.36	1.09	0.814	1.30	YES	1.13	0.19	0.93	0.21	0.72	79.3	NO	0.00	YES	79.3	YES	0.7	0.7	0.750	0.8	80.8	22.45	0.0000	0.00	0	0.0000	80.79
1/2/67	1.36	0.36	1.01	0.814	1.30	YES	1.06	0.19	0.87	0.29	0.57	80.8	NO	0.00	YES	80.8	YES	0.6	0.6	0.750	1.5	82.1	22.61	0.0000	0.00	0	0.0000	82.11
1/3/67	1.36	0.36	1.01	0.814	1.30	YES	1.06	0.19	0.87	0.29	0.57	82.1	NO	0.00	YES	82.1	YES	0.6	0.6	0.750	2.3	83.4	22.75	0.0000	0.00	0	0.0000	83.43
1/4/67	1.36	0.36	1.01	0.814	1.30	YES	1.06	0.19	0.87	0.29	0.57	83.4	NO	0.00	YES	83.4	YES	0.6	0.6	0.750	3.0	84.8	22.88	0.0000	0.00	0	0.0000	84.76
1/5/67	1.36	0.36	1.01	0.814	1.30	YES	1.06	0.19	0.87	0.29	0.57	84.8	NO	0.00	YES	84.8	YES	0.6	0.6	0.750	3.8	86.1	23.01	0.0000	0.00	0	0.0000	86.08
1/6/67	1.20	0.36	0.85	0.814	1.30	YES	0.94	0.19	0.74	0.45	0.29	86.1	NO	0.00	YES	86.1	YES	0.3	0.3	0.750	4.5	87.1	23.14	0.0000	0.00	0	0.0000	87.12
1/7/67	1.28	0.36	0.93	0.814	1.30	YES	1.00	0.19	0.81	0.37	0.43	87.1	NO	0.00	YES	87.1	YES	0.4	0.4	0.750	5.3	88.3	23.23	0.0000	0.00	0	0.0000	88.31
1/8/67	2.00	0.36	1.65	0.814	1.30	NO	1.56	0.19	1.37	0.00	1.37	88.3	NO	0.00	YES	88.3	YES	1.4	1.4	0.750	6.0	90.4	23.33	0.0000	0.00	0.22	0.1499	90.57
1/9/67	2.24	0.36	1.89	0.814	1.30	NO	1.75	0.19	1.56	0.00	1.56	90.6	NO	0.00	YES	90.6	YES	1.6	1.6	0.750	6.8	92.9	23.52	0.0000	0.00	0	0.0000	92.88
1/10/67	1.72	0.36	1.37	0.814	1.30	NO	1.34	0.19	1.15	0.00	1.15	92.9	NO	0.00	YES	92.9	YES	1.1	1.1	0.750	7.5	94.8	23.69	0.0000	0.00	0	0.0000	94.78
1/11/67	1.52	0.36	1.17	0.814	1.30	YES	1.19	0.19	0.99	0.13	0.86	94.8	NO	0.00	YES	94.8	YES	0.9	0.9	0.750	8.3	96.4	23.82	0.0000	0.00	0	0.0000	96.39
1/12/67	1.52	0.36	1.17	0.814	1.30	YES	1.19	0.19	0.99	0.13	0.86	96.4	NO	0.00	YES	96.4	YES	0.9	0.9	0.750	9.0	98.0	23.92	0.0000	0.00	0	0.0000	98.00
1/13/67	1.44	0.36	1.09	0.814	1.30	YES	1.13	0.19	0.93	0.21	0.72	98.0	NO	0.00	YES	98.0	YES	0.7	0.7	0.750	9.8	99.5	24.01	0.0000	0.00	0	0.0000	99.47
1/14/67	1.48	0.36	1.13	0.814	1.30	YES	1.16	0.19	0.96	0.17	0.79	99.5	NO	0.00	YES	99.5	YES	0.8	0.8	0.750	10.5	101.0	24.09	0.0000	0.00	0.06	0.0409	101.05
1/15/67	1.60	0.36	1.25	0.814	1.30	YES	1.25	0.19	1.06	0.05	1.00	101.0	NO	0.00	YES	101.0	YES	1.0	1.0	0.750	11.3	102.8	24.17	0.0000	0.00	0	0.0000	102.80
1/16/67	1.48	0.36	1.13	0.814	1.30	YES	1.16	0.19	0.96	0.17	0.79	102.8	NO	0.00	YES	102.8	YES	0.8	0.8	0.750	12.0	104.3	24.24	0.0000	0.00	0	0.0000	104.34
1/17/67	1.36	0.36	1.01	0.814	1.30	YES	1.06	0.19	0.87	0.29	0.57	104.3	NO	0.00	YES	104.3	YES	0.6	0.6	0.750	12.8	105.7	24.30	0.0000	0.00	0	0.0000	105.66
1/18/67	1.28	0.36	0.93	0.814	1.30	YES	1.00	0.19	0.81	0.37	0.43	105.7	NO	0.00	YES	105.7	YES	0.4	0.4	0.750	13.5	106.8	24.35	0.0000	0.00	0	0.0000	106.85
1/19/67	1.24	0.36	0.89	0.814	1.30	YES	0.97	0.19	0.77	0.41	0.36	106.8	NO	0.00	YES	106.8	YES	0.4	0.4	0.750	14.3	108.0	24.38	0.0000	0.00	0.05	0.0341	107.99
1/20/67	1.28	0.36	0.93	0.814	1.30	YES	1.00	0.19	0.81	0.37	0.43	108.0	NO	0.00	YES	108.0	YES	0.4	0.4	0.750	15.0	109.2	24.42	0.0000	0.00	0	0.0000	109.17
1/21/67	1.16	0.36	0.81	0.814	1.30	YES	0.91	0.19	0.71	0.49	0.22	109.2	NO	0.00	YES	109.2	YES	0.2	0.2	0.750	15.8	110.1	24.44	0.0000	0.00	0	0.0000	110.14
1/22/67	1.20	0.36	0.85	0.814	1.30	YES	0.94	0.19	0.74	0.45	0.29	110.1	NO	0.00	YES	110.1	YES	0.3	0.3	0.750	16.5	111.2	24.46	0.0000	0.00	0	0.0000	111.18
1/23/67	1.24	0.36	0.89	0.814	1.30	YES	0.97	0.19	0.77	0.41	0.36	111.2	NO	0.00	YES	111.2	YES	0.4	0.4	0.750	17.3	112.3	24.48	0.0000	0.00	0	0.0000	112.29
1/24/67	1.28	0.36	0.93	0.814	1.30	YES	1.00	0.19	0.81	0.37	0.43	112.3	NO	0.00	YES	112.3	YES	0.4	0.4	0.750	18.0	113.5	24.50	0.0000	0.00	0	0.0000	113.47
1/25/67	1.24	0.36	0.89	0.814	1.30	YES	0.97	0.19	0.77	0.41	0.36	113.5	NO	0.00	YES	113.5	YES	0.4	0.4	0.750	18.8	114.6	24.51	0.0000	0.00	0	0.0000	114.59
1/26/67	1.20	0.36	0.85	0.814	1.30	YES	0.94	0.19	0.74	0.45	0.29	114.6	NO	0.00	YES	114.6	YES	0.3	0.3	0.750	19.5	115.6	24.52	0.0000	0.00	0	0.0000	115.62
1/27/67	3.29	0.36	2.93	0.814	1.30	NO	2.56	0.19	2.37	0.00	2.37	115.6	NO	0.00	YES	115.6	YES	2.4	2.4	0.000	19.5	118.0	24.52	0.0000	0.00	0.66	0.4498	118.44
1/28/67	2.85	0.36	2.49	0.814	1.30	NO	2.22	0.19	2.03	0.00	2.03	118.4	NO	0.00	YES	118.4	YES	2.0	2.0	0.000	19.5	120.5	24.52	0.0000	0.00	0	0.0000	120.47
1/29/67	1.72	0.36	1.37	0.814	1.30	NO	1.34	0.19	1.15	0.00	1.15	120.5	NO	0.00	YES	120.5	YES	1.1	1.1	0.000	19.5	121.6	24.50	0.0000	0.00	0	0.0000	121.62
1/30/67	1.52	0.36	1.17	0.814	1.30	YES	1.19	0.19	0.99	0.13	0.86	121.6	NO	0.00	YES	121.6	YES	0.9	0.9	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
1/31/67	1.40	0.36	1.05	0.814	1.30	YES	1.09	0.19	0.90	0.25	0.65	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/1/67	1.36	0.36	1.01	0.788	1.26	YES	1.06	0.19	0.87	0.25	0.62	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/2/67	1.36	0.36	1.01	0.788	1.26	YES	1.06	0.19	0.87	0.25	0.62	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.15	0.1022	121.80
2/3/67	1.44	0.36	1.09	0.788	1.26	YES	1.13	0.19	0.93	0.17	0.76	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/4/67	1.28	0.36	0.93	0.788	1.26	YES	1.00	0.19	0.81	0.33	0.47	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/5/67	1.28	0.36	0.93	0.788	1.26	YES	1.00	0.19	0.81	0.33	0.47	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/6/67	1.24	0.36	0.89	0.788	1.26	YES	0.97	0.19	0.77	0.37	0.40	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.06	0.0409	121.80
2/7/67	1.00	0.36	0.65	0.788	1.26	YES	0.78	0.19	0.59	0.61	0.00	121.8	YES	0.03	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	1.15	0.7838	121.80
2/8/67	1.20	0.36	0.85	0.788	1.26	YES	0.94	0.19	0.74	0.41	0.33	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/9/67	1.32	0.36	0.97	0.788	1.26	YES	1.03	0.19	0.84	0.29	0.54	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.13	0.0886	121.80
2/10/67	1.36	0.36	1.01	0.788	1.26	YES	1.06	0.19	0.87	0.25	0.62	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.01	0.0068	121.80
2/11/67	1.40	0.36	1.05	0.788	1.26	YES	1.09	0.19	0.90	0.21	0.69	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/12/67	1.28	0.36	0.93	0.788	1.26	YES	1.00	0.19	0.81	0.33	0.47	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/13/67	1.20	0.36	0.85	0.788	1.26	YES	0.94	0.19	0.74	0.41	0.33	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/14/67	1.28	0.36	0.93	0.788	1.26	YES	1.00	0.19	0.81	0.33	0.47	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/15/67	1.40	0.36	1.05	0.788	1.26	YES	1.09	0.19	0.90	0.21	0.69	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/16/67	2.04	0.36	1.69	0.788	1.26	NO	1.59	0.19	1.40	0.00	1.40	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/17/67	1.64	0.36	1.29	0.788	1.26	NO	1.28	0.19	1.09	0.00	1.09	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.35	0.2386	121.80
2/18/67	1.52	0.36	1.17	0.788	1.26	YES	1.19	0.19	0.99	0.09	0.90	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.17	0.1159	121.80
2/19/67	1.40	0.36	1.05	0.788	1.26	YES	1.09	0.19	0.90	0.21	0.69	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/20/67	1.40	0.36	1.05	0.788	1.26	YES	1.09	0.19	0.90	0.21	0.69	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.09	0.0613	121.80
2/21/67	1.60	0.36	1.25	0.788	1.26	YES	1.25	0.19	1.06	0.01	1.04	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.1	0.0682	121.80
2/22/67	1.48	0.36	1.13	0.788	1.26	YES	1.16	0.19	0.96	0.13	0.83	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/23/67	1.48	0.36	1.13	0.788	1.26	YES	1.16	0.19	0.96	0.13	0.83	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/24/67	1.36	0.36	1.01	0.788	1.26	YES	1.06	0.19	0.87	0.25	0.62	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.03	0.0204	121.80
2/25/67	1.24	0.36	0.89	0.788	1.26	YES	0.97	0.19	0.77	0.37	0.40	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/26/67	1.28	0.36	0.93	0.788	1.26	YES	1.00	0.19	0.81	0.33	0.47	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
2/27/67	1.36	0.36	1.01	0.788	1.26	YES	1.06	0.19	0.87	0.25	0.62	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.01	0.0068	121.80
2/28/67	1.28	0.36	0.93	0.788	1.26	YES	1.00	0.19	0.81	0.33	0.47	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/1/67	1.20	0.36	0.85	0.915	1.46	YES	0.94	0.19	0.74	0.62	0.13	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/2/67	1.20	0.36	0.85	0.915	1.46	YES	0.94	0.19	0.74	0.62	0.13	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/3/67	1.16	0.36	0.81	0.915	1.46	YES	0.91	0.19	0.71	0.66	0.06	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/4/67	1.24	0.36	0.89	0.915	1.46	YES	0.97	0.19	0.77	0.58	0.20	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.19	0.1295	121.80
3/5/67	1.60	0.36	1.25	0.915	1.46	YES	1.25	0.19	1.06	0.22	0.84	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.02	0.0136	121.80
3/6/67	2.04	0.36	1.69	0.915	1.46	NO	1.59	0.19	1.40	0.00	1.40	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	1.02	0.6952	121.80
3/7/67	30.27	0.36	29.91	0.915	1.46	NO	23.60	0.19	23.40	0.00	23.40	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	1.49	1.0155	121.80
3/8/67	5.61	0.36	5.26	0.915	1.46	NO	4.38	0.19	4.18	0.00	4.18	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/9/67	3.93	0.36	3.57	0.915	1.46	NO	3.06	0.19	2.87	0.00	2.87	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/10/67	3.37	0.36	3.01	0.915	1.46	NO	2.63	0.19	2.43	0.00	2.43	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/11/67	3.05	0.36	2.69	0.915	1.46	NO	2.38	0.19	2.18	0.00	2.18	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/12/67	2.77	0.36	2.41	0.915	1.46	NO	2.16	0.19	1.96	0.00	1.96	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/13/67	2.61	0.36	2.25	0.915	1.46	NO	2.03	0.19	1.84	0.00	1.84	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/14/67	2.57	0.36	2.21	0.915	1.46	NO	2.00	0.19	1.81	0.00	1.81	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.05	0.0341	121.80
3/15/67	3.69	0.36	3.33	0.915	1.46	NO	2.88	0.19	2.68	0.00	2.68	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.78	0.5316	121.80
3/16/67	3.17	0.36	2.81	0.915	1.46	NO	2.47	0.19	2.28	0.00	2.28	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.03	0.0204	121.80
3/17/67	2.85	0.36	2.49	0.915	1.46	NO	2.22	0.19	2.03	0.00	2.03	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.02	0.0136	121.80
3/18/67	2.57	0.36	2.21	0.915	1.46	NO	2.00	0.19	1.81	0.00	1.81	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/19/67	2.37	0.36	2.01	0.915	1.46	NO	1.84	0.19	1.65	0.00	1.65	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/20/67	2.37	0.36	2.01	0.915	1.46	NO	1.84	0.19	1.65	0.00	1.65	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/21/67	2.49	0.36	2.13	0.915	1.46	NO	1.94	0.19	1.74	0.00	1.74	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.46	0.3135	121.80

