

HARMONY – PHASE 4

UTILITY CONFORMANCE LETTER

AURORA, COLORADO

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APPROVED FOR ONE YEAR FROM THIS DATE _____

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Preparation Date:
June 10, 2021

FACSIMILE

This electronic plan is a facsimile of the signed and sealed pdf set

CO Professional Engineer
Brian P. Wilson, P.E. No. 0050067

Date

ENGINEER'S STATEMENT:

This utility study "Harmony – Master Utility Conformance Letter" was prepared under my direct supervision in accordance with the provisions of the City of Aurora Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure. I understand that the City of Aurora does not and will not assume liability for facilities designed by others.

Brian P. Wilson, P.E. 0050067
CVL Consultants of Colorado, Inc.

Date

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INTRODUCTION

GENERAL DESCRIPTION

The Harmony Development, formerly Sandy Creek, contains a total of approximately 1,089 acres. This report is a modification to the previously submitted “*Harmony Creek Master Utility Report*” (Ref.1) prepared by CVL Consultants of Colorado, Inc (CVL) and approved in 2016. The project will be primarily residential with development to include a maximum of 2,700 detached single-family units, and 310 attached single-family townhome units. There will also be a community center, a fire station, two oil and gas sites, and two school parcels located within the site. While a parcel in the central west portion of the site has been set aside for commercial development and is not included as part of this FDP, it has been accounted for as part of this report. The same is true regarding the church site farther south and the multi-family parcel in the extreme southwest corner of the site. The remaining improved areas will be for roadways, detention ponds, drainage channels, parks, streets, and open space located throughout the development.

Harmony CSP 4 Filings 14 and 15 contain a total of approximately 231 acres. Harmony CSP 4 is primarily residential with development to include 743 detached single-family units (SFD).

SCOPE OF WORK

The purpose of this Utility Conformance Letter is to amend the “Master Utility Report” (Ref. 1) prepared by CVL Consultants of Colorado, Inc (CVL). The proposed water and sewer system must meet the criteria set forth by the guidelines of the ***Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure*** (Ref. 2) manual prepared by the City of Aurora (COA). CVL will work in conjunction with the client and the COA to ensure that the water distribution and sanitary sewer systems are compatible with existing facilities and planned development.

PROJECT LOCATION

The 1,089-acre Harmony development is located in the southern 1/2 of Section 9, the southwest, northwest, and northeast 1/4 of Section 16, and the northern 1/2 of Section 15, Township 4 South, Range 65 West of the 6th Principal Meridian, in the City of Aurora, Colorado. The project is bound on the north by future Alameda Avenue and future 1st Avenue, while future Mississippi Avenue and future Exposition Avenue bound the site to the south. Powhaton Road defines the west boundary of the project, and future Monaghan Road, future Trussville Street, and future Hayesmount Road provide the easterly boundaries.

Currently there are no existing developments bounding the proposed site apart from the *Adonea Development* which is located west of the northern portion of the site and is partially constructed. The areas north of the western section of the site (formerly *Sun Meadow*), and northeast (formerly *Sky Ranch*) are currently undeveloped. *Parklands (formerly Eastern Hills)* is located east, south, and west of the proposed development, and is currently in the conceptual/preliminary planning stage. There are no current

plans for the land immediately to the east. Figure-1 clearly depicts the project in context to the surrounding roadways and known developments.

