STAFF REPORT FOR PLANNING COMMISSION MEETING FEBRUARY 27, 2019

FILE NO: N/A **AGENDA ITEM: E.5**

STAFF CONTACT: Dan Stucky, City Engineer; Lee Plemel, Community Development Director

REQUEST: For Discussion Only: A presentation by the Public Works Division regarding a water use analysis conducted to project water use and delivery needs for the Master Plan city buildout scenario. (Dan Stucky, dstucky@carson.org; Lee Plemel, lplemel@carson.org)

STAFF SUMMARY: The Public Works Department has been working with the Planning Division and consultants over the last few months to evaluate current and projected water usage under a scenario where the city is developed or "built-out" under the current Master Plan land use designations. The purpose of this item is to report the finding of this water use analysis.

RECOMMENDED MOTION: [No motion.]

DISCUSSION:
The buildout water usage study, completed by Atkins North America, analyzed current water usage records for each of the approximately 20,000 parcels located within Carson City and used those results to determine water usage trends and estimate the amount of water usage expected at buildout for Carson City under the current Master Plan land use designations. This analysis was performed at the parcel scale using GIS spatial analysis tools to provide a higher level of detail, both spatially and in estimating overall usage, than used in past studies.

Based on the 2018 State Demographer's population projection data for Carson City and the City's long-range estimates, the City anticipates reaching a buildout population of approximately 80,000 people sometime between 2055 and 2085, depending on different population projection rates. The results of this study indicate that annual water demand in Carson City at buildout will reach approximately 16,000 acre-feet, approximately 5,000 acre-feet more than currently used today. The City has secured enough usable water rights (17,602 annual acre-feet) to meet the projected water demand in the buildout condition.

The study also indicated that Carson City will need to increase maximum day production in the water system by approximately 8.3 MGD to meet the future demand of 29.0 MGD. These projections are in line with projections from past studies. As water usage increases in the future, Carson City will need to increase water production to meet the demand. These increases in production will occur as required over time, and the City has a number of different plans in place to meet the demand when the time is needed, including: well rehabilitation/re-drill projects, new supply wells, upgrades to the Quill Water Treatment Plant, etc.

The water usage buildout analysis includes both residential and non-residential growth based on current Master Plan land use designations. For the residential side, the following table shows the number of existing units within the various land use designations as well as the projected number of units within those designations that were used for the analysis.

ATKINS

Carson City Water Use Analysis

Carson City

February 11, 2019

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Executive summary

The purpose of this project was to develop a planning level tool that will estimate the City's current peak water use, water use rates for each master plan land use, and potential future peak water use. The analysis included review of water records from 2014 to 2017 which were used to define the existing condition as well as the water use rates for each land use. Future peak water use was estimated using the water use rates for each land use applied to likely areas of development to estimate the total future water use.

The results of the analysis summarized in this report are also included in a GIS shapefile that includes a point for each parcel within the City limits. The GIS shapefile table was also exported into a spreadsheet with filtering added. These two files will allow the City to easily query the analysis results using the spreadsheet filters as well as answer a wide variety of planning level questions through GIS shapefile intersections.

During the initial analysis of the City provided water use records for 2014 through 2017, records were reviewed and refined, to remove questionable or outlier data, however the raw data could not be fully checked during the analysis due to scope limitations of the project. The result of the review resulted in the team selecting the 2014 data for the analysis and generation of peak water use rates. One reason for this selection was that the 2014 data produced the highest overall peak water use which is slightly conservative in relation to this analysis.

The existing condition peak water use of 20.7 MGD (Table 4-1) was determined by using the 2014 data for each parcel and adding water use for parcels that had water use after 2014 (2015 to 2017). The water use applied to the added parcels utilized the rates generated for the City master plan land uses and essentially baselined the 2014 water use data to a 2017 level. Generation of water use rates for each City master plan land use was achieved by mapping assessor's land use codes to each master plan land use as shown in Table 2-4. To factor in uncertainty with the water use rates, a high and low range option of +10% and -10% values were calculated for each land use (Table 2-1 and Table 2-3). A 20% reserve was then applied to the rates (Table 2-2) to account for the mandated State Engineer's requirement. Figure 2-1 summarizes the parcels used in the existing condition analysis.

The future condition water use of 29.0 MGD (Table 4-2) was determined through several rounds of coordination with the City planning staff and identified which parcels and areas were likely to be developed. Parcels with zero existing condition water use were considered for future development with distant parcels removed and parcels not likely to be developed removed. Several parcels developed in the existing condition were assigned future condition water use to account for potential redevelopment and select parcels currently on well water were included that may be converted to City water in the future. The remaining parcels with no existing water use were assigned future water use estimates based on the City master plan land use for that parcel and the rates developed with this project. The future condition peak water use identified with this analysis represents an approximate 49% increase over the existing condition peak water use estimate. Figure 4-1 summarizes the increase in water use GPD per parcel for the future condition. Figure 2-2 summarizes the parcels used in the future condition analysis. The City estimates they will need to increase production in the water system by approximately 8.3 MGD to meet the future demand of 29.0 MGD. The City has secured enough usable water rights (17,602 AFA) to meet the projected water demand in the buildout condition.

After the generation of potential future peak water use, Carson City water rights and state demographer data were reviewed. Carson City is currently permitted for ground water and surface water rights totaling 17,602 acre-ft annually (AFA) per year (Table 3-1, Table 3-2, and Table 3-3). The City's average water demand from 2014 to 2017 has previously been estimated as 11,124 AFA. This project has identified an existing peak water use of approximately 10,900 acre-feet and a future annual water use of approximately 16,000 acre-feet.

2018 State Demographer's population projection data for Carson City identified the 2017 population as 55,438 with varying growth estimates for each year from 2018 to 2037 and a long-term growth of 0.9% after 2037 (Figure 4-2 and Figure 4-3). Analyzing the water use per capita, Carson City was estimated to achieve the future peak water use from this analysis around the year 2060 when the population reaches 78,000. If growth rates of 0.5% or 0.9% is estimated starting in 2018, then future peak water use may occur as early as 2055 or as late as 2085.

1. Project Description

The purpose of this project was to develop a planning level tool that will define the City's current peak water use, identify usage rates for each master plan land use, and estimate potential future peak water use. For the future development condition, definition of the water use rates per land use were completed to provide a framework with which to answer a wide variety of potential future development scenarios. The GIS shapefile was developed to present the analysis results at a parcel level and facilitate a variety of analyses that can be performed through spreadsheet filtering and GIS intersections.

At the outset of this project, the City provided water use records for 2014 through 2017. This set of water use data was reviewed and analyzed to provide the foundation of the rates identified in this analysis. Current assessor's parcel information was used to link the water use records to the City's Master Plan data and review current and planned future land uses. The combination of this data provided the framework necessary to estimate an existing condition peak water use and develop use rates necessary for future development water use projections. The following is a detailed summary of steps taken during this analysis.

2. Water Use Analysis

The first step in this project was to perform an analysis of the City provided water use records for 2014 through 2017. The records were reviewed and refined as indicated below, however the raw data could not be fully checked during the analysis due to scope limitations of the project. The analysis focused on identifying outlier data and anomalies in the water use data and excluded these values from the analysis. In general, the overall data quality looked reasonable and the water use records appeared to be sufficiently accurate for a planning level analysis.

The major steps performed with this analysis were as follows:

1. Analyze the 2014 through 2017 water use data and assign peak water use rates to existing parcels
2. Develop recommended peak water use rates for each land use identified
3. Calculate existing condition peak water use
4. Project a future development peak water use with the City's guidance on likely development areas
5. Compare findings to the City's current permitted useable water rights
6. Review the state demographer's population estimates

City master plan land uses used in this analysis are as follows:

- Low Density Residential (LDR)
- Medium Density Residential (MDR)
- High Density Residential (HDR)
- Community / Regional Commercial (CC)
- Downtown Mixed-Use (DT-MU)
- Mixed-Use Commercial (MUC)
- Mixed-Use Employment (MUE)
- Mixed-Use Residential (MUR)
- Neighborhood Commercial (NC)
- Industrial (I)
- Public / Quasi-Public (PUB / QP)
- Parks and Recreation (PR)
- Office (OFF)

The Appendix to this report includes a table of descriptions for the Carson City Master Plan Land Uses and a map of the Carson City Land Use Master Plan.

2.1. 2014 to 2017 Water Use Data

Water use data supplied by the City was evaluated from 2014 through 2017. The evaluation and analysis included various combinations of years, months, maximums, averages, etc. Results of this preliminary analysis were discussed with the City and it was determined that using 2014 data represented a reasonable estimation of the existing condition water use that may be slightly conservative (e.g. total water use records from 2015 to 2017 were slightly less than 2014 total water use).

