

Report on the City of North Plains' Urban Growth Boundary Expansion Infrastructure Impacts – Capacity Issues and Costs

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1) Introduction¹

The following is an “order of magnitude” report on key issues and costs associated with providing public facilities and services to lands in the City of North Plains’ proposed 855-acre Urban Growth Boundary (UGB) expansion area. This report addresses domestic water supply, transportation (roads and streets), and waste and surface water management.

North Plains itself does not provide all of its needed services. It purchases most of its domestic water from the Washington County Joint Water Commission (JWC) via an intertie with a mainline within Glencoe Road. The City, along with others in Washington County, relies on Clean Water Services (CWS) for wastewater treatment and conveyance and for storm water system planning and maintenance of regional facilities. The City also contracts with the Washington County Sheriff’s Department to provide public safety services. Tualatin Valley Fire and Rescue provides fire and life safety services. Development as envisioned within the UGB expansion area would be very impactful to the City’s street system and the road networks of Washington County and the state.

2) Background

The [City of North Plains](#) is a small community on the western edge of the Portland region along Oregon State Highway 26 (Sunset Highway) on the way to the Oregon coast. It is not within the Portland Metro region’s UGB, and is not subject to the region’s boundary expansion requirements. In recent times, political and business interests have desired the City to expand its boundary to provide a substantial amount of land for new industrial and commercial development. This is in addition to new lands proposed to accommodate housing for population growth.

According to the [North Plains unapproved Housing Needs Analysis \(2022 Updated\)](#) (HNA), the City’s estimated current population is about 3,400 and is projected to grow by about 3,650 people to 7,050 by 2040. This estimate is based on a 2020 Portland State University Population Forecast that will likely be updated in 2024 with a lower projection. Per the 2022 HNA, this will require 1,350 new homes to be built by 2040. The City claims that there are about 67 acres of net developable land inside the City which can accommodate about 550 new units. They claim that the remaining need of 800 units would require 110 acres of new, buildable residential land. In addition, another

¹ Please Note: The City of North Plains recently removed many source links from its website, including links to UGB related materials. This report attempted to reestablish the links from other sources.

57 acres is proposed to provide for future recreation needs such as parks, trails, and open space.

Rather than forecasting land need to accommodate future employment growth based on past and future trends, North Plains took a different approach and used aspirational projected jobs growth based on its [2022 Economic Opportunities Analysis](#). In the EOA, the City then utilized a [targeted industries approach](#), which resulted in a proposal to dramatically expand the City's UGB. This is reflected in its current proposal to expand the boundary for commercial and industrial uses by 688 acres in addition to the above 167 acres for new housing. The North Plains Urban Growth Boundary Expansion final report that seeks to justify the expansion is linked [here](#). The original intent of the North Plains' City Council was to attract high paying technology-based jobs – particularly a semiconductor manufacturing facility and/or data storage. Other reasons proposed were to create a more reasonable jobs-to-housing balance and to increase the City's tax base to pay for needed services.

Part of the UGB proposal was originally justified on concerns that Oregon was non-competitive nationally for siting of semiconductor and related technology manufacturing sites. This was based on a [study from Business Oregon, Port of Portland, and Oregon Business Council](#) that claimed no sites existed inside Oregon UGBs for large semiconductor manufacturers and that the only acceptable lands were 1700 acres NW of Hillsboro. However, once asked, Oregon cities identified 10,000 acres of development-ready industrial land including several 1,000-acre sites close to the Portland International Airport (PDX). Oregon's [Senate Bill 4](#) gave the Governor the ability to supersite some properties for semiconductor facilities, among other provisions. However, all of the state match funding requests were for [expansion or modernization of existing facilities](#); no new industrial land outside of UGBs has been requested.

Even though the proposed North Plains UGB expansion was not considered for semiconductor manufacturing or other technology uses, the City has pushed ahead with plans of promoting large-scale development of the area for new industrial, commercial, and residential land uses.