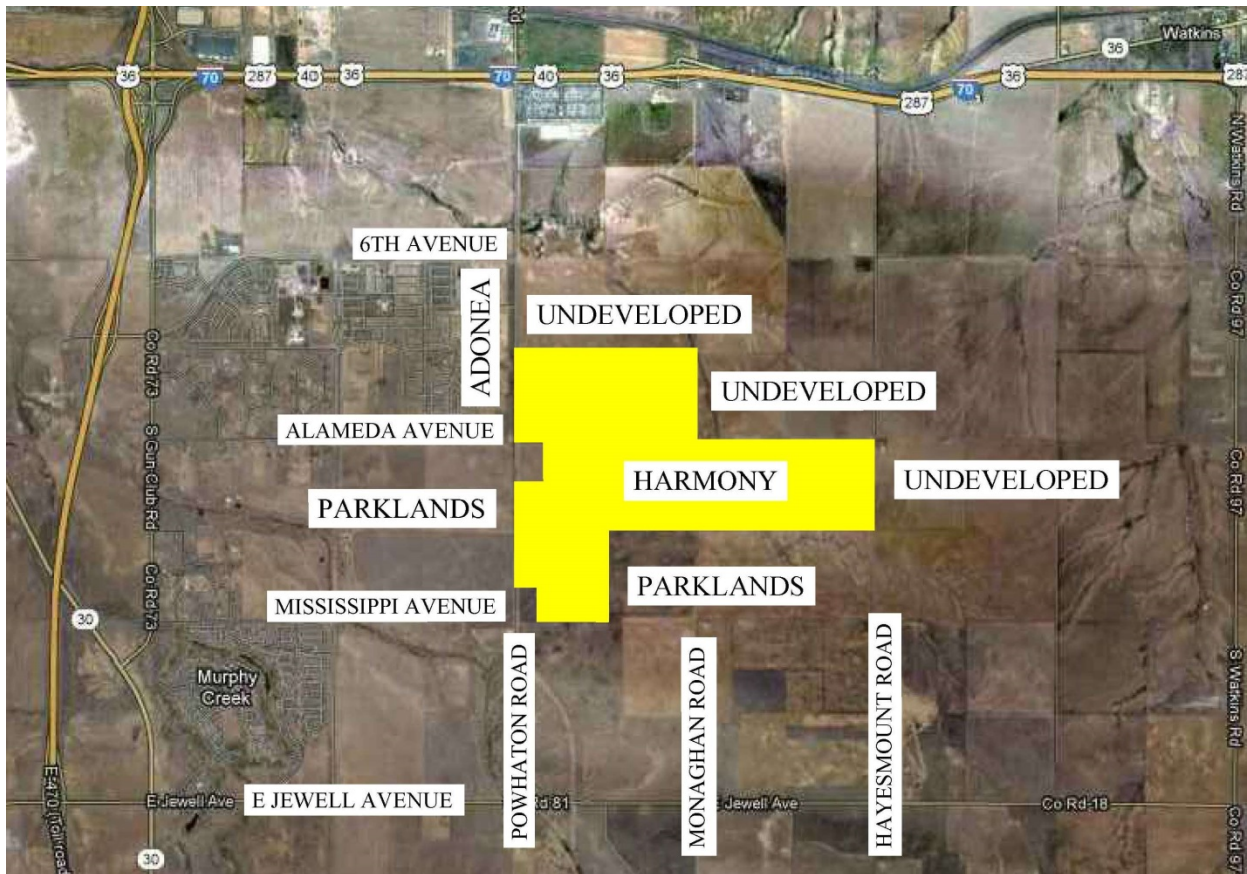


Figure 1
Location Map

Harmony CSP 4 Filings 14 and 15 are generally located south of I-70, in a part or the north 1/2 of Section 16, Township 4 South, Range 65 West of the 6th Principal Meridian, City of Aurora, County Arapahoe, Colorado. To the north, Harmony CSP 4 is bordered by Alameda Avenue and Harmony CSP 3 and Harmony CSP 4. To the west it is bordered by Powhatan Road. To the south it is bordered by Exposition Avenue. Additionally, to the east of it is bordered by Monaghan Road.

TOPOGRAPHIC CONDITIONS

The proposed site encompasses approximately 1,089 acres of currently undeveloped land. The western portion of the site slopes from the south to the northwest, while the eastern portions drain both east and west to the First Creek drainage which drains from the south to the north. The total elevation change in the western portion is approximately 60 feet, dropping from 5675 feet above mean sea level (MSL) at the southern boundary of the development to 5615 feet above MSL at the northwest portion of the development. The total elevation change in the eastern portion is approximately 115 feet, dropping from 5720 feet (56.3 psi) above mean sea level (MSL) at the eastern boundary to 5605 feet (106 psi) above

MSL at the north-central point of the development. From the *City of Aurora's Water Capital Improvement Plan (CIP)*, (Ref. 3) dated February 2009, it is shown that the proposed development is entirely within pressure Zone 4. Table 1 below presents the pressures provided for Zone 4.