The analysis of the 2014 data included:

- Ordering the raw water use data by APN, location, meter reading date, and meter reading value
- Calculating the number of days for each meter reading
- Filtering meter reading data to:
  - Remove any records that had less than 20 or more than 40 days since the last reading
  - Combine meter readings for sites with two readings on the same day

  - Assign 30.4 days (average of readings) to readings without a previous reading date
  - Delete records with negative consumption values (adjustments)
  - Delete records with unusually high actual consumption values
- Reducing the data to July and August data only (typically the highest water use months)
- Selecting the highest reading for each APN

This step in the analysis resulted in a peak existing condition water use generated from 2014 data.

2.2. Existing Condition Analysis

The next step in the analysis was to take the results of the 2014 data, define peak water use rates for each City master plan land use and utilize those use rates to define an existing condition peak water use that was more closely baselined to current development (2017 levels).

The steps taken to define peak water use rates for each City master plan land use were as follows:

- The 14 identified City master plan land uses were mapped to the 58 assessor's land use codes as shown in Table 2-4.
- Rural Residential (RR) was identified to be generally on well water and was therefore excluded from the analysis based on the City's recommendation
- Master plan land uses not listed were assumed to have no City water use
- Some assessor's land use codes were used for calculating water use rates for multiple City master plan land uses (e.g. assessor's code 200 for single family residential was used in rate calculations for City master plan land uses of low density residential (LDR) and medium density residential (MDR)
- Generally, City master plan land uses were mapped to multiple assessor's land use codes (e.g. LDR was mapped to assessor's land use codes 110, 120, 200, 220, 280, 282, 320, and 321)
- Peak water use rates (Table 2-1) were determined for each master plan land use by averaging the individual parcel water use rates (e.g. the average peak water use rate for LDR was determined by averaging all water use rates for parcels with assessor's land use codes 110, 120, 200, 220, 280, 282, 320, and 321)
  - Average peak water use in gallons per day per dwelling unit was calculated for residential land uses LDR, MDR, high density residential (HDR), and mixed use residential (MUR)
    - Water use per dwelling unit is industry standard for residential land uses
  - Average peak water use in gallons per day per acre was calculated for all land uses
    - Water use per acre is industry standard for non-residential land uses
    - Calculating water use per residential acre also provides the City with the maximum flexibility in assigning future water use rates to an identified parcel
- To provide a high and low range option +10% and -10% values were calculated for each land use
- Annual water use quantities (volumes) were also calculated for each land use in a comparable manner to the gallons per day peak use rates based on a per dwelling unit or per acre basis
- Peak water use rates were also calculated to include a 20% reserve mandated by the State Engineer (Table 2-2).
  - The State Engineer requires the City to hold 20% in reserve supply condition for drought, equipment failure, routine maintenance outages, etc.

Table 2-1 Peak Water Use Rates

Land Use	GPD per DU -10%	GPD per DU Avg	GPD per DU +10%	GPD per AC -10%	GPD per AC Avg	GPD per AC +10%
LDR	630	700	770	3,072	3,413	3,754
MDR	611	679	746	3,025	3,361	3,697
HDR	207	230	253	4,242	4,713	5,184
CC				1,484	1,649	1,814
DT-MU				3,128	3,475	3,823
MUC				3,081	3,423	3,765
MUE				1,366	1,518	1,670
MUR	186	207	228	3,132	3,480	3,828
NC				1,491	1,656	1,822
I				1,169	1,299	1,429
PUB / QP				1,140	1,266	1,393
PR				1,889	2,098	2,308
OFF				2,310	2,566	2,823

Table 2-2 Peak Water Use Rates with 20% Reserve

Land Use	GPD per DU -10%	GPD per DU Avg	GPD per DU +10%	GPD per AC -10%	GPD per AC Avg	GPD per AC +10%
LDR	756	840	924	3,686	4,096	4,505
MDR	733	814	896	3,630	4,033	4,437
HDR	249	276	304	5,090	5,655	6,221
CC				1,781	1,979	2,177
DT-MU				3,753	4,170	4,587
MUC				3,697	4,107	4,518
MUE				1,640	1,822	2,004
MUR	223	248	273	3,758	4,176	4,593
NC				1,789	1,988	2,187
I				1,403	1,559	1,715
PUB / QP				1,367	1,519	1,671
PR				2,266	2,518	2,770
OFF				2,772	3,080	3,388

Table 2-3 Annual Water Use Quantities

Land Use	Ac-Ft per DU - 10%	Ac-Ft per DU Avg	Ac-Ft per DU + 10%
LDR	0.36	0.40	0.44
MDR	0.35	0.38	0.42
HDR	0.15	0.16	0.18
Land Use	**Ac-Ft per Ac - 10%**	**Ac-Ft per Ac Avg**	**Ac-Ft per Ac + 10%**
CC	0.79	0.88	0.97
DT-MU	1.96	2.18	2.40
MUC	1.85	2.05	2.26
MUE	0.73	0.81	0.90
MUR	1.89	2.10	2.31
NC	0.79	0.88	0.97
I	0.65	0.72	0.79
PUB / QP	0.62	0.69	0.76
PR	2.59	2.87	3.16
OFF	1.23	1.37	1.51

To define the existing condition peak water use that was more closely baselined to current development (2017 levels), a GIS shapefile was developed and populated with water use data. Water use data based on APN was joined to a point shapefile created from the City's parcel shapefile which was considered the existing condition based on 2014 data (i.e. 2014 water use data for each APN was populated in the shapefile). To baseline to 2017 levels, parcels with zero water use in 2014 but reported water use in 2015, 2016, or 2017 were populated with peak water use data consistent with the parcel's master plan land use designation.

The following steps describe the creation of the GIS shapefile, population of 2014 data, and population of data to baseline to 2017 levels.

- The City's polygon parcel boundary file (with APNs) was converted to a parcel point shapefile
  - This created a point shapefile with APN and zoning data
- Spatially joined the created parcel point shapefile with the City's master plan land use file
  - This allowed fields for the City's master plan LU_Code (Category and LU_Label) to be copied into the parcel point shapefile
- Joined water use analysis data to the created parcel point shapefile and labeled fields with the prefix "ASSD_" for assessor's data
  - This allowed calculated 2014 gallons per day use, square feet, calculated 2014 ac-ft of water use, assessor's land use code, assessor's parcel acreage and square footage, and number of dwelling units to be copied into the parcel point shapefile from the water use analysis. This resulted in population of the 2014 peak water use data shown in Table 4-1.
- After the join of the 2014 data, approximately 4,400 entries were noted to have failed to join water use analysis data to the created parcel point shapefile. Review of the entries showed that:
  - Approximately 800 entries were attributed to parcels that are identified to be on well water or have master plan land use codes associated with no water use. No change was made for these parcels since City water use was assumed to be zero.
  - Approximately 3,300 parcels did not have water use in any of the water data from 2014 to 2017. These parcels were assumed to be long term vacant or parcels whose water use may be accounted for through another parcel meter. No change was made for these parcels and City water use was assumed to be zero.
  - Approximately 350 parcels did not have water use in 2014 but did have water use in at least one year between 2015 and 2017. These parcels were defined as either short term vacant or developed areas between 2014 and 2017. Water use data for these parcels was assigned based on average values for their master plan land use codes (Table 2-1).
- Addition of the water use associated with the approximately 350 parcels was intended to baseline the 2014 water use to 2017 by incorporating newly occupied or developed parcels into the existing condition (Table 4-1).
- The assessor's data acreages were checked and we found that some were unreasonable or double counted so a field, "ATK_AC" was added to calculate acreage for each parcel based off the shapefile geometry.

2.3. Projected Future Condition Analysis

To define the parcels that were likely to see future development, several rounds of coordination were conducted with the City's planning department. Parcels that had zero existing condition water use were highlighted by land use and reviewed. Parcels distant from core City infrastructure were removed from consideration and determined to require too much infrastructure to be developable for this analysis. Next other parcels that were not likely to be developed were also removed from consideration. Additionally, several parcels developed in the existing condition were assigned future condition water use. These areas were generally identified as areas of potential redevelopment or areas currently on well water that may be converted to City water in the future. Notes associated with these parcels are included in the "Anlys_Note" GIS field to explain assumptions made for the analysis. Numbers of dwelling units for future redevelopment parcels were provided by the City and acreages of development for non-residential land uses were used from the "ATK_AC" field. Approximately 79 parcels on well water were identified for future connection to City water. These parcels were noted as "Well – Future City Water" in the "Anlys_Note" GIS field. The average total GPD water use for these parcels totaled approximately 89,700 GPD (50.8 ACFT) or 107,700 GPD with the 20% reserve.

At the beginning of this project, future development was planned to be summarized by major areas within the City, identified by the City's planning department. During the project, the decision was made to address future development at a parcel scale and future development numbers were added to the parcel point shapefile which also contained the existing condition water use data. The future development areas may still be useful to the City for analysis queries, so a polygon shapefile was digitized to represent the major development area redlines received and each area was assigned a unique identifier.