3) Determining Needed Public Services and Their Costs

3A) Order of Magnitude Analysis of Public Services

North Plains did not consider the feasibility and costs of providing adequate public facilities and services to serve future land uses in the expansion area. The following summarizes the method used to develop an “order of magnitude analysis” of infrastructure needs and costs of the UGB proposal. These kinds of studies are often used in both business and government settings to determine the consequences and/or

feasibility of implementing a course of action or policy. They are often referred to as planning-scale exercises or analyses and these terms are also used in the following reports.

3B) Methodology

The future order of magnitude of the UGB expansion area's need for water, transportation, and wastewater services was derived from projected residential units, employment numbers, commercial and industrial land area and building square footage. Infrastructure demand/need at the concept level was determined at the level of millions of gallons (mgd) of water and wastewater flows, thousands of average daily trips (ADT) added to the transportation network, and acres of impervious surface. Planning-scale costs were derived from the extent and type of infrastructure improvements associated with these criteria.

It is not needed for this order of magnitude study to be more refined in terms of size of specific businesses. For a planning-scale review of infrastructure needs, the estimated number of employees and acreage or square footage of land uses are the primary factors and not the size of specific buildings or development types. The North Plains 2018 Economic Opportunity Analysis and [Urban Growth Boundary Expansion Report](#) are the sources of this information. They provide a general summary of the types of employment land uses that the City wishes to accommodate, such as office, institutional and retail flex/business park, general industrial, and warehouse categories.

There is an abnormality in the report that needs to be addressed at the outset and that is it forecasted that 687.8 acres of industrial and commercial land would result in only 3,000 to 3,500 employees during the 20-year planning period 2021-2041. There are two problems with this employment assumption.

First, 20 years is too short a timeframe to plan for and invest in infrastructure that must serve land uses over a much longer timeframe.

Secondly, 3000-3,500 employees accommodated on 687.8 acres is an extremely low employment density (4.3-5.0 employment density per acre, or EDA). It is much less than most suburban cities close to metro areas. Such a low employee/acre projection is not rational considering the wide range of employment land uses proposed by the City's documents. It is inconsistent with North Plains' stated desire to be like North Hillsboro, and it is much less than employment densities inside current city limits.

For example, North Plains' existing developed commercial and industrial districts have significantly greater densities. There are an estimated 381 employees on 22 acres of developed commercial land in North Plains and 769 industrial jobs on 86 acres for a

total of 1,150 employees. This results in EDAs of 17.3 for commercial and 8.9 for industrial uses.

[A study completed in 2020](#) compared industrial and commercial EDA for cities outside of the Portland region and the results range between a median of 8.3 in Albany to 12.2 in Canby, with an aggregate employment density of 9.9. Another study done by [ECONorthwest in 2020 for Clark County Washington](#) had similar findings.

For these reasons, this report estimates employment at full development of the proposed UGB using Tualatin, Oregon’s EDA for industrial land of 15 EDA, and an adjusted commercial EDA of 22. The reasoning is that North Plains’ aspirations for the UGB expansion area are for it to develop in a way similar to the North Hillsboro Area. However, because the estimated EDA for North Hillsboro was not available, Tualatin was determined to be a comparable reference. This is because Tualatin is also at the edge of the Portland region and its industrial/commercial land uses somewhat correlate with those in the UGB Expansion Report. Also, a 22 commercial EDA is reasonable considering that North Plains’ UGB development aspirations are for a wide range of office, institutional, retail and flex-space/business-park land uses.

As a point of reference, if North Plains desired to add 3,000 jobs, it would be reasonable to do so using employment densities like other similarly situated communities. For example, assuming a jobs ratio of 25 percent commercial and 75 percent commercial and an employment density like Tualatin, 3,000 jobs could be accommodated on about 184 acres maximum. It would be less if some of the projected jobs could be accommodated on vacant and underutilized land inside the City.

3C) The Numerical Basis of this Report

The following are numbers used in the public facility needs analysis of this report.