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity	1.60	mgd
Reservoir Volume	121.80	MG
Medford Quarry Start Setpoint	104	MG
Hull Creek Minimum Stream Flow-By:	0.355	mgd
Cranberry Branch Minimum Stream Flow-By:	0.194	mgd
Min Reservoir Level	12.6	ft
Medford Quarry Pump Rate	0.750	MGD
Medford Quarry Max Annual Vol	176	MG
	234	days
MQ Stop Set Point	116.0	MG

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
3/22/67	2.73	0.36	2.37	0.915	1.46	NO	2.13	0.19	1.93	0.00	1.93	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/23/67	2.85	0.36	2.49	0.915	1.46	NO	2.22	0.19	2.03	0.00	2.03	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.05	0.0341	121.80
3/24/67	2.77	0.36	2.41	0.915	1.46	NO	2.16	0.19	1.96	0.00	1.96	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/25/67	2.49	0.36	2.13	0.915	1.46	NO	1.94	0.19	1.74	0.00	1.74	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/26/67	2.41	0.36	2.05	0.915	1.46	NO	1.88	0.19	1.68	0.00	1.68	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/27/67	2.29	0.36	1.93	0.915	1.46	NO	1.78	0.19	1.59	0.00	1.59	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/28/67	2.24	0.36	1.89	0.915	1.46	NO	1.75	0.19	1.56	0.00	1.56	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/29/67	2.57	0.36	2.21	0.915	1.46	NO	2.00	0.19	1.81	0.00	1.81	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0.28	0.1908	121.80
3/30/67	2.24	0.36	1.89	0.915	1.46	NO	1.75	0.19	1.56	0.00	1.56	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
3/31/67	2.12	0.36	1.77	0.915	1.46	NO	1.66	0.19	1.46	0.00	1.46	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.0000	0.00	0	0.0000	121.80
4/1/67	2.08	0.36	1.73	0.992	1.59	NO	1.63	0.19	1.43	0.00	1.43	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/2/67	2.08	0.36	1.73	0.992	1.59	NO	1.63	0.19	1.43	0.00	1.43	121.7	NO	0.00	YES	121.7	YES	1.4	1.4	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/3/67	2.00	0.36	1.65	0.992	1.59	NO	1.56	0.19	1.37	0.00	1.37	121.7	NO	0.00	YES	121.7	YES	1.4	1.4	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/4/67	1.92	0.36	1.57	0.992	1.59	YES	1.50	0.19	1.31	0.02	1.29	121.7	NO	0.00	YES	121.7	YES	1.3	1.3	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/5/67	1.96	0.36	1.61	0.992	1.59	NO	1.53	0.19	1.34	0.00	1.34	121.7	NO	0.00	YES	121.7	YES	1.3	1.3	0.000	19.5	121.8	24.48	0.1895	0.13	0.03	0.0204	121.69
4/6/67	2.00	0.36	1.65	0.992	1.59	NO	1.56	0.19	1.37	0.00	1.37	121.7	NO	0.00	YES	121.7	YES	1.4	1.4	0.000	19.5	121.8	24.48	0.1895	0.13	0.09	0.0613	121.74
4/7/67	2.41	0.36	2.05	0.992	1.59	NO	1.88	0.19	1.68	0.00	1.68	121.7	NO	0.00	YES	121.7	YES	1.7	1.7	0.000	19.5	121.8	24.48	0.1895	0.13	0.15	0.1022	121.78
4/8/67	2.04	0.36	1.69	0.992	1.59	NO	1.59	0.19	1.40	0.00	1.40	121.8	NO	0.00	YES	121.8	YES	1.4	1.4	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/9/67	1.96	0.36	1.61	0.992	1.59	NO	1.53	0.19	1.34	0.00	1.34	121.7	NO	0.00	YES	121.7	YES	1.3	1.3	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/10/67	2.00	0.36	1.65	0.992	1.59	NO	1.56	0.19	1.37	0.00	1.37	121.7	NO	0.00	YES	121.7	YES	1.4	1.4	0.000	19.5	121.8	24.48	0.1895	0.13	0.01	0.0068	121.68
4/11/67	1.88	0.36	1.53	0.992	1.59	YES	1.47	0.19	1.27	0.06	1.22	121.7	NO	0.00	YES	121.7	YES	1.2	1.2	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/12/67	1.84	0.36	1.49	0.992	1.59	YES	1.44	0.19	1.24	0.10	1.15	121.7	NO	0.00	YES	121.7	YES	1.1	1.1	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/13/67	1.84	0.36	1.49	0.992	1.59	YES	1.44	0.19	1.24	0.10	1.15	121.7	NO	0.00	YES	121.7	YES	1.1	1.1	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/14/67	1.88	0.36	1.53	0.992	1.59	YES	1.47	0.19	1.27	0.06	1.22	121.7	NO	0.00	YES	121.7	YES	1.2	1.2	0.000	19.5	121.8	24.48	0.1895	0.13	0.01	0.0068	121.68
4/15/67	1.84	0.36	1.49	0.992	1.59	YES	1.44	0.19	1.24	0.10	1.15	121.7	NO	0.00	YES	121.7	YES	1.1	1.1	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/16/67	1.76	0.36	1.41	0.992	1.59	YES	1.38	0.19	1.18	0.18	1.00	121.7	NO	0.00	YES	121.7	YES	1.0	1.0	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/17/67	2.04	0.36	1.69	0.992	1.59	NO	1.59	0.19	1.40	0.00	1.40	121.7	NO	0.00	YES	121.7	YES	1.4	1.4	0.000	19.5	121.8	24.48	0.1895	0.13	0.65	0.4430	121.80
4/18/67	2.12	0.36	1.77	0.992	1.59	NO	1.66	0.19	1.46	0.00	1.46	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/19/67	1.84	0.36	1.49	0.992	1.59	YES	1.44	0.19	1.24	0.10	1.15	121.7	NO	0.00	YES	121.7	YES	1.1	1.1	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/20/67	1.76	0.36	1.41	0.992	1.59	YES	1.38	0.19	1.18	0.18	1.00	121.7	NO	0.00	YES	121.7	YES	1.0	1.0	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/21/67	1.72	0.36	1.37	0.992	1.59	YES	1.34	0.19	1.15	0.22	0.93	121.7	NO	0.00	YES	121.7	YES	0.9	0.9	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/22/67	1.84	0.36	1.49	0.992	1.59	YES	1.44	0.19	1.24	0.10	1.15	121.7	NO	0.00	YES	121.7	YES	1.1	1.1	0.000	19.5	121.8	24.48	0.1895	0.13	0.08	0.0545	121.73
4/23/67	1.68	0.36	1.33	0.992	1.59	YES	1.31	0.19	1.12	0.26	0.86	121.7	NO	0.00	YES	121.7	YES	0.9	0.9	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/24/67	1.76	0.36	1.41	0.992	1.59	YES	1.38	0.19	1.18	0.18	1.00	121.7	NO	0.00	YES	121.7	YES	1.0	1.0	0.000	19.5	121.8	24.48	0.1895	0.13	0.05	0.0341	121.71
4/25/67	1.68	0.36	1.33	0.992	1.59	YES	1.31	0.19	1.12	0.26	0.86	121.7	NO	0.00	YES	121.7	YES	0.9	0.9	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/26/67	1.68	0.36	1.33	0.992	1.59	YES	1.31	0.19	1.12	0.26	0.86	121.7	NO	0.00	YES	121.7	YES	0.9	0.9	0.000	19.5	121.8	24.48	0.1895	0.13	0.4	0.2726	121.80
4/27/67	2.45	0.36	2.09	0.992	1.59	NO	1.91	0.19	1.71	0.00	1.71	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.1895	0.13	0.26	0.1772	121.80
4/28/67	2.00	0.36	1.65	0.992	1.59	NO	1.56	0.19	1.37	0.00	1.37	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/29/67	1.80	0.36	1.45	0.992	1.59	YES	1.41	0.19	1.21	0.14	1.07	121.7	NO	0.00	YES	121.7	YES	1.1	1.1	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
4/30/67	1.84	0.36	1.49	0.992	1.59	YES	1.44	0.19	1.24	0.10	1.15	121.7	NO	0.00	YES	121.7	YES	1.1	1.1	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/1/67	1.80	0.36	1.45	1.051	1.68	YES	1.41	0.19	1.21	0.23	0.98	121.7	NO	0.00	YES	121.7	YES	1.0	1.0	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/2/67	1.80	0.36	1.45	1.051	1.68	YES	1.41	0.19	1.21	0.23	0.98	121.7	NO	0.00	YES	121.7	YES	1.0	1.0	0.000	19.5	121.8	24.48	0.1895	0.13	0.45	0.3067	121.80
5/3/67	2.12	0.36	1.77	1.051	1.68	NO	1.66	0.19	1.46	0.00	1.46	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.1895	0.13	0.15	0.1022	121.78
5/4/67	1.80	0.36	1.45	1.051	1.68	YES	1.41	0.19	1.21	0.23	0.98	121.8	NO	0.00	YES	121.8	YES	1.0	1.0	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/5/67	1.72	0.36	1.37	1.051	1.68	YES	1.34	0.19	1.15	0.31	0.84	121.7	NO	0.00	YES	121.7	YES	0.8	0.8	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/6/67	1.72	0.36	1.37	1.051	1.68	YES	1.34	0.19	1.15	0.31	0.84	121.7	NO	0.00	YES	121.7	YES	0.8	0.8	0.000	19.5	121.8	24.48	0.1895	0.13	0.31	0.2113	121.80
5/7/67	3.97	0.36	3.61	1.051	1.68	NO	3.09	0.19	2.90	0.00	2.90	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.1895	0.13	1.63	1.1110	121.80
5/8/67	2.89	0.36	2.53	1.051	1.68	NO	2.25	0.19	2.06	0.00	2.06	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.1895	0.13	0.02	0.0136	121.69
5/9/67	2.45	0.36	2.09	1.051	1.68	NO	1.91	0.19	1.71	0.00	1.71	121.7	NO	0.00	YES	121.7	YES	1.7	1.7	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/10/67	2.08	0.36	1.73	1.051	1.68	NO	1.63	0.19	1.43	0.00	1.43	121.7	NO	0.00	YES	121.7	YES	1.4	1.4	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/11/67	2.29	0.36	1.93	1.051	1.68	NO	1.78	0.19	1.59	0.00	1.59	121.7	NO	0.00	YES	121.7	YES	1.6	1.6	0.000	19.5	121.8	24.48	0.1895	0.13	0.13	0.0886	121.76
5/12/67	2.16	0.36	1.81	1.051	1.68	NO	1.69	0.19	1.49	0.00	1.49	121.8	NO	0.00	YES	121.8	YES	1.5	1.5	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/13/67	1.92	0.36	1.57	1.051	1.68	YES	1.50	0.19	1.31	0.11	1.19	121.7	NO	0.00	YES	121.7	YES	1.2	1.2	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/14/67	1.96	0.36	1.61	1.051	1.68	YES	1.53	0.19	1.34	0.07	1.26	121.7	NO	0.00	YES	121.7	YES	1.3	1.3	0.000	19.5	121.8	24.48	0.1895	0.13	0.15	0.1022	121.78
5/15/67	2.33	0.36	1.97	1.051	1.68	NO	1.81	0.19	1.62	0.00	1.62	121.8	NO	0.00	YES	121.8	YES	1.6	1.6	0.000	19.5	121.8	24.48	0.1895	0.13	0.24	0.1636	121.80
5/16/67	2.77	0.36	2.41	1.051	1.68	NO	2.16	0.19	1.96	0.00	1.96	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/17/67	2.12	0.36	1.77	1.051	1.68	NO	1.66	0.19	1.46	0.00	1.46	121.7	NO	0.00	YES	121.7	YES	1.5	1.5	0.000	19.5	121.8	24.48	0.1895	0.13	0.01	0.0068	121.68
5/18/67	2.00	0.36	1.65	1.051	1.68	YES	1.56	0.19	1.37	0.03	1.34	121.7	NO	0.00	YES	121.7	YES	1.3	1.3	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/19/67	1.92	0.36	1.57	1.051	1.68	YES	1.50	0.19	1.31	0.11	1.19	121.7	NO	0.00	YES	121.7	YES	1.2	1.2	0.000	19.5	121.8	24.48	0.1895	0.13	0.2	0.1363	121.80
5/20/67	1.92	0.36	1.57	1.051	1.68	YES	1.50	0.19	1.31	0.11	1.19	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/21/67	1.72	0.36	1.37	1.051	1.68	YES	1.34	0.19	1.15	0.31	0.84	121.7	NO	0.00	YES	121.7	YES	0.8	0.8	0.000	19.5	121.8	24.48	0.1895	0.13	0.02	0.0136	121.69
5/22/67	1.76	0.36	1.41	1.051	1.68	YES	1.38	0.19	1.18	0.27	0.91	121.7	NO	0.00	YES	121.7	YES	0.9	0.9	0.000	19.5	121.8	24.48	0.1895	0.13	0.14	0.0954	121.77
5/23/67	1.72	0.36	1.37	1.051	1.68	YES	1.34	0.19	1.15	0.31	0.84	121.8	NO	0.00	YES	121.8	YES	0.8	0.8	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/24/67	1.68	0.36	1.33	1.051	1.68	YES	1.31	0.19	1.12	0.35	0.77	121.7	NO	0.00	YES	121.7	YES	0.8	0.8	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/25/67	1.60	0.36	1.25	1.051	1.68	YES	1.25	0.19	1.06	0.43	0.62	121.7	NO	0.00	YES	121.7	YES	0.6	0.6	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/26/67	1.56	0.36	1.21	1.051	1.68	YES	1.22	0.19	1.02	0.47	0.55	121.7	NO	0.00	YES	121.7	YES	0.6	0.6	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/27/67	1.52	0.36	1.17	1.051	1.68	YES	1.19	0.19	0.99	0.51	0.48	121.7	NO	0.00	YES	121.7	YES	0.5	0.5	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/28/67	1.44	0.36	1.09	1.051	1.68	YES	1.13	0.19	0.93	0.59	0.34	121.7	NO	0.00	YES	121.7	YES	0.3	0.3	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
5/29/67	1.68	0.36	1.33	1.051	1.68	YES	1.31	0.19	1.12	0.35	0.77	121.7	NO	0.00	YES	121.7	YES	0.8	0.8	0.000	19.5	121.8	24.48	0.1895	0.13	0.33	0.2249	121.80
5/30/67	1.84	0.36	1.49	1.051	1.68	YES	1.44	0.19	1.24	0.19	1.05	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	19.5	121.8	24.48	0.1895	0.13	0.01	0.0068	121.68
5/31/67	1.56	0.36	1.21	1.051	1.68	YES	1.22	0.19	1.02	0.47	0.55	121.7	NO	0.00	YES	121.7	YES	0.6	0.6	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/1/67	1.48	0.36	1.13	1.164	1.86	YES	1.16	0.19	0.96	0.73	0.23	121.7	NO	0.00	YES	121.7	YES	0.2	0.2	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.67
6/2/67	1.40	0.36	1.05	1.164	1.86	YES	1.09	0.19	0.90	0.81	0.09	121.7	NO	0.00	YES	121.7	YES	0.1	0.1	0.000	19.5	121.8	24.48	0.1895	0.13	0	0.0000	121.63
6/3/67	1.36	0.36	1.01	1.164	1.86	YES	1.06	0.19	0.87	0.85	0.01	121.6	NO	0.00	YES	121.6	YES	0.0	0.0	0.000	19.5	121.6	24.48	0.1895	0.13	0	0.0000	121.52
6/4/67	1.32	0.36	0.97	1.164	1.86	YES	1.03	0.19	0.84	0.90	0.00	121.5	YES	0.06	YES	121.5	NO	0.0	0.0	0.000	19.5	121.5	24.49	0.1895	0.13	0	0.0000	121.34
6/5/67	1.32	0.36	0.97	1.164	1.86	YES	1.03	0.19	0.84	0.90	0.00	121.3	YES	0.06	YES	121.3	NO	0.0	0.0	0.000	19.5	121.3	24.49	0.1895	0.13	0	0.0000	121.15
6/6/67	1.28	0.36	0.93	1.164	1.86	YES	1.00	0.19	0.81	0.94	0.00	121.2	YES	0.13	YES	121.0	NO	0.0	0.0	0.000	19.5	121.0	24.49	0.1895	0.13	0	0.0000	120.90
6/7/67	1.28	0.36	0.93	1.164	1.86	YES	1.00	0.19	0.81	0.94	0.00	120.9	YES	0.13	YES	120.8	NO	0.0	0.0	0.000	19.5	120.8	24.49	0.1895	0.13	0	0.0000	120.64
6/8/67	1.24	0.36	0.89	1.164	1.86	YES	0.97	0.19	0.77	0.98	0.00	120.6	YES	0.20	YES	120.4	NO	0.0	0.0	0.000	19.5	120.4	24.50	0.1895	0.13	0	0.0000	120.32
6/9/67	1.20	0.36	0.85	1.164	1.86	YES	0.94	0.19	0.74	1.02	0.00	120.3	YES	0.27	YES	120.0	NO	0.0	0.0	0.000	19.5	120.0	24.50	0.1895	0.13	0	0.0000	119.92
6/10/67	1.16	0.36	0.81	1.164	1.86	YES	0.91	0.19	0.71	1.06	0.00	119.9	YES	0.34	YES	119.6	NO	0.0	0.0	0.000	19.5	119.6	24.51	0.1895	0.13	0	0.0000	119.45
6/11/67	1.12	0.36	0.77	1.164	1.86	YES	0.88	0.19	0.68	1.10	0.00	119.5	YES	0.41	YES	119.0	NO	0.0	0.0	0.000	19.5	119.0	24.51	0.1895	0.13	0	0.0000	118.91
6/12/67	1.08	0.36	0.73	1.164	1.86	YES	0.84	0.19	0.65	1.14	0.00	118.9	YES	0.49	YES	118.4	NO	0.0	0.0	0.000	19.5	118.4	24.52	0.1895	0.13	0	0.0000	118.30
6/13/67	1.04	0.36	0.69	1.164	1.86	YES	0.81	0.19	0.62	1.18	0.00	118.3	YES	0.56	YES	117.7	NO	0.0	0.0	0.000	19.5	117.7	24.52	0.1895	0.13	0	0.0000	117.61