In addition to the steps discussed in Section 2.2, the following improvements were made to the GIS parcel point shapefile to summarize the future condition analysis data:

- The created parcel point shapefile was joined with the major development areas identified by the City
  - Allowed for categorizing or grouping data into one of 27 areas (denoted by CC##) identified by the City as areas of likely development
- Worked with the City to identify parcels that were likely to see development in the future and entered the anticipated dwelling units or acreages into the "FUT_..." fields
- Calculated total future water use ("TOT_..." fields) by adding the existing water use for each parcel to the future water use calculated for each parcel
  - Future development water use was not calculated for a specific field in the shapefile, rather future development water use calculations were made in the "TOT_..." fields based on either dwelling units or acreage of the development multiplied by the use rate for that land use
- Calculated total future water use with mandated 20% reserve and reported values in the "RSV_..." fields
- Notes were added to the "Anlys_Note" field to identify where deviations to the base analysis have occurred, assumptions have been made, note where wells were assumed to remain (no City water use), note where wells may be converted to City water, note LU_Codes that have no water use, note areas of no likely development, master plan land use assumptions, etc.

Table 2-4 Assessor's Land Use to City Master Plan Land Use Mapping

Assessor's Data		City Master Plan Land Uses														
Unique Values (LU)		RR - Rural Residential (5-20 ac/du) - NO WATER	LDR - Low Density Residential (0.2-3 du/ac or 5-0.33	MDR - Medium Density Residential (3-8 du/ac)	HDR - High Density Residential (8-36 du/ac)	CRC - Community / Regional Commercial	DMU - Downtown Mixed-Use	MUC - Mixed-Use Commercial	MUE - Mixed-Use Employment	MUR - Mixed-Use Residential	NC - Neighorhood Commercial	IND - Industrial	PUB_QP - Public / Quassi-Public	PR - Parks and Recreation	OFF- Office	
LU	LU Category															
110	Vacant - unknown		X	X	X	X	X	X	X	X	X					
120	Vacant - SFR		X	X	X									X		
140	Vacant - commercial						X	X			X			X		
150	Vacant - industrial								X							
160	Vacant - mixed						X	X	X	X						
190	Vacant - public use (Public - Quasi-Public)												X	X		
200	SFR		X	X												
210	Condo				X		X	X		X						
220	Manufactured home - real prop		X	X												
230	Manufactured home - on roll			X												
231	Manufactured home - conversion pending			X												
232	Manufactured home unsecured			X	X											
236	Personal property manufactured home secured			X												
240	town house				X		X	X		X						
270	SFR common area			X	X											
280	SFR with minor improvements		X	X												
282	SFR with minor improvements, no livable structures		X	X	X											
290	Mixed use with SFR as primary				X					X						
300	Duplex			X	X											
310	Two SFR			X												
313	Multi-family residence with manufactured home conversion				X					X						
320	Three to four units		X	X	X											
321	Three to four units under construction		X	X	X											
330	Five or more units, low rise				X		X	X		X						
331	Five or more units, low rise under construction				X		X	X		X						
333	Exempt or partially exempt apartment building				X		X	X		X						
340	Five or more units, high rise				X		X	X		X						
350	Manufactured home park - ten or more units				X											
390	Mixed use with multi-family residence as primary				X		X	X		X						
400	General commercial					X	X	X	X	X	X	X	X			
402	Parking and or parking structures					X	X	X	X	X	X	X				
403	Restaurants					X	X	X	X	X	X	X				
404	Convenience stores					X	X	X	X	X	X	X				
408	Bars or taverns without restaurants					X	X	X			X	X				
410	Offices, professional and business services					X	X	X	X	X	X	X	X			X
420	Casino or hotel casino					X	X	X				X				
430	Commercial living accomodations					X	X	X		X	X					
440	Commercial recreation					X		X			X	X	X	X		
450	Golf course													X		
480	Commercial with minor improvements					X	X	X	X	X	X	X				
490	Mixed use with commercial as primary					X	X	X			X					
500	General industrial - light											X	X			
510	Commercial industrial - retail											X				
520	Heavy industrial											X	X			
570	Industrial common area											X				
580	Industrial with minor improvments											X				
590	Mixed use with industrial as primary											X				
600	Agricultural qualified per NRS 361A - vacant (Conservation Res.)															
620	Open space															
622	Sites designated as historic - residential			X			X			X						
624	Sites designated as historic - commercial						X	X			X					
700	Operating communication, transportation, and utility property of an interstate or intercounty nature					X							X			
710	Communication, transportation, and utility property of a local nature					X										
900	Parks for public use (Public/Quasi-Public)													X		
910	Cemeteries (Public/Quasi-public)															
920	Hospitals					X										
922	Skilled nursing homes					X	X	X			X					
980	Special purpose with minor improvements					X										

N

Legend

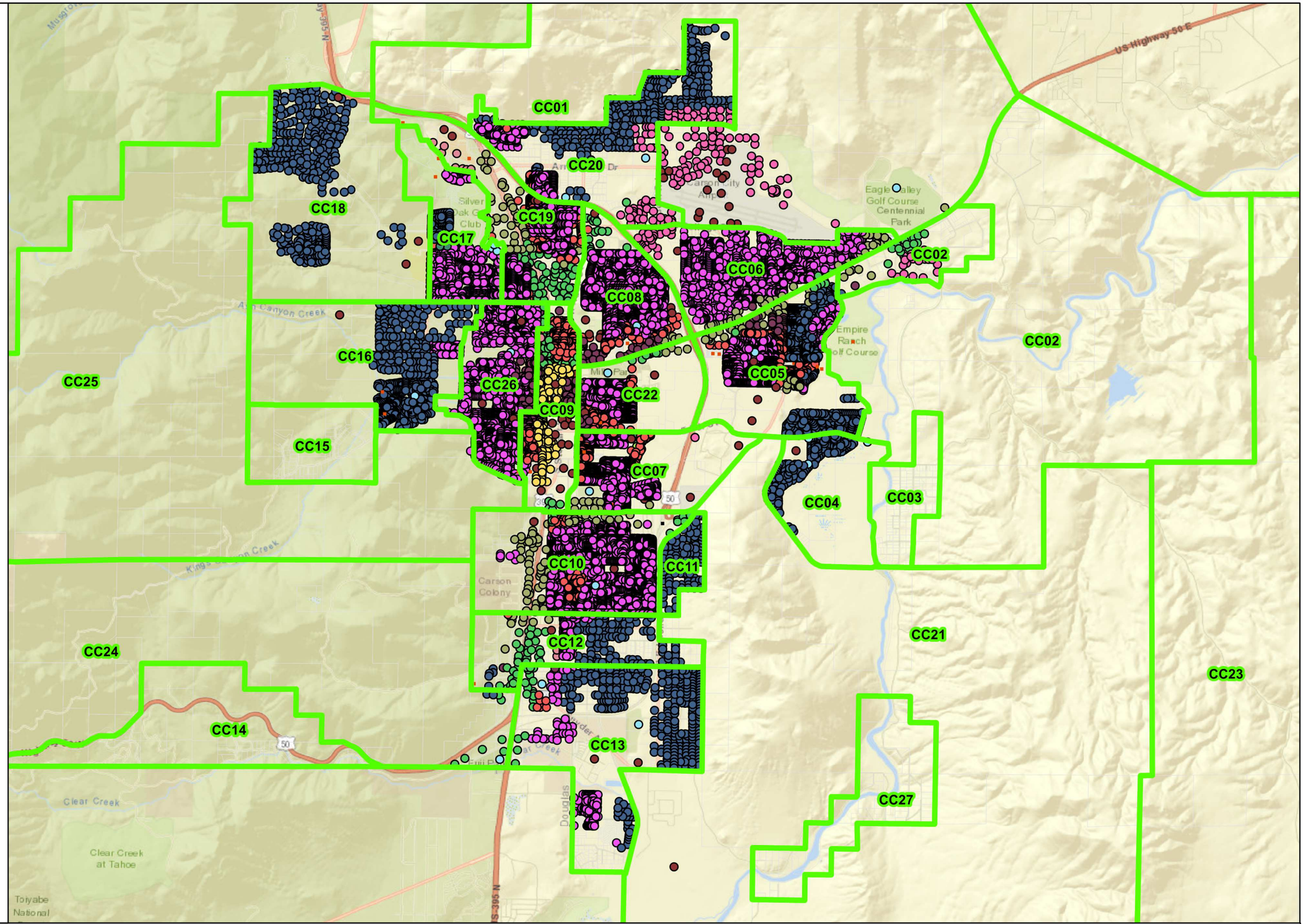
Future Development Areas

Master Plan Land Use Code

- LDR
- MDR
- HDR
- CC
- DT-MU
- MUC
- MUE
- MUR
- NC
- I
- PUB_QP
- PR
- OFF
- CR, OS, RR
- Undefined

Parcel Boundary

0 0.5 1 2 Miles



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Existing Condition Map
Figure 2-1