**Table 1: North Plains’ Existing 2021 Housing
Projected 2040 Future Housing and Population**

Current Population (2021)	Persons Per DU Average	Current Housing Units (2021)	Projected Population (2040)	Growth (population)	New Housing Units Needed	Total Housing Units 2040
3,400	2.72	1,253	7,050	3,650	1,350	2,603

**Table 2: North Plains’ Existing Commercial and Industrial Lands
Acres, Employment, and Employment Density**

Land Use	Acres Occupied 2021	Employment 2021	Employment Density/Acre
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Commercial	22	381	17.3
Industrial	86	769	8.9
Totals	108 Acres	1,150	

Table 3: North Plains' UGB Expansion Future Employment Land
Land Use Categories & Assigned Acreage per North Plains' UGB Expansion Report

Land Use	Acres
Commercial	172.4
Office	91.5
Institutional	21.2
Retail	72.3
Industrial	515.4
Flex/Bus Park	167.6
General Indus.	324.5
Warehouse	52.9
Total	687.8

This table reflects the information in the UGB Expansion Report's Table 6: Employment Land Need (Recommended by PAC) in May 2021. Note There is a mistake in Table 6 in the UGB Expansion Report of 13.7 acres. The total of office, commercial and retail lands equals 185.1 not 172.4. The industrial lands total is off by 29.6 acres. This error has been carried forward in the facilities analysis.

Table 4: Number of Employees in North Plains UGB at Buildout of UGB Expansion

Land use	Acres	Employee Density/Acr	Total Employees
Commercial	172.4	22 (avg all categories)	3,793
Industrial	515.4	15 (avg all categories)	7,731
Totals	687.8	16.77	11,524 Employees at buildout

Keep in mind that about 1,150 employees also work in North Plains on about 108 acres. Total projected employment if the proposed industrial and commercial land had similar EDAs would be 12,674.

4) Water Service Impacts of North Plains' UGB Expansion

4A) Cost Summary of North Plains UGB Expansion for Water Infrastructure

The following is an order of magnitude cost summary of providing water service to the proposed North Plains UGB expansion, prefaced by background information on North Plains' water supply, including key findings and conclusions. A key assumption underlying this analysis is that the Joint Water Commission of Washington County would make adequate water available to North Plains to allow for this UGB expansion. The appended water use scenario predicts deficits of between 1.127 million gallons per day (mgd) Maximum Day Demand and 2.568 mgd at build-out. This does not consider the siting of water intensive uses, such as computer chip manufacturing in the UGB area.

North Plains' water infrastructure currently provides service to approximately 700 acres (696.64) of land within the current city limits. The City's proposed Urban Growth Boundary expansion and annexation of 855 acres would eventually result in a municipality of about 1,555 acres. This expansion would require a very large expansion of the City's water distribution system and other public facilities and services. The following summarizes the methodology used to arrive at an order of magnitude cost of providing water service to the proposed UGB expansion.

This order of magnitude cost estimate uses an inventory of the existing distribution system as presented in North Plains' 2019 Water Master Plan. The water line distribution system's current value has been determined by applying current costs of installation to its various parts. Also, present value is applied to other distribution system capital improvements, such as mainline repair and replacement. The topography of the expansion area is generally flat, similar to within the current city limits, so it is likely that no new lift stations will be necessary.

The present value cost factor does not include the recently completed 2 mg storage and pump station improvements and updated telemetry systems. Additional storage will be needed in the form of new telemetry systems – the costs of such systems are included separately. Future distribution system pipe costs are based on all new ductile iron distribution pipe with minimum diameters of eight inches.

The 2019 North Plains Master Plan determined that the City's 16-inch line, which connects with Hillsboro's 72" water main and provides water to the entire system, is of sufficient size to provide capacity for considerable growth. However, the plan was not specific and it recommended that the actual capacity of the pipe be determined. The plan further noted that major work is needed to ensure the line is earthquake resilient.