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity	1.60	mgd	Hull Creek Minimum Stream Flow-By:	0.355	mgd	Min Reservoir Level	12.6	ft	Medford Quarry Pump Rate	0.750	MGD	`	MQ Stop Set Point	116.0	MG
Reservoir Volume	121.80	MG	Cranberry Branch Minimum Stream Flow-By:	0.194	mgd				Medford Quarry Max Annual Vol	176	MG				
Medford Quarry Start Setpoint	104	MG								234	days				

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
6/14/67	1.04	0.36	0.69	1.164	1.86	YES	0.81	0.19	0.62	1.18	0.00	117.6	YES	0.56	YES	117.1	NO	0.0	0.0	0.000	19.5	117.1	24.52	0.1895	0.13	0	0.0000	116.93
6/15/67	1.08	0.36	0.73	1.164	1.86	YES	0.84	0.19	0.65	1.14	0.00	116.9	YES	0.49	YES	116.4	NO	0.0	0.0	0.000	19.5	116.4	24.52	0.1895	0.13	0	0.0000	116.32
6/16/67	1.08	0.36	0.73	1.164	1.86	YES	0.84	0.19	0.65	1.14	0.00	116.3	YES	0.49	YES	115.8	NO	0.0	0.0	0.000	19.5	115.8	24.52	0.1895	0.13	0	0.0000	115.71
6/17/67	0.96	0.36	0.61	1.164	1.86	YES	0.75	0.19	0.56	1.26	0.00	115.7	YES	0.70	YES	115.0	NO	0.0	0.0	0.000	19.5	115.0	24.52	0.1895	0.13	0	0.0000	114.88
6/18/67	0.96	0.36	0.61	1.164	1.86	YES	0.75	0.19	0.56	1.26	0.00	114.9	YES	0.70	YES	114.2	NO	0.0	0.0	0.000	19.5	114.2	24.52	0.1895	0.13	0.02	0.0136	114.07
6/19/67	1.00	0.36	0.65	1.164	1.86	YES	0.78	0.19	0.59	1.22	0.00	114.1	YES	0.63	YES	113.4	NO	0.0	0.0	0.000	19.5	113.4	24.52	0.1895	0.13	0.05	0.0341	113.35
6/20/67	0.96	0.36	0.61	1.164	1.86	YES	0.75	0.19	0.56	1.26	0.00	113.3	YES	0.70	YES	112.6	NO	0.0	0.0	0.000	19.5	112.6	24.51	0.1895	0.13	0	0.0000	112.52
6/21/67	0.92	0.36	0.57	1.164	1.86	YES	0.72	0.19	0.52	1.30	0.00	112.5	YES	0.77	YES	111.8	NO	0.0	0.0	0.000	19.5	111.8	24.50	0.1895	0.13	0	0.0000	111.63
6/22/67	0.92	0.36	0.57	1.164	1.86	YES	0.72	0.19	0.52	1.30	0.00	111.6	YES	0.77	YES	110.9	NO	0.0	0.0	0.000	19.5	110.9	24.49	0.1895	0.13	1.23	0.8383	111.57
6/23/67	1.16	0.36	0.81	1.164	1.86	YES	0.91	0.19	0.71	1.06	0.00	111.6	YES	0.34	YES	111.2	NO	0.0	0.0	0.000	19.5	111.2	24.49	0.1895	0.13	0	0.0000	111.10
6/24/67	1.08	0.36	0.73	1.164	1.86	YES	0.84	0.19	0.65	1.14	0.00	111.1	YES	0.49	YES	110.6	NO	0.0	0.0	0.000	19.5	110.6	24.48	0.1895	0.13	0	0.0000	110.49
6/25/67	0.92	0.36	0.57	1.164	1.86	YES	0.72	0.19	0.52	1.30	0.00	110.5	YES	0.77	YES	109.7	NO	0.0	0.0	0.000	19.5	109.7	24.47	0.1895	0.13	0	0.0000	109.59
6/26/67	0.80	0.36	0.45	1.164	1.86	YES	0.63	0.19	0.43	1.42	0.00	109.6	YES	0.99	YES	108.6	NO	0.0	0.0	0.000	19.5	108.6	24.45	0.1895	0.13	0	0.0000	108.48
6/27/67	0.80	0.36	0.45	1.164	1.86	YES	0.63	0.19	0.43	1.42	0.00	108.5	YES	0.99	YES	107.5	NO	0.0	0.0	0.000	19.5	107.5	24.43	0.1895	0.13	0	0.0000	107.37
6/28/67	0.80	0.36	0.45	1.164	1.86	YES	0.63	0.19	0.43	1.42	0.00	107.4	YES	0.99	YES	106.4	NO	0.0	0.0	0.000	19.5	106.4	24.40	0.1895	0.13	0	0.0000	106.26
6/29/67	0.80	0.36	0.45	1.164	1.86	YES	0.63	0.19	0.43	1.42	0.00	106.3	YES	0.99	YES	105.3	NO	0.0	0.0	0.000	19.5	105.3	24.37	0.1895	0.13	0	0.0000	105.15
6/30/67	1.76	0.36	1.41	1.164	1.86	YES	1.38	0.19	1.18	0.45	0.73	105.1	NO	0.00	YES	105.1	YES	0.7	0.7	0.000	19.5	105.9	24.33	0.1895	0.13	0.59	0.4021	106.15
7/1/67	1.20	0.36	0.85	1.300	2.08	YES	0.94	0.19	0.74	1.23	0.00	106.2	YES	0.49	YES	105.7	NO	0.0	0.0	0.000	19.5	105.7	24.36	0.1895	0.13	0	0.0000	105.54
7/2/67	1.16	0.36	0.81	1.300	2.08	YES	0.91	0.19	0.71	1.27	0.00	105.5	YES	0.56	YES	105.0	NO	0.0	0.0	0.000	19.5	105.0	24.34	0.1895	0.13	2.72	1.8539	106.70
7/3/67	3.33	0.36	2.97	1.300	2.08	NO	2.59	0.19	2.40	0.00	2.40	106.7	NO	0.00	YES	106.7	YES	2.4	2.4	0.000	19.5	109.1	24.38	0.1895	0.13	0.19	0.1295	109.11
7/4/67	1.24	0.36	0.89	1.300	2.08	YES	0.97	0.19	0.77	1.19	0.00	109.1	YES	0.42	YES	108.7	NO	0.0	0.0	0.000	19.5	108.7	24.44	0.1895	0.13	0.09	0.0613	108.63
7/5/67	1.16	0.36	0.81	1.300	2.08	YES	0.91	0.19	0.71	1.27	0.00	108.6	YES	0.56	YES	108.1	NO	0.0	0.0	0.000	19.5	108.1	24.43	0.1895	0.13	0	0.0000	107.94
7/6/67	1.04	0.36	0.69	1.300	2.08	YES	0.81	0.19	0.62	1.39	0.00	107.9	YES	0.77	YES	107.2	NO	0.0	0.0	0.000	19.5	107.2	24.41	0.1895	0.13	0	0.0000	107.04
7/7/67	0.96	0.36	0.61	1.300	2.08	YES	0.75	0.19	0.56	1.47	0.00	107.0	YES	0.92	YES	106.1	NO	0.0	0.0	0.000	19.5	106.1	24.39	0.1895	0.13	0	0.0000	106.00
7/8/67	0.96	0.36	0.61	1.300	2.08	YES	0.75	0.19	0.56	1.47	0.00	106.0	YES	0.92	YES	105.1	NO	0.0	0.0	0.000	19.5	105.1	24.36	0.1895	0.13	0.11	0.0750	105.03
7/9/67	1.08	0.36	0.73	1.300	2.08	YES	0.84	0.19	0.65	1.35	0.00	105.0	YES	0.70	YES	104.3	NO	0.0	0.0	0.000	19.5	104.3	24.33	0.1895	0.13	0	0.0000	104.20
7/10/67	4.41	0.36	4.05	1.300	2.08	NO	3.44	0.19	3.24	0.00	3.24	104.2	NO	0.00	YES	104.2	YES	3.2	3.0	0.000	19.5	107.2	24.30	0.1895	0.13	0	0.0000	107.08
7/11/67	6.01	0.36	5.66	1.300	2.08	NO	4.69	0.19	4.49	0.00	4.49	107.1	NO	0.00	YES	107.1	YES	4.5	3.0	0.000	19.5	110.1	24.39	0.1895	0.13	0	0.0000	109.95
7/12/67	1.44	0.36	1.09	1.300	2.08	YES	1.13	0.19	0.93	0.99	0.00	110.0	YES	0.06	YES	109.9	NO	0.0	0.0	0.000	19.5	109.9	24.46	0.1895	0.13	0	0.0000	109.77
7/13/67	1.12	0.36	0.77	1.300	2.08	YES	0.88	0.19	0.68	1.31	0.00	109.8	YES	0.63	YES	109.1	NO	0.0	0.0	0.000	19.5	109.1	24.46	0.1895	0.13	0	0.0000	109.01
7/14/67	1.08	0.36	0.73	1.300	2.08	YES	0.84	0.19	0.65	1.35	0.00	109.0	YES	0.70	YES	108.3	NO	0.0	0.0	0.000	19.5	108.3	24.44	0.1895	0.13	0.01	0.0068	108.19
7/15/67	1.40	0.36	1.05	1.300	2.08	YES	1.09	0.19	0.90	1.03	0.00	108.2	YES	0.13	YES	108.1	NO	0.0	0.0	0.000	19.5	108.1	24.42	0.1895	0.13	0	0.0000	107.93
7/16/67	1.04	0.36	0.69	1.300	2.08	YES	0.81	0.19	0.62	1.39	0.00	107.9	YES	0.77	YES	107.2	NO	0.0	0.0	0.000	19.5	107.2	24.41	0.1895	0.13	0	0.0000	107.03
7/17/67	0.96	0.36	0.61	1.300	2.08	YES	0.75	0.19	0.56	1.47	0.00	107.0	YES	0.92	YES	106.1	NO	0.0	0.0	0.000	19.5	106.1	24.39	0.1895	0.13	0	0.0000	105.99
7/18/67	0.92	0.36	0.57	1.300	2.08	YES	0.72	0.19	0.52	1.51	0.00	106.0	YES	0.99	YES	105.0	NO	0.0	0.0	0.000	19.5	105.0	24.36	0.1895	0.13	0	0.0000	104.87
7/19/67	0.88	0.36	0.53	1.300	2.08	YES	0.69	0.19	0.49	1.55	0.00	104.9	YES	1.06	YES	103.8	NO	0.0	0.0	0.000	19.5	103.8	24.32	0.1895	0.13	0	0.0000	103.69
7/20/67	0.88	0.36	0.53	1.300	2.08	YES	0.69	0.19	0.49	1.55	0.00	103.7	YES	1.06	YES	102.6	NO	0.0	0.0	0.750	20.3	103.4	24.28	0.1895	0.12	0.25	0.1704	103.43
7/21/67	0.96	0.36	0.61	1.300	2.08	YES	0.75	0.19	0.56	1.47	0.00	103.4	YES	0.92	YES	102.5	NO	0.0	0.0	0.750	21.0	103.3	24.27	0.1895	0.12	0	0.0000	103.13
7/22/67	1.00	0.36	0.65	1.300	2.08	YES	0.78	0.19	0.59	1.43	0.00	103.1	YES	0.85	YES	102.3	NO	0.0	0.0	0.750	21.8	103.0	24.26	0.1895	0.12	0	0.0000	102.91
7/23/67	0.84	0.36	0.49	1.300	2.08	YES	0.66	0.19	0.46	1.59	0.00	102.9	YES	1.13	YES	101.8	NO	0.0	0.0	0.750	22.5	102.5	24.25	0.1895	0.12	0	0.0000	102.41
7/24/67	0.84	0.36	0.49	1.300	2.08	YES	0.66	0.19	0.46	1.59	0.00	102.4	YES	1.13	YES	101.3	NO	0.0	0.0	0.750	23.3	102.0	24.23	0.1895	0.12	0	0.0000	101.90