N

Legend

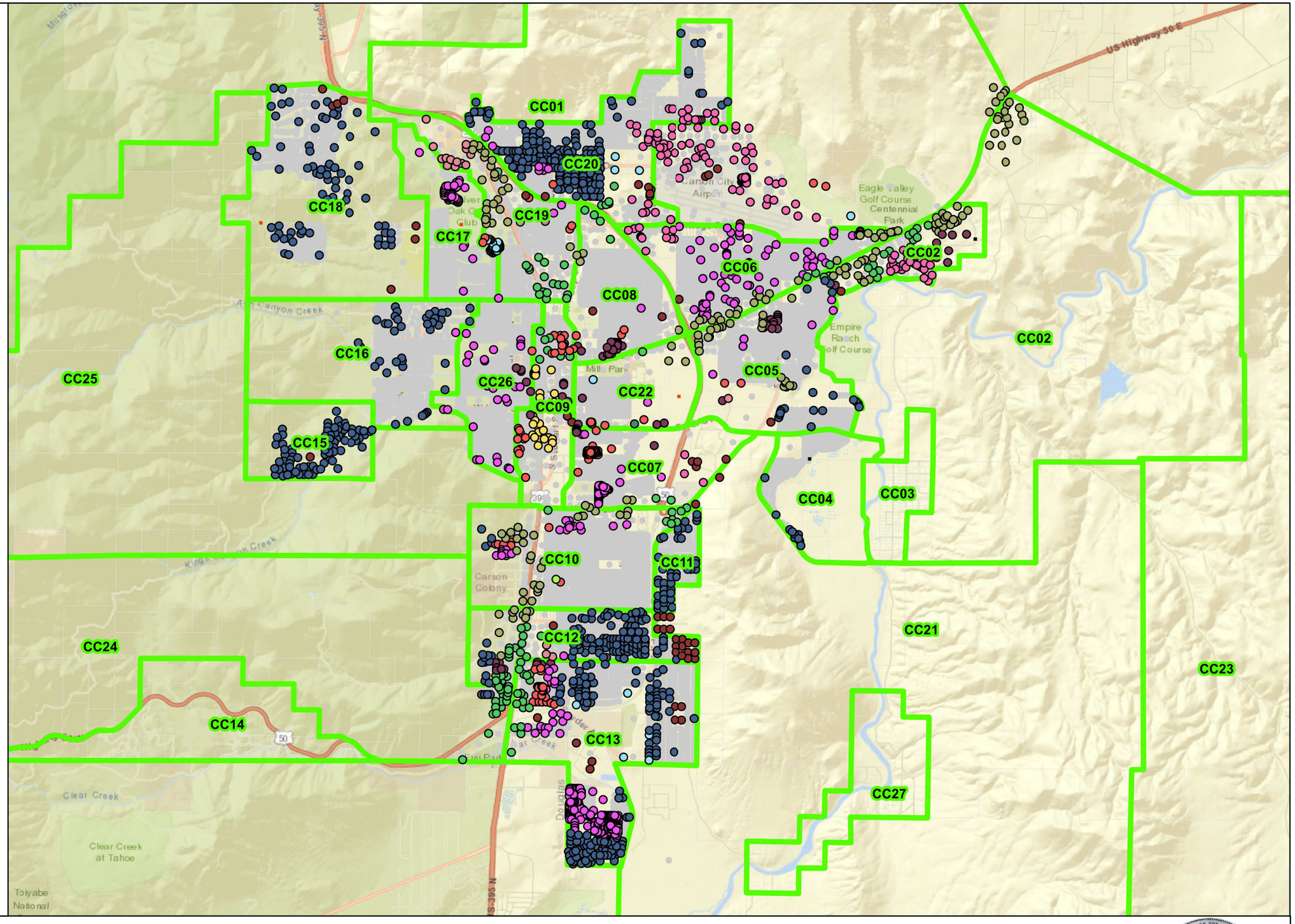
Master Plan Land Use Code

- LDR
- MDR
- HDR
- CC
- DT-MU
- MUC
- MUE
- MUR
- NC
- I
- PUB_QP
- PR
- OFF
- CR, OS, RR
- Undefined
- Future Development Areas

Existing Condition Parcels

- Existing Condition Parcels
- Parcel Boundary

0 0.5 1 2 Miles



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Projected Future Condition Map
Figure 2-2

3. Carson City Water Rights

The information in this section has been summarized here to provide context for the water use analysis performed. Carson City owns ground water and surface water rights totaling 17,602 acre-ft annually (AFA) per year. The City's average water demand from 2014 to 2017 has previously been estimated as 11,124 AFA.

Table 3-1 Carson City Total Water Rights Summary

Water Right	Annual Permitted (ac-ft)	Usable (ac-ft)
Ground Water	13,475	12,599
Surface Water	8,173	5,003
Totals	21,648	17,602

3.1. Ground Water Rights

Table 3-2 is a summary of current ground water rights currently held by Carson City. Eagle Valley is a total combined duty amount for 6,716.30 AFA, and does not include the drought permits (Permit 61505, 61507, 61508) which allows Carson City to pump a maximum of 11,700 AF for a one year period provided that the average groundwater pumped from Eagle Valley over a period of five consecutive drought years will not exceed 9,900 AFA, as set forth under State Engineer Order 1140. Drought permits are included in the City's permit terms. Carson Valley groundwater totals include the Carson – Douglas Intertie Pipeline.

Table 3-2 Carson City Ground Water Rights Summary

Ground Water	Annual Permitted (ac-ft)	Usable (ac-ft)
Eagle Valley (Basin 104)	6,716	6,716
Dayton Valley (Basin 103)	3,206	2,330
Carson Valley (Basin 105)	3,553	3,553
Totals	13,475	12,599

3.2. Surface Water Rights

Table 3-3 is a summary of current surface water rights currently held by Carson City. The Quill Water Treatment Plant production has been significantly reduced in recent years due to water quality issues from both the Marlette Hobart and Ash Creek sources.

Carson City has access to surface water from the Marlette Hobart Water System (MHWS) which is shown below as the Franktown Creek Decree and Marlette Water. These state-owned rights are not added in to the total usable rights due to water quality issues, but the City has access to them for purchase. The only useable right from the MHWS comes from springs on the East Slope spring collection system that is diverted to Carson City and to Virginia City and that number is shown in the useable section.

Table 3-3 Carson City Surface Water Rights Summary

Surface Water	Annual Permitted (ac-ft)	Usable (ac-ft)
Carson River (Basin 103)	2,295	2,095
Kings Canyon (Basin 104)	939	939
Ash Canyon (Basin 104)	1,666	0
Clear Creek (Basin 105))	273	0
State Owned: Franktown Creek Decree (Basin 89) and Marlette Water (Basin 90)	 7,240 from Franktown Creek (Not included in total) 3,000 from Marlette	 1,969
Totals	8,173	5,003

4. Results

This section summarizes the results of the analyses performed for this project and reviews the population growth estimates for Carson City.

4.1. Existing Condition Results

Following the approach outlined in Section 2.2, the following existing condition peak water use rates and quantities were generated from the analysis. As described previously, the 2014 Data Results represent total peak water use associated with parcels that had water data in 2014 while the 2017 Baseline Results represent those 2014 results with parcels added that had water data between 2015 and 2017.

Table 4-1 Existing Condition Water Use Results

Water Use	2014 Data Results	2017 Baseline Results
Maximum Demand Day	19.5 MG	20.7 MG
Annual Water Demand	10,700 Ac-Ft	10,900 Ac-Ft

4.2. Future Condition Results

Based on the approach described in Section 2.3, the following future condition peak water use rates and quantities have been identified. These results represent an approximately 49% increase over the existing condition peak water use estimate. The City estimates they will need to increase production in the water system by approximately 8.3 MGD to meet the future demand of 29.0 MGD. The City has secured enough usable water rights (17,602 AFA) to meet the projected water demand in the buildout condition.

Table 4-2 Future Condition Water Use Results

Water Use	Future Condition Results (Avg.)	Future Condition w/ 20% Reserve (Avg.)
Maximum Demand Day	29.0 MG	34.9 MG
Annual Water Demand	16,000 Ac-Ft	N/A

Figure 4-1 summarizes the increase in water use GPD per parcel for the future condition. As shown, many of the water use increases are less than 1,000 GPD with several of the increases above 10,000 GPD.