In addition to the cost of building a new distribution system and associated storage and pumping, North Plains should first undertake significant major repairs and seismic upgrades to ensure a fully functioning and resilient system. This includes investigating feasibility of enhancing the City’s water supply and resiliency through an aquifer storage and recovery system.

These are identified in the 2019 Updated Water Master Plan and summarized as follows. It is important to note that ongoing investments have been and are being made for storage, some seismic issues, and distribution/flow issues. For example, a new 2.0 mg reservoir system and pump station improvements have been constructed and the City has budgeted for aquifer storage and recovery (ASR) studies. Many of the water distribution system improvements done in the last two to three years have been to provide service to new residential subdivisions.

[Construction costs and materials](#) in aggregate have increased at least 20 percent since 2019. Prices for labor and material changed considerably, and there is still an upward trend. Thus, a 20-40 percent increase in 2019 estimated costs in this case is reasonable to bring the cost of repair of system components closer to present value at the projected time of expansion.

The 2019 Water Plan water distribution infrastructure cost estimate for North Plains *without* the UGB Expansion consists of two parts as follows:

Table 5: Currently Needed Seismic Resiliency Investment and Major Maintenance/Repair of the Existing System Using 20% Cost Factor for 2019-2024

Project	Cost (2024)	Year Recommended
Joint strengthening of 16” Mainline Connection	\$1,200,000	2030
Mainline Vault Strengthening	\$516,000	2042 through 2051
Total	\$1,716,000	

In addition to the above earthquake related projects, the 2019 Water Master Plan stressed that North Plains needs a water source to augment its supply in case of a major earthquake. The 2019 water study recommends an initial study to determine feasibility and if an aquifer storage and recharge system should be developed in the long term (2061). The cost of the ASR well was estimated at \$6 million. The ASR well is not included in the overall cost estimate because it is significantly far into the future and the outcome of finding a favorable location is uncertain.

Table 6: Existing System: Telemetry, Pump Stations, Fire Flow and Distribution, and Main Line Replacement Using 20% cost Factor 2019-2024

Project	Cost (2024)	Year Recommended
Telemetry	\$195,300	2024
Pump Stations Upgrades	\$700,000	2024
Fire Flow Improvements	\$1,458,790	2024-2031
Mainline Replacement and Standard Upsizing Program	\$5,142,100	2024-2039
Total	\$7,496,190	

Table 7: Present Value of Existing Distribution System
Based on Minimum 8" Mains and all Pipe are Ductile Iron

Pipe Diameter (Inch)	Cost per foot Installed*	Length** of Main Lines	Total Cost
8"	\$300	60,326 ft	\$18,097,800
10"	\$370	2,671 ft	\$988,270
12"	\$440	10,228 ft	\$4,500,320
14"	\$572	5,301 ft	\$3,032,172
Totals		78,526 ft	\$26,618,562

* Includes est. cost of valves, fittings , etc.

** 14.8 miles of mains in 2020

The above present value estimate used the size of the City in 2018 , which was about 576 acres. Annexation since then has brought in about 123 acres, which have been developed primarily as single-family detached residences. The proposed UGB expansion is 855 acres, of which 110 acres is proposed for residential uses and 57 for parks for 167 acres total. The cost of the water distribution system for the previously annexed residential lands was estimated by the 2019 Water System Master Plan (Updated) as **\$10,260,000**. For the purpose of this report, the cost per acre is assumed to be the same and adjusted for inflation for new residential land.

The existing distribution system of 14.8 miles served a city area of 576 acres before the above residential annexation. Multiplying 576 acres x 1.14 = 656 acres is approximately the amount of land proposed for UGB expansion employment land. Therefore, the distribution system cost for this portion of the UGB is estimated as \$26,618,562 x 1.14 = **\$30,345,160**. This is a low estimate and a starting point for refinement. The cost would be about **\$57,000,000** if the same residential per acre cost (approximately \$85,000) is applied to the industrial portion of the UGB.