7/25/67	1.16	0.36	0.81	1.300	2.08	YES	0.91	0.19	0.71	1.27	0.00	101.9	YES	0.56	YES	101.3	NO	0.0	0.0	0.750	24.0	102.1	24.20	0.1895	0.12	0.1	0.0682	102.04
7/26/67	1.24	0.36	0.89	1.300	2.08	YES	0.97	0.19	0.77	1.19	0.00	102.0	YES	0.42	YES	101.6	NO	0.0	0.0	0.750	24.8	102.4	24.21	0.1895	0.12	0	0.0000	102.24
7/27/67	0.96	0.36	0.61	1.300	2.08	YES	0.75	0.19	0.56	1.47	0.00	102.2	YES	0.92	YES	101.3	NO	0.0	0.0	0.750	25.5	102.1	24.22	0.1895	0.12	0	0.0000	101.95
7/28/67	0.84	0.36	0.49	1.300	2.08	YES	0.66	0.19	0.46	1.59	0.00	102.0	YES	1.13	YES	100.8	NO	0.0	0.0	0.750	26.3	101.6	24.21	0.1895	0.12	0.03	0.0204	101.47
7/29/67	0.92	0.36	0.57	1.300	2.08	YES	0.72	0.19	0.52	1.51	0.00	101.5	YES	0.99	YES	100.5	NO	0.0	0.0	0.750	27.0	101.2	24.19	0.1895	0.12	0.06	0.0409	101.15
7/30/67	1.20	0.36	0.85	1.300	2.08	YES	0.94	0.19	0.74	1.23	0.00	101.1	YES	0.49	YES	100.7	NO	0.0	0.0	0.750	27.8	101.4	24.17	0.1895	0.12	0	0.0000	101.28
7/31/67	0.88	0.36	0.53	1.300	2.08	YES	0.69	0.19	0.49	1.55	0.00	101.3	YES	1.06	YES	100.2	NO	0.0	0.0	0.750	28.5	101.0	24.18	0.1895	0.12	0	0.0000	100.85
8/1/67	0.80	0.36	0.45	1.243	1.99	YES	0.63	0.19	0.43	1.54	0.00	100.8	YES	1.11	YES	99.7	NO	0.0	0.0	0.750	29.3	100.5	24.16	0.1895	0.12	0	0.0000	100.36
8/2/67	0.88	0.36	0.53	1.243	1.99	YES	0.69	0.19	0.49	1.46	0.00	100.4	YES	0.97	YES	99.4	NO	0.0	0.0	0.750	30.0	100.1	24.13	0.1895	0.12	0	0.0000	100.02
8/3/67	2.16	0.36	1.81	1.243	1.99	YES	1.69	0.19	1.49	0.18	1.31	100.0	NO	0.00	YES	100.0	YES	1.3	1.3	0.750	30.8	102.1	24.12	0.1895	0.12	2.18	1.4858	103.45
8/4/67	13.75	0.36	13.40	1.243	1.99	NO	10.72	0.19	10.53	0.00	10.53	103.4	NO	0.00	YES	103.4	YES	10.5	3.0	0.750	31.5	107.2	24.27	0.1895	0.12	1.21	0.8247	107.90
8/5/67	4.41	0.36	4.05	1.243	1.99	NO	3.44	0.19	3.24	0.00	3.24	107.9	NO	0.00	YES	107.9	YES	3.2	3.0	0.750	32.3	111.6	24.41	0.1895	0.13	0.15	0.1022	111.62
8/6/67	1.76	0.36	1.41	1.243	1.99	YES	1.38	0.19	1.18	0.58	0.60	111.6	NO	0.00	YES	111.6	YES	0.6	0.6	0.750	33.0	113.0	24.49	0.1895	0.13	0	0.0000	112.85
8/7/67	1.44	0.36	1.09	1.243	1.99	YES	1.13	0.19	0.93	0.90	0.03	112.8	NO	0.00	YES	112.8	YES	0.0	0.0	0.750	33.8	113.6	24.50	0.1895	0.13	0	0.0000	113.50
8/8/67	1.52	0.36	1.17	1.243	1.99	YES	1.19	0.19	0.99	0.82	0.17	113.5	NO	0.00	YES	113.5	YES	0.2	0.2	0.750	34.5	114.4	24.51	0.1895	0.13	0	0.0000	114.30
8/9/67	1.96	0.36	1.61	1.243	1.99	YES	1.53	0.19	1.34	0.38	0.96	114.3	NO	0.00	YES	114.3	YES	1.0	1.0	0.750	35.3	116.0	24.52	0.1895	0.13	0	0.0000	115.88
8/10/67	8.74	0.36	8.38	1.243	1.99	NO	6.81	0.19	6.62	0.00	6.62	115.9	NO	0.00	YES	115.9	YES	6.6	3.0	0.000	35.3	118.9	24.52	0.1895	0.13	0.23	0.1568	118.91
8/11/67	1.96	0.36	1.61	1.243	1.99	YES	1.53	0.19	1.34	0.38	0.96	118.9	NO	0.00	YES	118.9	YES	1.0	1.0	0.000	35.3	119.9	24.52	0.1895	0.13	0	0.0000	119.74
8/12/67	1.60	0.36	1.25	1.243	1.99	YES	1.25	0.19	1.06	0.74	0.32	119.7	NO	0.00	YES	119.7	YES	0.3	0.3	0.000	35.3	120.1	24.51	0.1895	0.13	0	0.0000	119.93
8/13/67	1.44	0.36	1.09	1.243	1.99	YES	1.13	0.19	0.93	0.90	0.03	119.9	NO	0.00	YES	119.9	YES	0.0	0.0	0.000	35.3	120.0	24.51	0.1895	0.13	0	0.0000	119.83
8/14/67	1.40	0.36	1.05	1.243	1.99	YES	1.09	0.19	0.90	0.94	0.00	119.8	YES	0.04	YES	119.8	NO	0.0	0.0	0.000	35.3	119.8	24.51	0.1895	0.13	0	0.0000	119.66
8/15/67	1.24	0.36	0.89	1.243	1.99	YES	0.97	0.19	0.77	1.10	0.00	119.7	YES	0.33	YES	119.3	NO	0.0	0.0	0.000	35.3	119.3	24.51	0.1895	0.13	0	0.0000	119.21
8/16/67	1.16	0.36	0.81	1.243	1.99	YES	0.91	0.19	0.71	1.18	0.00	119.2	YES	0.47	YES	118.7	NO	0.0	0.0	0.000	35.3	118.7	24.51	0.1895	0.13	0	0.0000	118.62
8/17/67	1.12	0.36	0.77	1.243	1.99	YES	0.88	0.19	0.68	1.22	0.00	118.6	YES	0.54	YES	118.1	NO	0.0	0.0	0.000	35.3	118.1	24.52	0.1895	0.13	0	0.0000	117.95
8/18/67	1.12	0.36	0.77	1.243	1.99	YES	0.88	0.19	0.68	1.22	0.00	117.9	YES	0.54	YES	117.4	NO	0.0	0.0	0.000	35.3	117.4	24.52	0.1895	0.13	0	0.0000	117.28
8/19/67	1.08	0.36	0.73	1.243	1.99	YES	0.84	0.19	0.65	1.26	0.00	117.3	YES	0.61	YES	116.7	NO	0.0	0.0	0.000	35.3	116.7	24.52	0.1895	0.13	0.65	0.4430	116.99
8/20/67	1.40	0.36	1.05	1.243	1.99	YES	1.09	0.19	0.90	0.94	0.00	117.0	YES	0.04	YES	116.9	NO	0.0	0.0	0.000	35.3	116.9	24.52	0.1895	0.13	0.2	0.1363	116.95
8/21/67	1.48	0.36	1.13	1.243	1.99	YES	1.16	0.19	0.96	0.86	0.10	117.0	NO	0.00	YES	117.0	YES	0.1	0.1	0.000	35.3	117.1	24.52	0.1895	0.13	0.14	0.0954	117.03
8/22/67	1.28	0.36	0.93	1.243	1.99	YES	1.00	0.19	0.81	1.06	0.00	117.0	YES	0.26	YES	116.8	NO	0.0	0.0	0.000	35.3	116.8	24.52	0.1895	0.13	0	0.0000	116.64
8/23/67	1.16	0.36	0.81	1.243	1.99	YES	0.91	0.19	0.71	1.18	0.00	116.6	YES	0.47	YES	116.2	NO	0.0	0.0	0.000	35.3	116.2	24.52	0.1895	0.13	0.21	0.1431	116.19
8/24/67	2.61	0.36	2.25	1.243	1.99	NO	2.03	0.19	1.84	0.00	1.84	116.2	NO	0.00	YES	116.2	YES	1.8	1.8	0.000	35.3	118.0	24.52	0.1895	0.13	1.56	1.0633	118.97
8/25/67	8.74	0.36	8.38	1.243	1.99	NO	6.81	0.19	6.62	0.00	6.62	119.0	NO	0.00	YES	119.0	YES	6.6	3.0	0.000	35.3	121.8	24.51	0.1895	0.13	1.34	0.9133	121.80
8/26/67	3.85	0.36	3.49	1.243	1.99	NO	3.00	0.19	2.81	0.00	2.81	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.1895	0.13	0.09	0.0613	121.74
8/27/67	38.85	0.36	38.49	1.243	1.99	NO	30.28	0.19	30.09	0.00	30.09	121.7	NO	0.00	YES	121.7	YES	30.1	3.0	0.000	35.3	121.8	24.48	0.1895	0.13	0.91	0.6202	121.80
8/28/67	7.06	0.36	6.70	1.243	1.99	NO	5.50	0.19	5.31	0.00	5.31	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.1895	0.13	0	0.0000	121.67
8/29/67	3.65	0.36	3.29	1.243	1.99	NO	2.84	0.19	2.65	0.00	2.65	121.7	NO	0.00	YES	121.7	YES	2.7	2.7	0.000	35.3	121.8	24.48	0.1895	0.13	0	0.0000	121.67
8/30/67	2.81	0.36	2.45	1.243	1.99	NO	2.19	0.19	1.99	0.00	1.99	121.7	NO	0.00	YES	121.7	YES	2.0	2.0	0.000	35.3	121.8	24.48	0.1895	0.13	0	0.0000	121.67
8/31/67	2.41	0.36	2.05	1.243	1.99	NO	1.88	0.19	1.68	0.00	1.68	121.7	NO	0.00	YES	121.7	YES	1.7	1.7	0.000	35.3	121.8	24.48	0.1895	0.13	0	0.0000	121.67
9/1/67	2.04	0.36	1.69	1.017	1.63	NO	1.59	0.19	1.40	0.00	1.40	121.7	NO	0.00	YES	121.7	YES	1.4	1.4	0.000	35.3	121.8	24.48	0.1895	0.13	0	0.0000	121.67
9/2/67	1.84	0.36	1.49	1.017	1.63	YES	1.44	0.19	1.24	0.14	1.10	121.7	NO	0.00	YES	121.7	YES	1.1	1.1	0.000	35.3	121.8	24.48	0.1895	0.13	0	0.0000	121.67
9/3/67	1.72	0.36	1.37	1.017	1.63	YES	1.34	0.19	1.15	0.26	0.89	121.7	NO	0.00	YES	121.7	YES	0.9	0.9	0.000	35.3	121.8	24.48	0.1895	0.13	0	0.0000	121.67
9/4/67	1.60	0.36	1.25	1.017	1.63	YES	1.25	0.19	1.06	0.38	0.68	121.7	NO	0.00	YES	121.7	YES	0.7	0.7	0.000	35.3	121.8	24.48	0.1895	0.13	0	0.0000	121.67
9/5/67	1.52	0.36	1.17	1.017	1.63	YES	1.19	0.19	0.99	0.46	0.53	121.7	NO	0.00	YES	121.7	YES	0.5	0.5	0.000	35.3	121.8	24.48	0.1895	0.13	0	0.0000	121.67