N

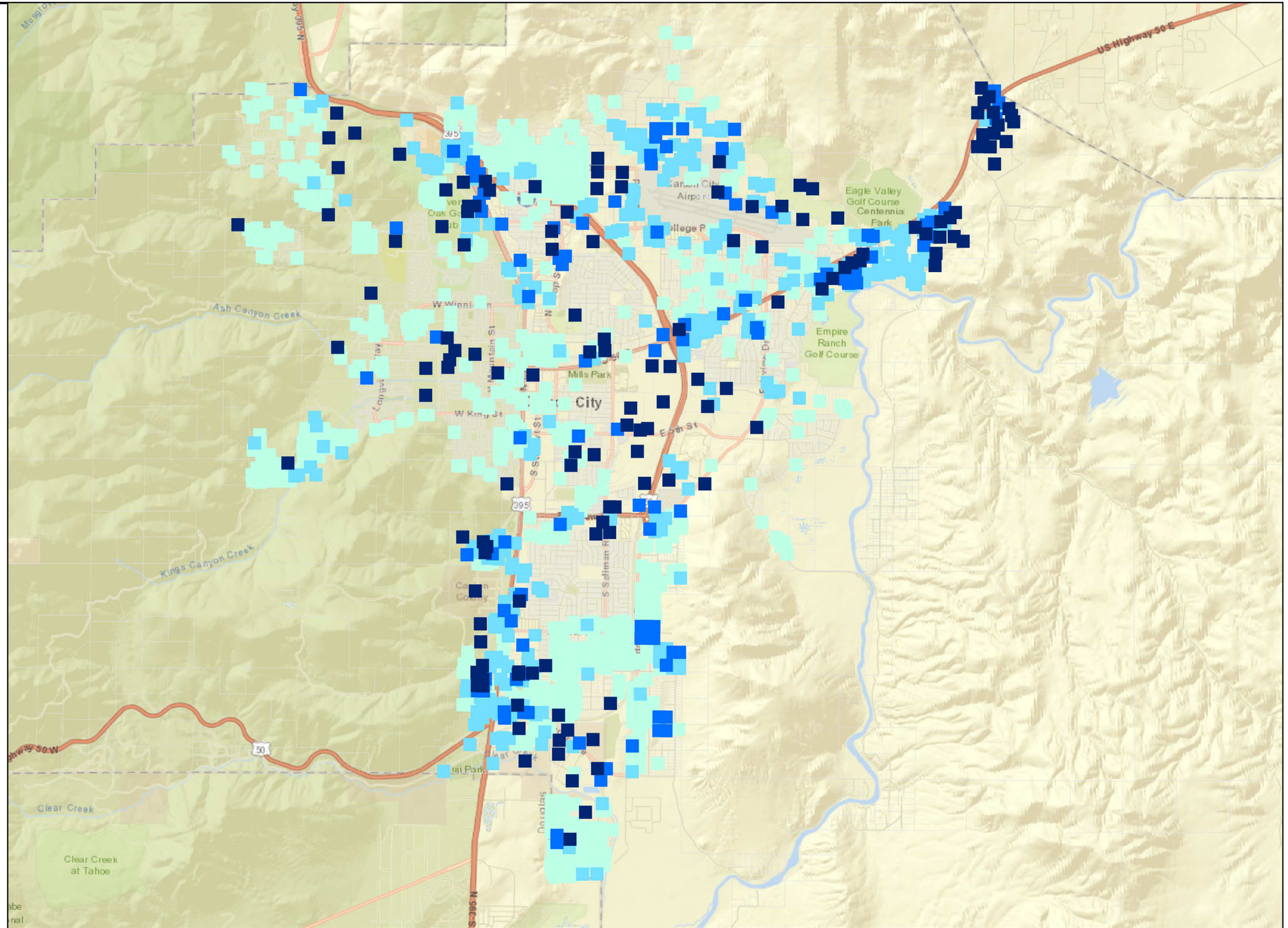
Legend

Future Water Use Increase

- 0
- 0 - 1,000 GPD
- 1,000 - 5,000 GPD
- 5,000 - 10,000 GPD
- 10,000 + GPD
- Parcel Boundary

Points shown indicate parcels with likely wateruse increase in the buildout condition. Values are calculated by taking the average buildout flow in GPD (without 20% reserve) minus the existing wateruse data in GPD. Parcels that are expected to have no wateruse increase have a difference of 0 and are left blank; the remaining parcels are shown in units of GPD increase per parcel.

0 0.5 1 2 Miles



ATKINS

GPD Increase in Buildout Condition Map
Figure 4-1

4.3. Growth Outlook

State Demographer's population projection data for Carson City was reviewed as part of this project to compare population projections with the future development water use projected from this analysis. The 2018 State Demographer's population projection includes population growth estimates for each year from 2018 to 2037 and indicates future growth may be 0.9% beginning in 2038. In addition to State Demographer's data a current growth estimate from Carson City staff was reviewed. This estimate included varying estimates of 150 to 300 dwelling units added per year until 2067. This information is included Figure 4-3 which also referenced the 2018 Demographer projection. Figure 4-2 summarizes the 2018 State Demographer's population projection and two variations dependent on varying population growth scenarios starting in 2018. The first variation identifies what a population growth scenario would be if Carson City experienced slower recurring long-term growth of 0.5% (average of the 20-year projections from the 2015 through 2018 Demographer's population projections) beginning in 2018. The second variation identifies what a population growth scenario would be if Carson City experienced accelerated recurring long-term growth of 0.9% (2018 Demographer projection) beginning in 2018.

Figure 4-2 Population Estimates

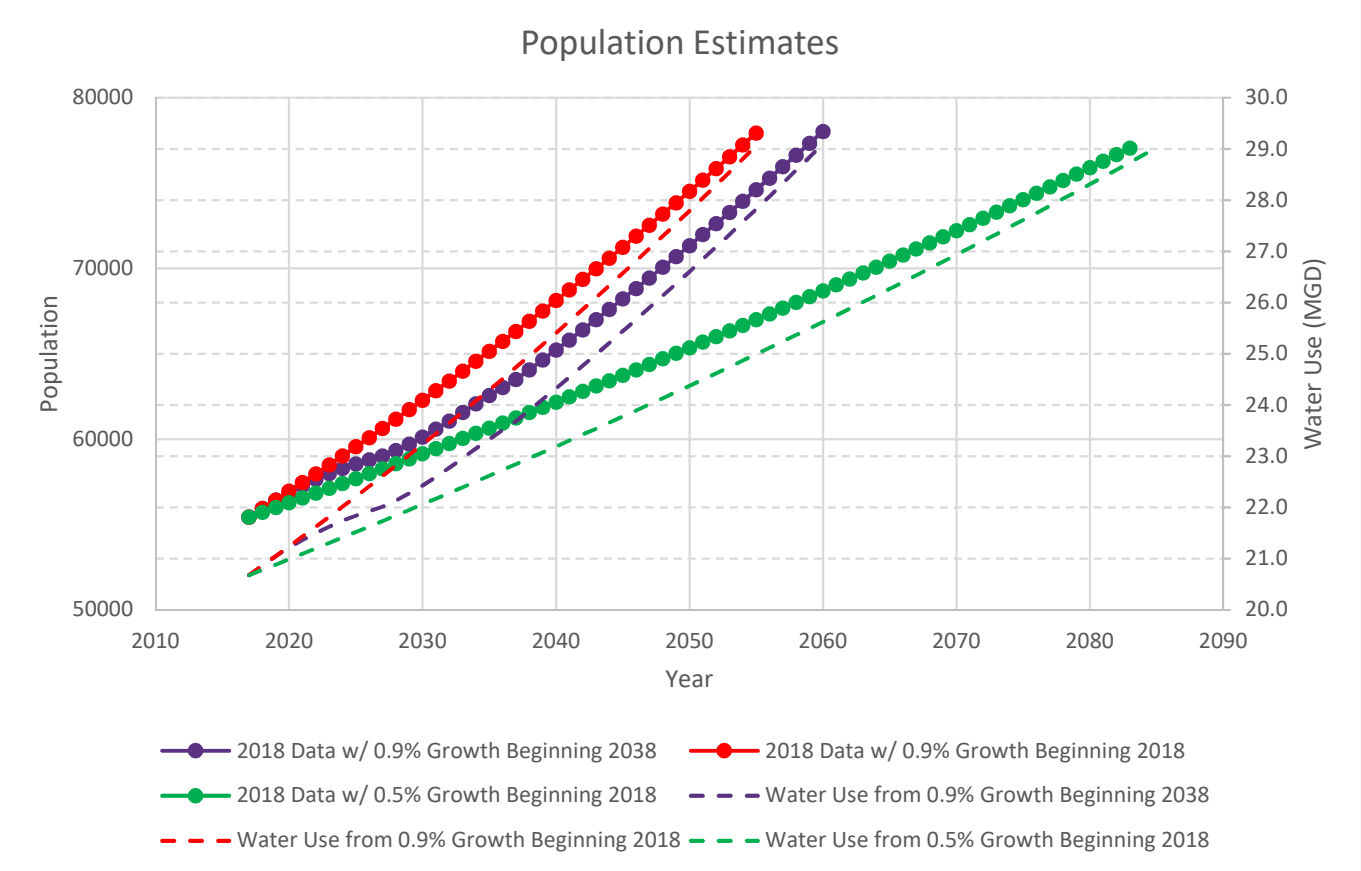
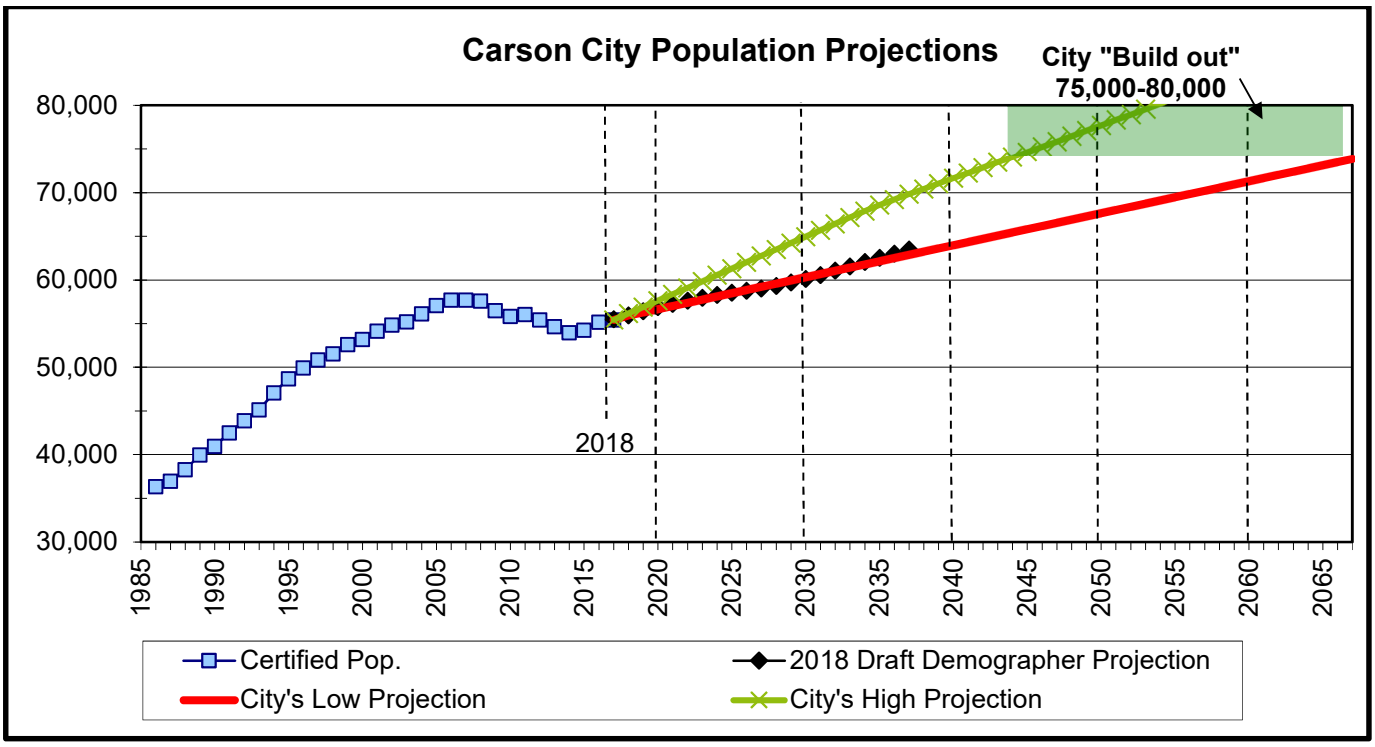