Table 1 – City of Aurora Pressure Zones

Zone	Static Hydraulic Grade Line, (ft)	Service Elevation Range, (ft)	Static Pressure Range, (psig)
Zone 4	5850	5589-5711	60-113

From the *City of Aurora Wastewater Utility Plan – Volume I: Report* (Ref. 4) the proposed development falls within the service area Subarea 2 – Environs/Eastern Prairie Developing Area and part of the First Creek drainage basin.

WATER DISTRIBUTION SYSTEM

It is known that the proposed development is entirely within pressure Zone 4.

DEMANDS

The following is a list of criteria used to develop the water demands for the proposed site:

- Single Family Average Day demand = 0.11 gpm/capita
- Single Family Max Day Factor + Fire Flow = $2.8 \times \text{average day demand} + 1500 \text{ gpm (fire flow)}$
- Single Family Peak Hour Factor = $4.5 \times \text{average day demand}$

All potable water will be supplied by the City of Aurora's water distribution system. The proposed water distribution system will connect to the COA's system in two locations. The first location will be at the intersection of Alameda Avenue and Waterloo Street South. This connection is to a 24" water main that was built as part of the Harmony CSP 3 Development. The second connection point will occur at the intersection of Monaghan Road and East Virginia Street with a 16" water main. However, at the time of this report, this line has not been installed. As a result, this will require the extension of this water main north approximately 1200 feet along the alignment of Monaghan Road to Alameda Avenue.

Harmony CSP 4 Filings 14 and 15 connect to the existing Harmony system in two locations. The first location will be at the existing water stub located along South Trussville Street. This connection is to a 12" water stub that was built during the construction of Harmony CSP 1. The second location shall be located at existing water main along East Alameda Avenue at the intersection of Waterloo Street South. This connection is to a 24" water stub that was built as a part of Harmony CSP 3.

WATER DEMANDS

The summary of current water demands calculated for the proposed water distribution system for Harmony CSP 4 is presented in Table 2. The summary of previous water demands calculated for the proposed water distribution system for Harmony CSP is presented in Table 3. As stated previously within this report, the demands were determined using assumptions and requirements outlined in the *Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure* (Ref. 2). The residential populations were based on 3.2 persons per single family detached dwelling unit. Average day demands were calculated average water demand rate. Maximum day and peak hour demands were calculated using peaking factors shown above.

Table 2 – New Calculated Water Demand for CSP 4 and Area Directly to the East

Planning Area	Residence Type	Residences	Population (Persons/SFD)	Demand (gpm/cap)	Max Population	Average Day Demand (gpm)	Max Day + Fire Flow Demand (gpm)	Max Hour Demand (gpm)
CSP 4	SFD	743	2.77	0.11	2058	226.38	2133.86	1018.71
CSP 4 Total		743			2058	226.38	2133.86	1018.71

Table 3 Previously Calculated Water Demand for

Planning Area	Area (ac)	Density (units/ac)	Max units	Population (Persons/SFD)	Demand (gpm/cap)	Max Population	Average Day Demand (gpm)	Max Day Demand (gpm)	Max Hour Demand (gpm)
PA-5	19.3	3.6	70	3.2	.11	224	24.64	68.99	110.88
PA-6	12.5	9.2	115	2.1	.11	242	26.57	74.38	119.54
PA-7	36.1	3.6	130	3.2	.11	416	45.76	128.13	205.92
PA-11	18.3	3.6	66	3.2	.11	211	23.23	65.05	104.54
PA-12	87.6	3.6	314	3.2	.11	1005	110.53	309.48	497.38
PA-18	18.1				.11	688	5.00	12.60	16.10
Total			695			2786	235.73	658.63	1054.36

SANITARY SEWER SYSTEM

SANITARY SYSTEM AND FLOWS

The summary of current sanitary sewer demands calculated for the proposed water sanitary sewer system for Harmony CSP 4 is presented in Table 4. The summary of previous water demands calculated for the proposed sanitary sewer system for Harmony CSP is presented in Table 5. The Harmony CSP 4 Filings 14 and 15 have a total of 743 residences, all detached single-family units. The flows from these residences will be carried by PVC pipes to existing 18" stubs located along East Alameda Avenue. Population estimates are based on 3.2 capita per dwelling unit for single-family units.