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity	1.60	mgd	Hull Creek Minimum Stream Flow-By:	0.355	mgd	Min Reservoir Level	12.6	ft	
Reservoir Volume	121.80	MG	Cranberry Branch Minimum Stream Flow-By:	0.194	mgd				
Medford Quarry Start Setpoint	104	MG							
Medford Quarry Pump Rate	0.750	MGD	`	MQ Stop Set Point	116.0	MG			
Medford Quarry Max Annual Vol	176	MG							
	234	days							

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
9/6/67	1.40	0.36	1.05	1.017	1.63	YES	1.09	0.19	0.90	0.58	0.32	121.7	NO	0.00	YES	121.7	YES	0.3	0.3	0.000	35.3	121.8	24.48	0.1895	0.13	0	0.0000	121.67
9/7/67	1.36	0.36	1.01	1.017	1.63	YES	1.06	0.19	0.87	0.62	0.25	121.7	NO	0.00	YES	121.7	YES	0.2	0.2	0.000	35.3	121.8	24.48	0.1895	0.13	0	0.0000	121.67
9/8/67	1.32	0.36	0.97	1.017	1.63	YES	1.03	0.19	0.84	0.66	0.18	121.7	NO	0.00	YES	121.7	YES	0.2	0.2	0.000	35.3	121.8	24.48	0.1895	0.13	0	0.0000	121.67
9/9/67	1.28	0.36	0.93	1.017	1.63	YES	1.00	0.19	0.81	0.70	0.11	121.7	NO	0.00	YES	121.7	YES	0.1	0.1	0.000	35.3	121.8	24.48	0.1895	0.13	0.01	0.0068	121.66
9/10/67	1.36	0.36	1.01	1.017	1.63	YES	1.06	0.19	0.87	0.62	0.25	121.7	NO	0.00	YES	121.7	YES	0.2	0.2	0.000	35.3	121.8	24.48	0.1895	0.13	0	0.0000	121.67
9/11/67	1.24	0.36	0.89	1.017	1.63	YES	0.97	0.19	0.77	0.74	0.03	121.7	NO	0.00	YES	121.7	YES	0.0	0.0	0.000	35.3	121.7	24.48	0.1895	0.13	0	0.0000	121.58
9/12/67	1.16	0.36	0.81	1.017	1.63	YES	0.91	0.19	0.71	0.82	0.00	121.6	YES	0.11	YES	121.5	NO	0.0	0.0	0.000	35.3	121.5	24.49	0.1895	0.13	0	0.0000	121.35
9/13/67	1.12	0.36	0.77	1.017	1.63	YES	0.88	0.19	0.68	0.86	0.00	121.3	YES	0.18	YES	121.2	NO	0.0	0.0	0.000	35.3	121.2	24.49	0.1895	0.13	0	0.0000	121.04
9/14/67	1.12	0.36	0.77	1.017	1.63	YES	0.88	0.19	0.68	0.86	0.00	121.0	YES	0.18	YES	120.9	NO	0.0	0.0	0.000	35.3	120.9	24.49	0.1895	0.13	0	0.0000	120.74
9/15/67	1.08	0.36	0.73	1.017	1.63	YES	0.84	0.19	0.65	0.90	0.00	120.7	YES	0.25	YES	120.5	NO	0.0	0.0	0.000	35.3	120.5	24.50	0.1895	0.13	0	0.0000	120.36
9/16/67	1.04	0.36	0.69	1.017	1.63	YES	0.81	0.19	0.62	0.94	0.00	120.4	YES	0.32	YES	120.0	NO	0.0	0.0	0.000	35.3	120.0	24.50	0.1895	0.13	0.02	0.0136	119.93
9/17/67	1.08	0.36	0.73	1.017	1.63	YES	0.84	0.19	0.65	0.90	0.00	119.9	YES	0.25	YES	119.7	NO	0.0	0.0	0.000	35.3	119.7	24.51	0.1895	0.13	0	0.0000	119.55
9/18/67	1.04	0.36	0.69	1.017	1.63	YES	0.81	0.19	0.62	0.94	0.00	119.6	YES	0.32	YES	119.2	NO	0.0	0.0	0.000	35.3	119.2	24.51	0.1895	0.13	0	0.0000	119.10
9/19/67	1.00	0.36	0.65	1.017	1.63	YES	0.78	0.19	0.59	0.98	0.00	119.1	YES	0.39	YES	118.7	NO	0.0	0.0	0.000	35.3	118.7	24.51	0.1895	0.13	0	0.0000	118.58
9/20/67	1.00	0.36	0.65	1.017	1.63	YES	0.78	0.19	0.59	0.98	0.00	118.6	YES	0.39	YES	118.2	NO	0.0	0.0	0.000	35.3	118.2	24.52	0.1895	0.13	0	0.0000	118.06
9/21/67	1.08	0.36	0.73	1.017	1.63	YES	0.84	0.19	0.65	0.90	0.00	118.1	YES	0.25	YES	117.8	NO	0.0	0.0	0.000	35.3	117.8	24.52	0.1895	0.13	0.01	0.0068	117.69
9/22/67	1.20	0.36	0.85	1.017	1.63	YES	0.94	0.19	0.74	0.78	0.00	117.7	YES	0.04	YES	117.7	NO	0.0	0.0	0.000	35.3	117.7	24.52	0.1895	0.13	0	0.0000	117.53
9/23/67	1.00	0.36	0.65	1.017	1.63	YES	0.78	0.19	0.59	0.98	0.00	117.5	YES	0.39	YES	117.1	NO	0.0	0.0	0.000	35.3	117.1	24.52	0.1895	0.13	0	0.0000	117.01
9/24/67	1.04	0.36	0.69	1.017	1.63	YES	0.81	0.19	0.62	0.94	0.00	117.0	YES	0.32	YES	116.7	NO	0.0	0.0	0.000	35.3	116.7	24.52	0.1895	0.13	0	0.0000	116.56
9/25/67	1.00	0.36	0.65	1.017	1.63	YES	0.78	0.19	0.59	0.98	0.00	116.6	YES	0.39	YES	116.2	NO	0.0	0.0	0.000	35.3	116.2	24.52	0.1895	0.13	0	0.0000	116.04
9/26/67	0.96	0.36	0.61	1.017	1.63	YES	0.75	0.19	0.56	1.02	0.00	116.0	YES	0.46	YES	115.6	NO	0.0	0.0	0.000	35.3	115.6	24.52	0.1895	0.13	0	0.0000	115.45
9/27/67	0.96	0.36	0.61	1.017	1.63	YES	0.75	0.19	0.56	1.02	0.00	115.5	YES	0.46	YES	115.0	NO	0.0	0.0	0.000	35.3	115.0	24.52	0.1895	0.13	0	0.0000	114.86
9/28/67	1.08	0.36	0.73	1.017	1.63	YES	0.84	0.19	0.65	0.90	0.00	114.9	YES	0.25	YES	114.6	NO	0.0	0.0	0.000	35.3	114.6	24.52	0.1895	0.13	0.16	0.1091	114.59
9/29/67	1.32	0.36	0.97	1.017	1.63	YES	1.03	0.19	0.84	0.66	0.18	114.6	NO	0.00	YES	114.6	YES	0.2	0.2	0.000	35.3	114.8	24.52	0.1895	0.13	0.01	0.0068	114.65
9/30/67	1.04	0.36	0.69	1.017	1.63	YES	0.81	0.19	0.62	0.94	0.00	114.7	YES	0.32	YES	114.3	NO	0.0	0.0	0.000	35.3	114.3	24.52	0.1895	0.13	0	0.0000	114.20
10/1/67	1.00	0.36	0.65	1.017	1.63	YES	0.78	0.19	0.59	0.98	0.00	114.2	YES	0.39	YES	113.8	NO	0.0	0.0	0.000	35.3	113.8	24.52	0.1895	0.13	0	0.0000	113.69
10/2/67	1.00	0.36	0.65	1.017	1.63	YES	0.78	0.19	0.59	0.98	0.00	113.7	YES	0.39	YES	113.3	NO	0.0	0.0	0.000	35.3	113.3	24.51	0.1895	0.13	0	0.0000	113.17
10/3/67	1.00	0.36	0.65	1.017	1.63	YES	0.78	0.19	0.59	0.98	0.00	113.2	YES	0.39	YES	112.8	NO	0.0	0.0	0.000	35.3	112.8	24.51	0.1895	0.13	0	0.0000	112.65
10/4/67	0.96	0.36	0.61	1.017	1.63	YES	0.75	0.19	0.56	1.02	0.00	112.6	YES	0.46	YES	112.2	NO	0.0	0.0	0.000	35.3	112.2	24.50	0.1895	0.13	0	0.0000	112.06
10/5/67	0.92	0.36	0.57	1.017	1.63	YES	0.72	0.19	0.52	1.06	0.00	112.1	YES	0.54	YES	111.5	NO	0.0	0.0	0.000	35.3	111.5	24.49	0.1895	0.13	0	0.0000	111.40
10/6/67	0.92	0.36	0.57	1.017	1.63	YES	0.72	0.19	0.52	1.06	0.00	111.4	YES	0.54	YES	110.9	NO	0.0	0.0	0.000	35.3	110.9	24.48	0.1895	0.13	0	0.0000	110.74
10/7/67	0.92	0.36	0.57	1.017	1.63	YES	0.72	0.19	0.52	1.06	0.00	110.7	YES	0.54	YES	110.2	NO	0.0	0.0	0.000	35.3	110.2	24.47	0.1895	0.13	0	0.0000	110.07
10/8/67	1.00	0.36	0.65	1.017	1.63	YES	0.78	0.19	0.59	0.98	0.00	110.1	YES	0.39	YES	109.7	NO	0.0	0.0	0.000	35.3	109.7	24.46	0.1895	0.13	0	0.0000	109.56
10/9/67	1.04	0.36	0.69	1.017	1.63	YES	0.81	0.19	0.62	0.94	0.00	109.6	YES	0.32	YES	109.2	NO	0.0	0.0	0.000	35.3	109.2	24.45	0.1895	0.13	0	0.0000	109.11
10/10/67	1.56	0.36	1.21	1.017	1.63	YES	1.22	0.19	1.02	0.42	0.61	109.1	NO	0.00	YES	109.1	YES	0.6	0.6	0.000	35.3	109.7	24.44	0.1895	0.13	0.41	0.2794	109.87
10/11/67	1.68	0.36	1.33	1.017	1.63	YES	1.31	0.19	1.12	0.30	0.82	109.9	NO	0.00	YES	109.9	YES	0.8	0.8	0.000	35.3	110.7	24.46	0.1895	0.13	0	0.0000	110.56
10/12/67	1.16	0.36	0.81	1.017	1.63	YES	0.91	0.19	0.71	0.82	0.00	110.6	YES	0.11	YES	110.5	NO	0.0	0.0	0.000	35.3	110.5	24.47	0.1895	0.13	0	0.0000	110.33
10/13/67	1.08	0.36	0.73	1.017	1.63	YES	0.84	0.19	0.65	0.90	0.00	110.3	YES	0.25	YES	110.1	NO	0.0	0.0	0.000	35.3	110.1	24.47	0.1895	0.13	0	0.0000	109.95
10/14/67	1.08	0.36	0.73	1.017	1.63	YES	0.84	0.19	0.65	0.90	0.00	110.0	YES	0.25	YES	109.7	NO	0.0	0.0	0.000	35.3	109.7	24.46	0.1895	0.13	0	0.0000	109.58
10/15/67	1.08	0.36	0.73	1.017	1.63	YES	0.84	0.19	0.65	0.90	0.00	109.6	YES	0.25	YES	109.3	NO	0.0	0.0	0.000	35.3	109.3	24.45	0.1895	0.13	0	0.0000	109.20