Figure 4-3 Population Estimate from Carson City Staff Report



Based on this data, the analysis attempted to determine at what population might the future condition peak water use likely occur and when that might likely happen. This estimate is based on the future water use without reserve, but the with reserve numbers would generate comparable results. Given an existing peak water use of approximately 20.7 MGD from Table 4-1 and a certified 2017 Carson City population of 55,438 from the 2018 Demographer's report, we estimated an existing peak water use of roughly 373 GPD per capita. If the future condition peak water use is estimated at 29.0 MGD in Table 4-2 and we assume that the water use per capita remains the same, then we would forecast the buildout condition to occur when the population of Carson City is roughly 78,000. In the previous figure, a population of 78,000 occurs in; 2060 based on the 2018 Demographer data with 0.9% long-term growth, 2055 if growth accelerates to 0.9% beginning in 2018, and 2085 if growth slows to 0.5% beginning in 2018.

It should be noted that these projections are extremely difficult to predict the longer the duration is and that a constant per capita water use rate over a long duration may not occur. Given that the buildout projection is approximately 36 to 66 years out, using these values for anything other than rough long-term planning should be avoided. Our review of existing data has been limited and therefore the projections and conclusions noted previously are likely to change as new population growth estimates are made.

4.4. Electronic Files

The following is a list of electronic files provided with this project and instructions for their intended use.

- Parcel_pts_MPLU_ASSD_FD.shp point shapefile
  - **Source –** Main deliverable for this project. The shapefile includes parcel data from the assessor's file, the City's master plan land use information, the existing condition water use analysis results, the projected future condition dwelling units and acreages of development, and total water use estimates.
  - **Details –**
    - Fields "FID" through "CENT_Y" are from the City's parcel polygon shapefile or its conversion to a point shapefile. These fields should not be altered.

  - Fields “LU_Code”, “CATEGORY”, and “LU_Label” are from the City’s Master_Plan_Land_Use GIS shapefile and should not be altered unless the City’s master plan is updated. These fields represent the data included in that file for reference.
  - Fields beginning with “ASSD_” are fields associated with the existing condition water use analysis and should not be altered unless the existing condition analysis is updated.
  - The “FD_Area” field is a link to the “Area_ID” field in the FutureDevelopment shapefile listed below. This field should not be altered.
  - Fields beginning with “FUT_” are fields used to show the planned future development for that parcel. Fields are populated with projected numbers of future dwelling units or projected future developed acreage. These fields should be updated as necessary to reflect the current future development projections.
  - Fields beginning with “TOT_” show the total (existing and future) projected water use in either gallons per day (GPD) or acre-feet (ACFT). These fields are calculated by adding the existing condition water use (“ASSD_GPD” or “ASSD_ACFT”) values and the future water use (e.g. “FUT_LDR_DU” x 700 + “FUT_MDR_DU x 679 + …) to get the total projected water use for each parcel. Six fields are included, 3 for GPD indicating whether the -10% (“_LO”), average (“_AV”) or +10% (“_HI”) values were used from Table 2-1 or Table 2-3. These fields should be updated as necessary whenever changes are made to the use rates or the “FUT_” fields.
  - Fields beginning with “RSV_” are the same as the “TOT_” fields but show the water use with the 20% reserve factors shown in Table 2-2. These fields should be updated as necessary whenever changes are made to the use rates or the “FUT_” fields.
  - The “ATK_AC” field is a field used to calculate acres for each parcel based on the original parcel polygon shapefile geometry. This fields should not be altered unless the parcel geometry changes.
  - The “BO_GPD_DIF” and “BO_ACFT_DIF” fields are used to calculate the difference between the “TOT_GPD_AV” and the “ASSD_GPD” fields or the “TOT_ACFT_AV” and the “ASSD_ACFT” fields to show the increase in water use for each parcel. This data was used on the heat map shown in Figure 4-1. These fields should be updated as necessary whenever changes are made to the 4 fields noted.
- **Intended Use -** This file is intended to be used to track the City’s current future development projections and the impact on future water use. This file may be used to intersect with any other shapefile to generate results for many different scenarios.

- Parcel_pts_MPLU_ASSD_FD.xls Excel file
  - **Source –** Export of the above point shapefile to Excel
  - **Details –** Data filters turned on for each shapefile field
  - **Intended Use -** This file may be quickly filtered to many configurations to quickly answer existing condition and future condition water use questions
- FutureDevelopment.shp polygon shapefile
  - **Source -** Digitized GIS shapefile of the City’s major development areas
  - **Details -** Unique area identifiers are listed in the “Area_ID” field
  - **Intended Use -** This file may be used in conjunction with other files to perform queries and summarize information.

5. References

Carson City, Staff Report for the Growth Management Commission Meeting of May 25,2016, File No: GM-16-043.

Nevada Department of Taxation, Draft Nevada County Population Projections 2018 to 2037, October 1, 2018.

Nevada Department of Taxation, Nevada County Population Projections 2017 to 2036 Final Draft, October 1, 2017.

Nevada Department of Taxation, Nevada County Population Projections 2016 to 2035, October 1, 2016.

Nevada Department of Taxation, Nevada County Population Projections 2015 to 2034, October 1, 2015.