WASTEWATER DESIGN CRITERIA

This section describes the design criteria incorporated in developing the wastewater collection system for Harmony. These design criteria were adopted from the *Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure* (Ref. 2):

- Population – 2.77 people per SFD/SFA/MF.
- Average Daily Flow – 68 gpd for residential areas, 10 gpd for schools, 4000 gallons per day/acre for commercial areas, and 5000 gallons per day for community centers, fire stations, and churches.
- Peaking Factor (PF) = $5 \div p^{0.167}$, where p = population in thousands and PF is no greater than 4.0 and no less than 1.7.
- The flow velocity shall not exceed ten (10) fps flowing full of ½ full using Manning's Formula and (n=0.011 for PVC) or (n=0.013 for RCP). Minimum slope shall be 0.4% with a minimum velocity of two (2) fps at least once per day.
- Depth of flow in pipes should not exceed 75% of capacity for pipes 12 inches or smaller and 90% for pipes larger than 12 inches
- Minimum drop through a manhole from inlet to outlet or same diameter pipe shall be:
 1. 0.2 ft. on straight through run
 2. 0.3 ft. on deflected bends greater than 45 degrees
- Minimum of 4 inch diameter pipe for service lines

Table 4 - New Calculated Sanitary Sewer Demand for CSP 3

Residence Type	Demand (gpd/cap)	Residences	Occupancy	Population (Thousands of People)	Average Day Flow (gpd)	Peaking Factor $4 > 5 \div p^{0.167} > 1.7$	Max Day Flow (gpd)
SFD	68	743	2.77	2.058	13951	4	559806
Total		743		2.058	13951		559806

Table 5 – Previously Calculated Sanitary Sewer Demand

Planning Area	Residence Type	Demand (gpd/cap)	Residences	Occupancy	Population (Thousands of People)	Average Day Flow (gpd)	Peaking Factor $4 > 5 \div p^{0.167} > 1.7$	Max Day Flow (gpd)
PA-5	SFD	80	70	3.2	0.224	17920	4	71680
PA-6	SFA-TH	80	115	2.1	0.242	19320	4	77280
PA-7	SFD	80	130	3.2	0.416	33280	4	133120
PA-11	SFD	80	66	3.2	0.211	16896	4	67584
PA-12	SFD	80	314	3.2	1.005	80384	4	321536
PA-18	SFA-TH	80	1	688	0.688	6880	4	27520
	Total		696		2.786	174680	4	698720

CONCLUSION

The Harmony CSP 4 Filings 14 and 15 water distribution system will connect to the existing Harmony water system at two points both along East Alameda Avenue. This water system will have a smaller demand than the previously reviewed “Master Utility Report” (Ref. 1) and conforms to the *Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure* (Ref. 2).

The sanitary sewer system for Harmony CSP 4 Metro Filings 14 and 15 will serve 743 residences. The flows will out fall to the existing sanitary sewer stubs located at East Alameda Avenue. The flows for the proposed sanitary system are smaller than the previously reviewed “Master Utility Report” (Ref. 1) and conforms to the *Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure* (Ref. 2).

REFERENCES

1. **Master Utility Report**, CVL Consultants of Colorado, June 1, 2016.
2. **Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure**, City of Aurora, January 2012.
3. **Treated Water Distribution System 2025 Capital Improvement Plan**, City of Aurora, February 2009.
4. **City of Aurora Wastewater Utility Plan – Volume I: Report**, Camp Dresser & McKee, Inc., January 15, 2003.