10/16/67	1.08	0.36	0.73	1.017	1.63	YES	0.84	0.19	0.65	0.90	0.00	109.2	YES	0.25	YES	109.0	NO	0.0	0.0	0.000	35.3	109.0	24.44	0.1895	0.13	0	0.0000	108.83
10/17/67	1.08	0.36	0.73	1.017	1.63	YES	0.84	0.19	0.65	0.90	0.00	108.8	YES	0.25	YES	108.6	NO	0.0	0.0	0.000	35.3	108.6	24.44	0.1895	0.13	0	0.0000	108.45
10/18/67	1.40	0.36	1.05	1.017	1.63	YES	1.09	0.19	0.90	0.58	0.32	108.4	NO	0.00	YES	108.4	YES	0.3	0.3	0.000	35.3	108.8	24.43	0.1895	0.13	0.16	0.1091	108.75
10/19/67	1.88	0.36	1.53	1.017	1.63	YES	1.47	0.19	1.27	0.10	1.18	108.8	NO	0.00	YES	108.8	YES	1.2	1.2	0.000	35.3	109.9	24.43	0.1895	0.13	0	0.0000	109.80
10/20/67	1.32	0.36	0.97	1.017	1.63	YES	1.03	0.19	0.84	0.66	0.18	109.8	NO	0.00	YES	109.8	YES	0.2	0.2	0.000	35.3	110.0	24.46	0.1895	0.13	0	0.0000	109.86
10/21/67	1.24	0.36	0.89	1.017	1.63	YES	0.97	0.19	0.77	0.74	0.04	109.9	NO	0.00	YES	109.9	YES	0.0	0.0	0.000	35.3	109.9	24.46	0.1895	0.13	0	0.0000	109.77
10/22/67	1.16	0.36	0.81	1.017	1.63	YES	0.91	0.19	0.71	0.82	0.00	109.8	YES	0.11	YES	109.7	NO	0.0	0.0	0.000	35.3	109.7	24.46	0.1895	0.13	0	0.0000	109.53
10/23/67	1.16	0.36	0.81	1.017	1.63	YES	0.91	0.19	0.71	0.82	0.00	109.5	YES	0.11	YES	109.4	NO	0.0	0.0	0.000	35.3	109.4	24.45	0.1895	0.13	0	0.0000	109.30
10/24/67	1.16	0.36	0.81	1.017	1.63	YES	0.91	0.19	0.71	0.82	0.00	109.3	YES	0.11	YES	109.2	NO	0.0	0.0	0.000	35.3	109.2	24.45	0.1895	0.13	0	0.0000	109.07
10/25/67	2.41	0.36	2.05	1.017	1.63	NO	1.88	0.19	1.68	0.00	1.68	109.1	NO	0.00	YES	109.1	YES	1.7	1.7	0.000	35.3	110.7	24.44	0.1895	0.13	0.77	0.5248	111.15
10/26/67	2.65	0.36	2.29	1.017	1.63	NO	2.06	0.19	1.87	0.00	1.87	111.1	NO	0.00	YES	111.1	YES	1.9	1.9	0.000	35.3	113.0	24.48	0.1895	0.13	0	0.0000	112.89
10/27/67	1.52	0.36	1.17	1.017	1.63	YES	1.19	0.19	0.99	0.46	0.53	112.9	NO	0.00	YES	112.9	YES	0.5	0.5	0.000	35.3	113.4	24.50	0.1895	0.13	0	0.0000	113.30
10/28/67	1.32	0.36	0.97	1.017	1.63	YES	1.03	0.19	0.84	0.66	0.18	113.3	NO	0.00	YES	113.3	YES	0.2	0.2	0.000	35.3	113.5	24.51	0.1895	0.13	0	0.0000	113.35
10/29/67	1.20	0.36	0.85	1.017	1.63	YES	0.94	0.19	0.74	0.78	0.00	113.4	YES	0.04	YES	113.3	NO	0.0	0.0	0.000	35.3	113.3	24.51	0.1895	0.13	0	0.0000	113.19
10/30/67	1.16	0.36	0.81	1.017	1.63	YES	0.91	0.19	0.71	0.82	0.00	113.2	YES	0.11	YES	113.1	NO	0.0	0.0	0.000	35.3	113.1	24.51	0.1895	0.13	0	0.0000	112.96
10/31/67	1.16	0.36	0.81	1.017	1.63	YES	0.91	0.19	0.71	0.82	0.00	113.0	YES	0.11	YES	112.8	NO	0.0	0.0	0.000	35.3	112.8	24.51	0.1895	0.13	0	0.0000	112.72
11/1/67	1.16	0.36	0.81	0.890	1.42	YES	0.91	0.19	0.71	0.62	0.10	112.7	NO	0.00	YES	112.7	YES	0.1	0.1	0.000	35.3	112.8	24.50	0.0000	0.00	0	0.0000	112.82
11/2/67	2.37	0.36	2.01	0.890	1.42	NO	1.84	0.19	1.65	0.00	1.65	112.8	NO	0.00	YES	112.8	YES	1.6	1.6	0.000	35.3	114.5	24.50	0.0000	0.00	0.95	0.6475	115.12
11/3/67	2.81	0.36	2.45	0.890	1.42	NO	2.19	0.19	1.99	0.00	1.99	115.1	NO	0.00	YES	115.1	YES	2.0	2.0	0.000	35.3	117.1	24.52	0.0000	0.00	0	0.0000	117.11
11/4/67	1.76	0.36	1.41	0.890	1.42	YES	1.38	0.19	1.18	0.01	1.17	117.1	NO	0.00	YES	117.1	YES	1.2	1.2	0.000	35.3	118.3	24.52	0.0000	0.00	0.02	0.0136	118.29
11/5/67	1.52	0.36	1.17	0.890	1.42	YES	1.19	0.19	0.99	0.26	0.74	118.3	NO	0.00	YES	118.3	YES	0.7	0.7	0.000	35.3	119.0	24.52	0.0000	0.00	0	0.0000	119.03
11/6/67	1.40	0.36	1.05	0.890	1.42	YES	1.09	0.19	0.90	0.38	0.52	119.0	NO	0.00	YES	119.0	YES	0.5	0.5	0.000	35.3	119.6	24.51	0.0000	0.00	0	0.0000	119.55
11/7/67	1.36	0.36	1.01	0.890	1.42	YES	1.06	0.19	0.87	0.42	0.45	119.6	NO	0.00	YES	119.6	YES	0.5	0.5	0.000	35.3	120.0	24.51	0.0000	0.00	0	0.0000	120.00
11/8/67	1.28	0.36	0.93	0.890	1.42	YES	1.00	0.19	0.81	0.50	0.31	120.0	NO	0.00	YES	120.0	YES	0.3	0.3	0.000	35.3	120.3	24.51	0.0000	0.00	0	0.0000	120.31
11/9/67	1.28	0.36	0.93	0.890	1.42	YES	1.00	0.19	0.81	0.50	0.31	120.3	NO	0.00	YES	120.3	YES	0.3	0.3	0.000	35.3	120.6	24.50	0.0000	0.00	0	0.0000	120.62
11/10/67	1.28	0.36	0.93	0.890	1.42	YES	1.00	0.19	0.81	0.50	0.31	120.6	NO	0.00	YES	120.6	YES	0.3	0.3	0.000	35.3	120.9	24.50	0.0000	0.00	0	0.0000	120.93
11/11/67	1.24	0.36	0.89	0.890	1.42	YES	0.97	0.19	0.77	0.54	0.24	120.9	NO	0.00	YES	120.9	YES	0.2	0.2	0.000	35.3	121.2	24.49	0.0000	0.00	0	0.0000	121.17
11/12/67	1.24	0.36	0.89	0.890	1.42	YES	0.97	0.19	0.77	0.54	0.24	121.2	NO	0.00	YES	121.2	YES	0.2	0.2	0.000	35.3	121.4	24.49	0.0000	0.00	0	0.0000	121.41
11/13/67	1.24	0.36	0.89	0.890	1.42	YES	0.97	0.19	0.77	0.54	0.24	121.4	NO	0.00	YES	121.4	YES	0.2	0.2	0.000	35.3	121.7	24.49	0.0000	0.00	0	0.0000	121.65
11/14/67	1.20	0.36	0.85	0.890	1.42	YES	0.94	0.19	0.74	0.58	0.17	121.7	NO	0.00	YES	121.7	YES	0.2	0.2	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
11/15/67	1.20	0.36	0.85	0.890	1.42	YES	0.94	0.19	0.74	0.58	0.17	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
11/16/67	1.12	0.36	0.77	0.890	1.42	YES	0.88	0.19	0.68	0.66	0.02	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
11/17/67	1.16	0.36	0.81	0.890	1.42	YES	0.91	0.19	0.71	0.62	0.10	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0.01	0.0068	121.80
11/18/67	1.24	0.36	0.89	0.890	1.42	YES	0.97	0.19	0.77	0.54	0.24	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0.1	0.0682	121.80
11/19/67	1.16	0.36	0.81	0.890	1.42	YES	0.91	0.19	0.71	0.62	0.10	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
11/20/67	1.08	0.36	0.73	0.890	1.42	YES	0.84	0.19	0.65	0.70	0.00	121.8	YES	0.05	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.75
11/21/67	1.12	0.36	0.77	0.890	1.42	YES	0.88	0.19	0.68	0.66	0.02	121.8	NO	0.00	YES	121.8	YES	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0.03	0.0204	121.80
11/22/67	1.36	0.36	1.01	0.890	1.42	YES	1.06	0.19	0.87	0.42	0.45	121.8	NO	0.00	YES	121.8	YES	0.5	0.5	0.000	35.3	121.8	24.48	0.0000	0.00	0.03	0.0204	121.80
11/23/67	1.48	0.36	1.13	0.890	1.42	YES	1.16	0.19	0.96	0.30	0.67	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0.14	0.0954	121.80
11/24/67	1.36	0.36	1.01	0.890	1.42	YES	1.06	0.19	0.87	0.42	0.45	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0.1	0.0682	121.80
11/25/67	1.36	0.36	1.01	0.890	1.42	YES	1.06	0.19	0.87	0.42	0.45	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0.03	0.0204	121.80
11/26/67	1.24	0.36	0.89	0.890	1.42	YES	0.97	0.19	0.77	0.54	0.24	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
11/27/67	1.20	0.36	0.85	0.890	1.42	YES	0.94	0.19	0.74	0.58	0.17	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
11/28/67	1.12	0.36	0.77	0.890	1.42	YES	0.88	0.19	0.68	0.66	0.02	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80