Data Supplied by Carson City:

Meter Reading CY2014 to 2017

Assessor's Data by APN

Appendix

LAND USE CATEGORY	RANGE OF DENSITY/SIZE	USES	CHARACTERISTICS	ZONE DISTRICTS
RESIDENTIAL				
Conservation Reserve (Private)-(CR)	Minimum 20 acres per dwelling unit.	*Primary:* Open lands, agriculture, ranching, or single-family residential. *Secondary:* N/A	▪ Private properties located in rural areas of the city that are currently vacant or primarily vacant, located in floodplains or are constrained by other significant environmental or topographic feature (e.g. steep slopes or access constraints). ▪ While properties are entitled to rural residential development based upon their current zoning, maintaining these properties as open lands where possible is desirable through the use of conservation easements, purchase, or other means. ▪ *Relationship to previous Master Plan:* Conservation Reserve is a new land use category which replaces the Open Space/Recreation/Rural Residential and Agricultural Residential.	CR, A
Rural Residential (RR)	5-20 acres per dwelling unit.	*Primary:* Large-lot single-family residences *Secondary:* Accessory farm structures, animal keeping.	▪ Typically found in rural settings on the urban fringe. ▪ Lot size and layout varies. ▪ Typically not served by urban utilities, but may be depending on location. ▪ *Relationship to previous Master Plan:* Rural Residential is an established land use category.	SF5, A
Low Density Residential (LDR)	1/3-5 acres per dwelling unit (0.2-3 dwelling units per acre)	*Primary:* Single-family residences. *Secondary:* Complimentary uses include schools, parks, recreation, and open space in a planned neighborhood setting.	▪ Mix of low density housing types in a neighborhood setting. ▪ Suburban development standards generally apply (e.g. no curb/gutter/sidewalk, minimal street lighting). ▪ Clustering of residential units is encouraged as a means of preserving open spaces while retaining a suburban density character and developments should be well-incorporated into the parks, pathways, and open space system. ▪ The LDR category contains a number of established neighborhoods—change is not anticipated or encouraged in these areas. ▪ *Relationship to previous Master Plan:* Low Density Residential combines the former Low Density Residential and Suburban Residential categories into a single category.	SF21, SF1A, MH1A, SF2A

Land Use Category	Range of Density/Size	Uses	Characteristics	Zone Districts
Medium Density Residential (MDR)	3-8 dwelling units/ acre.	*Primary:* Single-family residences. *Secondary:* Complementary duplexes or townhomes on individual lots in a planned neighborhood setting, as well as parks, *pathways,* places of worship, schools, and other civic uses.	▪ Medium-density residential neighborhoods should contain a mix of housing types in a neighborhood setting. ▪ Each neighborhood should have a recognizable center. Centers will vary in size and composition, but may include a combination of higher-density residential uses, parks and/or recreation facilities. ▪ Neighborhoods should contain connective green spaces that unify the development and provide transitions between other areas and uses. ▪ *Relationship to previous Master Plan:* Medium Density Residential combines the former Medium Density Residential and MDR/Mobile Home categories into a single category.	SF6, MH6, SF12, MH12
High Density Residential (HDR)	8-36 dwelling units per acre.	*Primary:* Apartments, condominiums, townhomes, four-plexes and duplexes. *Secondary:* Complimentary uses include parks and recreation amenities, places of worship, schools, and other civic uses.	▪ Designed to create opportunities for higher-density neighborhoods in an urban and suburban setting. ▪ *Relationship to previous Master Plan:* High Density Residential is an established land use category.	MFA, MFD, MHP
COMMERCIAL/EMPLOYMENT				
Community/ Regional Commercial (C/RC)	Typically between 10 and 30 acres.	*Primary:* Typically anchored by large format national retailers, which may provide sales of a variety of general merchandise, grocery, apparel, appliances, hardware, lumber, and other household goods, often under one roof. *Secondary:*	▪ Mix of retail and commercial services in a concentrated and unified center that serves the local community. ▪ May also include larger retail centers with unique stores or characteristics that serve as a regional draw. ▪ Concentrated, unified design allows center to meet a variety of community needs in a "one-stop shop" setting. ▪ Single use highway-oriented commercial activities will continue to occur in some areas; however, this pattern of development is generally not encouraged. ▪ *Relationship to previous Master Plan:* Community/Regional Commercial replaces the previous Commercial land use category.	GC, RC, NB,TC

LAND USE CATEGORY	RANGE OF DENSITY/SIZE	USES	CHARACTERISTICS	ZONE DISTRICTS
		Complementary uses, such as restaurants, specialty markets, specialty stores (such as furniture, computers, office supplies, or clothing stores).		
Neighborhood Commercial (NC)	Typically around 5 acres, but may vary, ranging from as small as 1-3 acres to as large as 10-15acres.	*Primary:* Supermarkets, restaurants, movie rentals, drycleaners, drugstores, filling stations, smaller specialty shops, retail and health services and business and professional offices. *Secondary:* Plazas and squares.	▪ Intended to provide a range of services. ▪ Will vary in scale and character. Smaller, limited use centers may be fully integrated into the surrounding neighborhood and be accessed primarily by pedestrian or bicycle; while larger centers will function more independently, providing ample parking and numerous stores. ▪ *Relationship to previous Master Plan:* Neighborhood Commercial replaces the previous Neighborhood Business land use category.	NB
Industrial (I)	N/A	*Primary:* Light and heavy manufacturing, warehousing and distribution, indoor and screened outdoor storage, and a wide range of other industrial services and operations. *Secondary:* Airport supportive uses and commercial uses.	▪ Uses typically involve more intensive work processes, and may involve manufacturing or basic resource handling. ▪ *Relationship to previous Master Plan:* Industrial combines the previous Industrial and Rural Industrial land use categories.	GI, LI, AIP

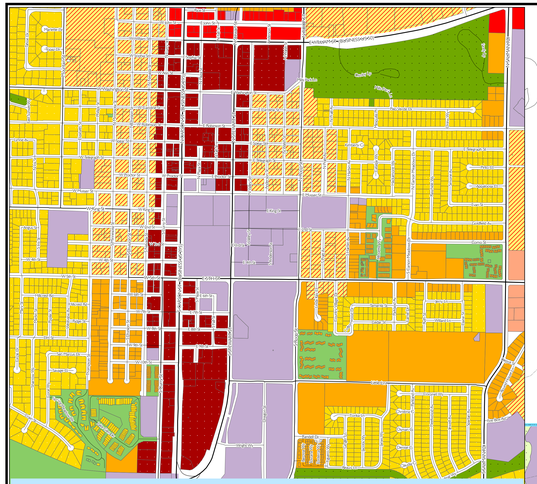
Land Use Category	Range of Density/Size	Uses	Characteristics	Zone Districts
MIXED USE				
Downtown Mixed-Use (DT-MU)	Typical floor area ratios (FARs) of between 0.75 and 3.	*Primary:* Variety of civic, cultural, retail, casinos, commercial, business, hotel/convention, professional offices, and financial institutions. *Secondary:* Variety of medium/high density housing types; plazas, squares, and pocket parks.	▪ Traditional downtown urban fabric with a compact, pedestrian-friendly scale. ▪ Intended to allow for and encourage a broader mix of uses than exist today, including high-density residential. ▪ Unique historic character and importance to the broader community. ▪ *Relationship to previous Master Plan:* Downtown Mixed-Use is a new land use category.	DC, DT-MU (will replace current DC zoning)
Mixed-Use Commercial (MUC)	Typical floor area ratios (FARs) of between 0.5 and 2, although they may be significantly higher within designated activity centers, or along major gateway corridors.	*Primary Uses:* Commercial retail and offices. *Secondary Uses:* Up to 25% higher density residential is encouraged in Mixed-Use Commercial areas, including live-work units. Open space, parks, trails, schools, places of worship, and other public uses, and senior housing facilities are also appropriate.	▪ The intent is to allow for vertical or horizontal mix of uses on sites, including some higher-density residential. ▪ These developments are generally located along major gateway corridors, within designated activity centers, and along collector or arterial streets. ▪ Mixed-use commercial development should be located where it may be readily served by existing or future transit and should be designed with clear pedestrian connections to transit stops and surrounding development. ▪ *Relationship to previous Master Plan:* Mixed-Use Commercial is a new land use category.	TBD
Mixed Use Employment (MUE)	Varies depending upon location and development context.	*Primary:* High quality employment facilities, such as corporate office headquarters, medical facilities and offices, research and development, and educational	▪ Intended to provide concentrated areas of employment, combined with a mix of complementary residential and commercial uses Office/Research Park developments may be incorporated into a master planned neighborhood, or located in close proximity to residential areas. ▪ May include smaller live-work complexes consisting of a single building or several buildings that are not located within a typical	TBD