Table F-1: Revised City of Westminster Flow Mass Analysis

Average Reliable Capacity			1.60	mgd	Hull Creek Minimum Stream Flow-By:				0.355	mgd	Min Reservoir Level		12.6	ft	Medford Quarry Pump Rate			0.750	MGD	`		MQ Stop Set Point		116.0	MG			
Reservoir Volume			121.80	MG	Cranberry Branch Minimum Stream Flow-By:				0.194	mgd					Medford Quarry Max Annual Vol			176	MG									
Medford Quarry Start Setpoint			104	MG														234	days										
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Date	Hull Creek Stream Flow (mgd)	Hull Creek Minimum Stream Flow (mgd)	Available Hull Creek Stream Flow (mgd)	MDE Monthly Multiplier	Monthly Reliable Capacity (mgd)	Cranberry Branch Required for Treatment (Y/N)	Cranberry Branch Stream Flow (mgd)	Cranberry Branch Minimum Stream Flow (mgd)	Available Cranberry Branch Stream Flow (mgd)	Cranberry Branch Daily Required Supplement (mgd)	Cranberry Branch Available After Reliable Capacity (mgd)	Starting Reservoir Volume (MG)	Reservoir Required (Y/N)	Required Reservoir Flow (mgd)	Reservoir Capacity Available (Y/N)	Reservoir Volume After Withdrawal (MG)	Reservoir Fill Available (Y/N)	Reservoir Fill Amount (Y/N)	Check Pump Capacity (3 mgd)	Medford Quarry Flow to Reservoir (MGD)	Cumulative Medford Quarry Volume (MG)	Reservoir Volume After Fill (MG)	Reservoir Water Surface Area (acres)	Pan Evaporation (inches)	Evaporation Loss (MG)	BWI Precipitation Amount (inches)	Precipitation Volume (MG)	Final Reservoir Volume (MG)
11/29/67	1.08	0.36	0.73	0.890	1.42	YES	0.84	0.19	0.65	0.70	0.00	121.8	YES	0.05	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.75
11/30/67	1.08	0.36	0.73	0.890	1.42	YES	0.84	0.19	0.65	0.70	0.00	121.8	YES	0.05	YES	121.7	NO	0.0	0.0	0.000	35.3	121.7	24.48	0.0000	0.00	1.19	0.8111	121.80
12/1/67	1.44	0.36	1.09	0.814	1.30	YES	1.13	0.19	0.93	0.21	0.72	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/2/67	1.68	0.36	1.33	0.814	1.30	NO	1.31	0.19	1.12	0.00	1.12	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0.05	0.0341	121.80
12/3/67	6.25	0.36	5.90	0.814	1.30	NO	4.88	0.19	4.68	0.00	4.68	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	1.43	0.9746	121.80
12/4/67	3.57	0.36	3.21	0.814	1.30	NO	2.78	0.19	2.59	0.00	2.59	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/5/67	2.33	0.36	1.97	0.814	1.30	NO	1.81	0.19	1.62	0.00	1.62	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/6/67	2.08	0.36	1.73	0.814	1.30	NO	1.63	0.19	1.43	0.00	1.43	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/7/67	2.08	0.36	1.73	0.814	1.30	NO	1.63	0.19	1.43	0.00	1.43	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0.01	0.0068	121.80
12/8/67	2.04	0.36	1.69	0.814	1.30	NO	1.59	0.19	1.40	0.00	1.40	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/9/67	1.76	0.36	1.41	0.814	1.30	NO	1.38	0.19	1.18	0.00	1.18	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/10/67	1.84	0.36	1.49	0.814	1.30	NO	1.44	0.19	1.24	0.00	1.24	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	1.05	0.7157	121.80
12/11/67	5.49	0.36	5.14	0.814	1.30	NO	4.28	0.19	4.09	0.00	4.09	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0.47	0.3203	121.80
12/12/67	4.37	0.36	4.01	0.814	1.30	NO	3.41	0.19	3.21	0.00	3.21	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0.29	0.1977	121.80
12/13/67	3.05	0.36	2.69	0.814	1.30	NO	2.38	0.19	2.18	0.00	2.18	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/14/67	2.45	0.36	2.09	0.814	1.30	NO	1.91	0.19	1.71	0.00	1.71	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/15/67	2.16	0.36	1.81	0.814	1.30	NO	1.69	0.19	1.49	0.00	1.49	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/16/67	1.96	0.36	1.61	0.814	1.30	NO	1.53	0.19	1.34	0.00	1.34	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/17/67	1.80	0.36	1.45	0.814	1.30	NO	1.41	0.19	1.21	0.00	1.21	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/18/67	1.72	0.36	1.37	0.814	1.30	NO	1.34	0.19	1.15	0.00	1.15	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0.02	0.0136	121.80
12/19/67	1.64	0.36	1.29	0.814	1.30	YES	1.28	0.19	1.09	0.01	1.07	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/20/67	1.56	0.36	1.21	0.814	1.30	YES	1.22	0.19	1.02	0.09	0.93	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/21/67	1.52	0.36	1.17	0.814	1.30	YES	1.19	0.19	0.99	0.13	0.86	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/22/67	1.80	0.36	1.45	0.814	1.30	NO	1.41	0.19	1.21	0.00	1.21	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0.35	0.2386	121.80
12/23/67	1.76	0.36	1.41	0.814	1.30	NO	1.38	0.19	1.18	0.00	1.18	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0.05	0.0341	121.80
12/24/67	1.52	0.36	1.17	0.814	1.30	YES	1.19	0.19	0.99	0.13	0.86	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/25/67	1.48	0.36	1.13	0.814	1.30	YES	1.16	0.19	0.96	0.17	0.79	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0.09	0.0613	121.80
12/26/67	1.72	0.36	1.37	0.814	1.30	NO	1.34	0.19	1.15	0.00	1.15	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/27/67	1.48	0.36	1.13	0.814	1.30	YES	1.16	0.19	0.96	0.17	0.79	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/28/67	2.04	0.36	1.69	0.814	1.30	NO	1.59	0.19	1.40	0.00	1.40	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	1.25	0.8520	121.80
12/29/67	6.09	0.36	5.74	0.814	1.30	NO	4.75	0.19	4.56	0.00	4.56	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/30/67	2.81	0.36	2.45	0.814	1.30	NO	2.19	0.19	1.99	0.00	1.99	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0	0.0000	121.80
12/31/67	2.37	0.36	2.01	0.814	1.30	NO	1.84	0.19	1.65	0.00	1.65	121.8	NO	0.00	YES	121.8	NO	0.0	0.0	0.000	35.3	121.8	24.48	0.0000	0.00	0.25	0.1704	121.80

Appendix G – New Water Allocation Policy (Resolution No. R15-2) and Summary

Sponsored by: Kevin R. Utz, Mayor
Robert Wack, Council President

RESOLUTION 15-2
OF THE MAYOR AND COMMON COUNCIL OF WESTMINSTER, ADOPTING A REVISED WATER AND WASTEWATER ALLOCATION POLICY SUPERSEDING THE POLICY SET FORTH IN RESOLUTION R-08-3

WHEREAS, the City of Westminster ("City") owns and operates two water supply systems serving the City and the surrounding portions of Carroll County, Maryland; and

WHEREAS, in the past, the City has from time to time experienced drought conditions which have adversely affected the availability of the City's water supply and the City has taken significant steps to improve its water system capacity; and

WHEREAS, the City has been working with the Maryland Department of the Environment ("MDE") to bridge the gap between its water supply and demand during drought conditions;

WHEREAS, the City and MDE entered into a Consent Order dated April 3, 2007, which has assisted the City in improving water system capacity and the drought year deficit and required the City to adopt an interim Allocation Policy to regulate the allocation of water provided for in the Consent Order; and

WHEREAS, Section 160-14 of the Westminster City Code authorizes The Mayor and Common Council of Westminster ("the Mayor and Common Council") to establish by Resolution an Allocation Policy regarding the issuance of water connections; and

WHEREAS, Section 124-22 of the Westminster City Code authorizes The Mayor and Common Council of Westminster ("the Mayor and Common Council") to establish by Resolution an Allocation Policy regarding the issuance of wastewater connections; and

WHEREAS, Section of the Westminster City Code authorizes The Mayor and Common Council of Westminster ("the Mayor and Common Council") to establish an Allocation Policy regarding the issuance of water connections; and

WHEREAS, the Mayor and Common Council has previously enacted Water Allocation policies by Resolution No. R07-2 and No. R08-3; and

WHEREAS, the Mayor and Common Council anticipates additional water sources becoming available in the foreseeable future and find that it behooves the City to revise its current policy in preparation for such eventuality; and

WHEREAS, the Mayor and Common Council Common Council wish to provide guidelines for the allocation of wastewater capacity in order to provide for the orderly distribution of capacity that may become scarce; and

WHEREAS, the Mayor and Common Council have conducted public hearings upon a proposed revised water and wastewater allocation policy and received input from members of the public in connection therewith.

NOW, THEREFORE, BE IT RESOLVED by the Mayor and Common Council that it hereby adopts the following revised Allocation Policy for the issuance of water and wastewater connections.

I. Introduction

In accord with the terms of a Consent Order, jointly approved by the City of Westminster (City) and the Maryland Department of the Environment (MDE) on April 3, 2007, the City adopted an interim Water Allocation Policy to regulate the issuance of public water service connections. On April 9, 2007, the Mayor and Common Council adopted Resolution No. R07-2 that contained an interim Allocation Policy as required in the Consent Order. R07-2 limited new

water allocations to residential, non-residential and emergency development projects having received the requisite approvals from the City prior to April 1, 2007.

On January 28, 2008, the Mayor and Common Council adopted Resolution No. R08-3, effectively modifying the original interim Allocation Policy. In addition to the residential, non-residential and emergency projects regulated by the prior Resolution, R08-3 added a category of projects to be considered when a change-of-use resulted in an increase over the original allocation.

The Mayor and Common Council now desire to modify the Allocation Policy in anticipation of limited water and wastewater service capacity expected to be available henceforth to new and re-development projects within the incorporated and unincorporated areas of the City's existing water and sewer service districts.

The policies contained herein represent long-term solutions to the capacity issues that gave rise to the need for the 2007 Consent Order with MDE. Strict adherence to the policy, adoption of the implementing ordinances that follow, and timely construction of the requisite capital improvements to the City's water and wastewater systems, ensure that the City's allocation of water and wastewater capacity will continue in a planned and measured fashion without further administrative delay.

II. Allocation of Water and Wastewater Service Capacity

The Mayor and Common Council approve of the allocation of water and wastewater capacity pursuant to the following considerations.

A. The Director of Community Planning and Development (Director) is authorized to allocate water and wastewater service capacity to eligible development projects, including:

1. Residential development projects;

2. Non-residential development projects;

3. Projects resulting in *de minimis* changes in consumption;

4. Emergency projects, as identified by the County Health Department, requiring water and or wastewater service for health and safety reasons and which do not require subdivision approval;

5. Entitlement claims*; and,

6. Government and institutional development projects.

B. The Mayor and Common Council shall designate, on an annual basis, a Water Capacity Reserve Supply ("the Reserve"). In addition to the allocations authorized by Sections C. through E. of this policy, the Mayor and Common Council, by supermajority vote, may allocate a portion of the Reserve for projects that would result in a substantial benefit to the City and its citizens, as well as for unexpected contingencies and related matters upon a finding that a specific project will have unusual and extraordinary benefits to the City that will or may be lost if the project is delayed due to unavailability of water to serve the project.

C. For the period between the adoption of this Resolution and January 1, 2016, the Director is authorized to allocate up to 16,000 gallons per day ("gpd") of water capacity on a first-come, first-served basis.

D. If, during the interim period set forth in Paragraph C. above, the Director determines that water capacity in excess of 16,000 gpd, is available to be allocated, the Director may recommend to the Mayor and Common Council, and the Mayor and Common Council may approve, an additional allocation upon a finding that such allocation is consistent with the intent

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* ***Right to water and/or wastewater capacity based on legally binding agreement or contract with the City, and/or based upon a due process property right.***

and purposes of this policy. In recommending such an additional allocation, the Director shall consider the factors enumerated in Paragraph E. below.

E. From and after January 1, 2016, the Director is authorized to allocate a maximum of 40,000 gpd per annum for new development and redevelopment projects requiring water and/or wastewater service capacity. In reviewing applications for water and/or wastewater allocation, the Director shall consider the following:

1. Currently available water and wastewater service capacity;

2. Anticipated timing and amount of future water sources or wastewater capacity;

3. Readiness of a project to proceed to construction;

4. Compliance with the resource conservation measures contained in the City's Development Design Preferences manual;

5. Date of the application; and

6. Other factors considered relevant by the Director.

F. In reviewing applications for water and/or wastewater allocation, the Director shall give priority to the following categories of use:

1. Projects providing benefit to the City's utility systems, including but not limited to: easements, new water sources and related matters;

2. Governmental and institutional projects;

3. Commercial and industrial projects;

4. Cooperative City-County projects; and

5. Residential and 'infill' residential projects.

G. 1. In accordance with subsection E. above, the Director is authorized to allocate water and wastewater capacity for each calendar year in the following amounts:

Category I: 30,000 gpd (gallons per day) for commercial and industrial projects;

Category II: 10,000 gpd for residential and infill residential projects*.

2. If at any time after July 1 of any calendar year, the Director determines that it is not reasonably likely that requests for water allocation will reach the capacity ceilings for either Category I or Category II during the remainder of the calendar year, the Director may transfer up to 25 percent of any underutilized capacity from one category to the other. Any capacity unallocated at the end of the calendar year will be transferred to the Reserve.

H. In an effort to support and enhance the development and expansion of small businesses, projects that require less than 150 gpd of water service capacity are exempt from the water and wastewater allocation process.

I. The Mayor and Common Council will focus available water and wastewater service capacity in areas included in the most current iteration of the adopted Carroll County Master Plan for Water and Sewerage. The Mayor and Common Council will continue to review and revise its approach in the consideration of annexation and good cause waiver requests. While the Mayor and Common Council reserve complete discretion as to the approval or denial of annexation and good cause waiver requests, petitioners should be aware that denial of said requests is possible due to ongoing constraints on water and wastewater service availability. Notwithstanding the above, the Mayor and Common Council will continue to fulfill the requirements and obligations prescribed by Maryland law with regard to the processing and consideration of petitions for annexation.

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* ***Two previously approved residential development projects currently have or plan to have water allocations sufficient to serve the new subdivisions (Roops Mill @ 193 single family lots; and Stonegate @ 225 single family lots).***

III. Procedures for Requesting Allocations

The Mayor and Common Council approve of the allocation of water and wastewater capacity pursuant to the following procedures.

A. Property owners seeking to obtain a water and/or wastewater service allocation under this policy shall file an application with the City Department of Community Planning and Development on a form provided by the Director and shall pay any applicable fees in conformance with the most current fee schedule. The Director shall review the application for conformity with criteria set forth in Section II. D. of this policy. The application shall be accompanied by all supporting documents, information and other relevant details establishing the project's eligibility for allocation. The Director may also request that the applicant provide whatever information is deemed necessary to make a final determination at the expense of the applicant.

B. After review of the application and supporting documentation, the Director may approve, disapprove or conditionally approve any request for an allocation under this policy. Any approval may contain such conditions deemed appropriate by the Director, including but not limited to: project phasing, time limits for the issuance and utilization of water connections and wastewater capacity, and any other related matters.

C. In the event an application is approved for a project that is subject to the sunset provisions contained in *Sections 164-188. O., 164-199. B., and 164-211. H.* of the Westminster City Code, and the development plan approval lapses pursuant to those sections, then the water and/or wastewater allocation approval also lapses and a new application must be filed with the Director.

D. An applicant may appeal the decision of the Director to the Mayor and Common

Council within ten (10) business days from the date of the written decision. Said appeal shall be made in writing to the Director and shall state the factual basis upon which the appeal is being filed. After its review, the Mayor and Common Council shall affirm, reverse or modify the Director's decision by Resolution within sixty (60) days from the date of the appeal. The decision of the Mayor and Common Council is final.

IV. Annual Review

The Director shall conduct an annual review of the water and wastewater allocation policy and allocations issued to ensure that approved allocations are being utilized in a manner consistent with the approved applications and the allocation policy contained herein. Results of the Annual Review will be made available to the Mayor and Common Council during the annual budget deliberations.

INTRODUCED this 23rd day of March, 2015

Margaret L Wolf
Margaret L. Wolf, City Administrator

ADOPTED this 23rd day of March, 2015

Margaret L Wolf
Margaret L. Wolf, City Administrator

APPROVED this 23rd day of March 2015

Kevin R. Utz, Mayor

APPROVED AS TO FORM AND SUFFICIENCY
this 10th day of April, 2015.

Elissa D. Levan, City Attorney

Newly Adopted City Policy

Future water demand is capped by (1) an annual allocation maximum and (2) a project unit maximum.

On April 13, 2015, the Mayor and Common Council of Westminster passed and approved Ord. No. 853, which updated the water and sewer allocation process in the City of Westminster. In an accompanying policy document, Res. No. 15-2, the Mayor and Common Council established implementation standards:

(1) The total amount of water that may be allocated per year is capped at 40,000 GPD, where 30,000 GPD is reserved for economic development (commercial/industrial) and 10,000 GPD for residential.

(2) There are two exceptions to the cap above. Stonegate (225 homes) and Roops Mill (193 homes) are exempted from the water allocation system. However, each project is also capped at a maximum of 40 units per year under City Code. This is 18,800 GPD in total for both together (9,400 GPD each).

The total amount of water that could be allocated in any year is 58,800 GPD. At the present time, the City has allocated approximately 12,000 GPD for 2016. Regardless of demand, 58,800 GPD is the limit.

Status of Previous Allocations

From a review of approved nonresidential allocations on file before 2008, it appears that these are for projects that were built. If an applicant were to appear with a previously approved allocation, the City would honor it AND deduct it from the 40,000 GPD. In this way, the 58,800 GPD would not be exceeded.

Recommendation

It is recommended that the projected future water demand be based upon the City's adopted policy.

c: Marge Wolf, City Administrator
Bret Grossnickle, Water Superintendent

GHD

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	L. Siemers A. Thron	J. Sturdevant	On File	J. Sturdevant		9/9/16
1	L. Siemers A. Thron	J. Sturdevant	On File			
2	L. Siemers A. Thron	J. Sturdevant	On File	J. Sturdevant		10/24/16

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