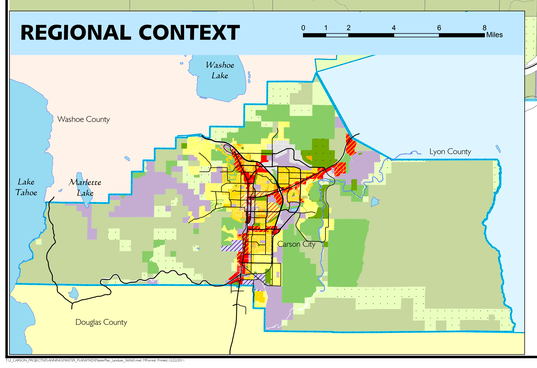
LAND USE CATEGORY	RANGE OF DENSITY/SIZE	USES	CHARACTERISTICS	ZONE DISTRICTS
		facilities in a planned, "campus-like" setting. *Secondary Uses:* Up to 25% higher density residential or commercial uses (or some combination of the two) are encouraged in Mixed-Use Employment areas. Open space, parks, *pathways,* schools, and other public uses, and senior housing facilities are also appropriate.	office park setting, but are located on infill sites within established areas of the City. ▪ Activities typically take place indoors and outdoor storage or other more industrial types of uses are typically not permitted. ▪ *Relationship to previous Master Plan:* Mixed-Use Employment replaces the previous Office land use category.	
Mixed-Use Residential (MUR)	3-36 dwelling units per acre. Typical floor area ratios (FARs) of between 0.5 and 1 for non-residential uses.	*Primary Uses:* A range of medium to high-density residential housing types, such as small lot single-family residences, duplexes, patio homes, townhomes, apartments, condominiums, and live-work units. *Secondary Uses:* Convenience retail and services such as supermarkets, restaurants, drugstores, smaller specialty shops, retail, health services, professional offices, and civic uses. Open	▪ Intended to promote self-supporting neighborhoods which contain medium to high-density housing predominantly (with a mix of types and intensities), but that also include retail, offices or live-work units. ▪ Appropriate adjacent to designated activity centers and along major corridors where infill and redevelopment is encouraged, as well as on larger vacant parcels within the urbanized area where larger scale planning is possible. ▪ *Relationship to previous Master Plan:* Mixed-Use Residential Neighborhood is a new land use category, but also incorporates some uses formerly designated as Office.	TBD

Land Use Category	Range of Density/Size	Uses	Characteristics	Zone Districts
		space, parks, *pathways,* schools, and other public uses are also appropriate.		

Land Use Category	Range of Density/Size	Uses	Characteristics	Zone Districts
PUBLIC/INSTITUTIONAL				
Public/Quasi-Public (P/QP)	N/A	*Primary:* Schools, government offices, community centers, fire stations, airport, libraries, hospitals, cemeteries, churches, and other places of worship. Also include facilities needed for essential public services such as electrical substations, water and wastewater facilities, and other similar uses.	▪ Provided by the City, special districts, or by a quasi-public organization. ▪ Churches are also an acceptable use in residential and some commercial areas and may not be designated as Public/Quasi-Public. ▪ *Relationship to previous Master Plan:* Public/Quasi-Public replaces the Public Neighborhood, Public Community, and Public Regional land use categories.	P, PN, PC PR
Washoe Tribe	N/A	*Primary:* A range of residential and non-residential uses associated with the Washoe Tribe.	▪ Properties owned by the Washoe Tribe are not within the City's jurisdiction. ▪ Proposed land use changes occurring adjacent to Washoe Tribe properties will require coordination with the Tribe's designated planning representative. ▪ *Relationship to previous Master Plan:* Washoe Tribe is an existing land use category.	
PARKS, RECREATION, AND OPEN LANDS				
Parks and Recreation (PR)	Varies, ranging from as small as 1-3 acres to 40+ acres for regional facilities.	*Primary:* Parks, pathways, and recreational facilities. *Secondary:* Utilities (e.g. municipal wells).	▪ Intended to provide for the active and passive recreational needs of the community. ▪ Generally provided by the City, however, privately operated facilities which also serve recreational needs, such as golf courses, are also included. ▪ *Relationship to previous Master Plan:* Parks and Recreation replaces the Open Space/Recreational/Public Regional and Public Neighborhood land use categories.	P, PN, PC, PR

Land Use Category	Range of Density/Size	Uses	Characteristics	Zone Districts
Open Space (OS)	N/A	*Primary:* Publicly-owned and accessible lands preserved by the City, other government agencies, or as part of a private development (e.g. planned unit development) for conservation, resource protection, or recreational use. May also be preserved without public access to protect sensitive natural areas. *Secondary:* Utilities (e.g. municipal wells or other utility structures).	▪ Provides wildlife habitat, view protection and/or recreational linkages between different areas of the City. ▪ Public access may be provided with designated trails or bicycle facilities; however, in other areas lands may be left intact as visual buffers along an important scenic corridor or gateway, or to protect significant ridgelines visible from various areas of the community. ▪ May be purchased outright by the City for public use, donated to private land trusts, or protected using another method, such as conservation easements, signage restrictions, and design controls. ▪ *Relationship to previous Master Plan:* Open Space replaces the Open Space/Recreational/Rural Residential land use category.	OS, P, PN, PC, PR
Public Conservation (PC)	N/A	*Primary:* Publicly-owned and accessible lands preserved for conservation, resource protection, or recreational use by the Bureau of Land Management (BLM), United States Forest Service (USFS), or State of Nevada Forest Service (SNFS). *Secondary:* Utilities (e.g. municipal wells or other utility structures).	▪ Large tracts of property that have been preserved through public ownership. ▪ Provides natural resource protection, view protection, protection of steep slopes or other sensitive areas. ▪ Active uses include unimproved trails for hiking, biking, equestrian use, and off-road vehicle use. ▪ Public access is generally provided through formal or informal trails and roadways; however, in other areas lands may be left intact as visual buffers along an important scenic corridor or gateway, or to protect significant ridgelines visible from various areas of the community. ▪ *Relationship to previous Master Plan:* Public Conservation replaces the Open Space/Public Regional land use category.	P, PN, PC, PR, CR





Washoe County
Carson City
To Reno
To Minden & Gardnerville
To Dayton & Virginia City
Carson City Airport
Proposed V & T Railroad Alignment
Lyon County
Carson City
Douglas County

CARSON CITY LAND USE MASTER PLAN

LEGEND

COMMERCIAL / EMPLOYMENT
- Community / Regional Commercial
- Neighborhood Commercial
- Industrial

RESIDENTIAL
- Rural Residential (5-20 ac/du)
- Low Density Residential (0.2-3 du/ac or 5-0.33 ac/du)
- Medium Density Residential (3-8 du/ac)
- High Density Residential (8-36 du/ac)

OTHER
- Public / Quasi-Public
- Washoe Tribe
- Conservation Reserve (Private)
- Vacant Private Land
- Specific Plan Areas

MIXED-USE
- Downtown Mixed-Use
- Mixed-Use Commercial
- Mixed-Use Residential
- Mixed-Use Employment

OPEN LANDS
- Public Conservation
- Open Space
- Parks & Recreation
- Mixed-Use Activity center

Adopted: 4/6/2006
Last Updated: 12/22/2011

0 0.5 1 2 Miles

CARSON CITY, NEVADA
THIS MAP IS PREPARED FOR THE CITY OF CARSON CITY FOR ILLUSTRATIVE PURPOSES ONLY. IT DOES NOT REPRESENT A SURVEY. NO LIABILITY IS ASSUMED AS TO THE SUFFICIENCY OR ACCURACY OF THE DATA DELINEATED HEREON.

Residential Units on City Water

Master Plan Land Use	Existing Res. Units	Future Res. Units	Total Units
Low Density Residential	3,171	1,405	4,576
Medium Density Residential	11,518	2,324	13,842
High Density Residential	5,816	2,306	8,122
Rural Residential	1	38	39
Conservation Reserve	8	0	8
Mixed-Uses Commercial	1,133	1,083	2,216
Mixed-Use Residential	950	1,505	2,455
Mixed-Use Employment	17	0	17
Downtown Mixed-Use	60	250	310
Commercial	632	184	816
Public-Quasi Public *	188	127	315
Industrial	6	0	6
Bureau of Indian Affairs	0	1,247	1,247
Totals:	23,500	10,469	33,969

* Under review – Some units may need to be allocated to another land use category.

Residential Units on Wells

Master Plan Land Use	Existing Res. Units	Future Res. Units	Total Units
Rural Residential	84	208	292
Low Density Residential	240	-78	162
Conservation Reserve	8	0	8
Open Space	4	0	4
Public/Quasi-Public*	13	12	25
Bureau of Indian Affairs	144	0	144
Totals:	493	142	635

* Under review – Some units may need to be allocated to another land use category.

With the GIS database developed for this analysis, staff will be able to keep track of the actual number of units development and the actual water usage from new non-residential development to continually update the capacity analysis. Furthermore, it will allow city staff and decision-makers to compare potential differences in water usage when a change in zoning or use if proposed. For example, if a property is converted from a commercial use to a high-density residential use, the estimated difference in average annual water usage can be accounted for.

This presentation will discuss the results of the study, as well as provide an overview of the water system and plans for the future. Overall, this analysis will help the City better understand the potential water demand spatially across the City, as well as provide a planning tool to analyze the impacts of future development on Carson City's water resources.

Attachments:

Carson City Water Use Analysis