The North Plains 16” water line connection will not need to be replicated to serve the UGB expansion area. Therefore, it is not part of the present value determination . Instead, its seismic upgrades are part of the overall cost to bring the existing water system into a condition to accommodate new urban growth, since new industry and other development should not be put at risk because of non-earthquake resilient infrastructure. The above 2024 estimate of this expense is **\$1,716,000**.

Providing water service to the new UGB area will likely need to include two additional pressure zones and associated pumping to assure adequate fire flows and pressures. The cost of this infrastructure is estimated by using the approximate costs of the City’s recently built 2 mg water storage and pump station, which was \$6.2 million each x 1.2 x 2 = **\$12.8 million**. This cost includes needed pumping infrastructure components. and is adjusted for inflation. New telemetry for the new system would provide needed flow management and data collection.

Based on the above the above, an order of magnitude cost of building a new water distribution system to serve the North Plains’ proposed 855-acre UGB expansion is summarized in the following chart:

Table 8: Water Infrastructure Order of Magnitude

New and Upgraded Water Infrastructure Component	Estimated Costs (2024 Dollars)	Comments
Seismic upgrades to 16” main service line	\$1,716,000	This is essential to address before making major investments in the water distribution system elsewhere.
Needed existing distribution system repairs and major maintenance	\$7,496,190	These repairs should be made so as to not create weak links in the distribution system.
UGB residential lands distribution system (110-120 acres)	\$12,312,000	Residential development because of lot patterns and density requires a denser mainline configuration than industrial and commercial uses
Industrial and commercial lands distribution system (650 acres)	\$30,500,000 low density and low-to-moderate WUI \$57,000,000 Moderate to High density and WUI	Industrial and commercial uses typically have less dense but larger main line water distribution systems for fire flows to accommodate multiple peak periods of use. Also, water distribution depends on actual use. Thus \$30,500,000 is a low-to-mid range estimate and \$57,000,000 is mid-to-high range.
Two 2 mg storage systems with integrated pump systems	\$14,400,000	Water use intensity of mixed industrial and commercial have different peak characteristics that require more flexibility

		in distribution. Furthermore, fire flow requirements of these land uses often require more storage capacity. Additionally, the size of the UGB expansion likely creates additional pressure zones that require storage.
New Telemetry Systems	\$750,000	The UGB and proposed uses create a distribution system that requires much higher levels of management and data collection.
Total Order of Magnitude Cost Range	\$52,888,590 to \$79,388,590	Note: Costs can be further refined by mapping proposed water systems once land uses have been determined.

4B) Attachment 4-1

4Ba) North Plains’ Water: Current and Future Conditions

The City of North Plains has no surface water rights or ownership to water and its current access to domestic water is governed by an agreement with the Joint Water Commission (JWC) of Washington County. This agreement has restrictions including maximum daily demand and limits on size of connections without approval. Future water from this source at the scale needed to provide residential, commercial, and industrial growth in North Plains will be at the discretion of JWC and the City of Hillsboro.

The agreement between North Plains and the JWC states that the City will receive up to 2.5 mgd Maximum Daily Demand of water by 2035 per the following table. Thereafter the agreement will need to be renegotiated.

Table 9: JWC Water Delivery to City of North Plains

Year	JWC Agreement to Provide Water to North Plains	
2020	Max. Day Demand	1.2 mgd
2025	Max. Day Demand	1.5 mgd
2030	Max. Day Demand	2.0 mgd
2035	Max. Day Demand	2.5 mgd (End of Agreement)
2040	Max. Day Demand	3.0 mgd Projected*

*The projection was made at the time of the original agreement.

The appended North Plains Urban Growth Water Demand scenarios expects that North Plains will have a water supply deficit in the future, resulting from build-out of the proposed UGB expansion. The appended water use scenario predicts deficits of between 1.127 mgd – Maximum Day Demand and 2.568 mgd – Maximum Day Demand. Furthermore, peak day and peak hour demands deficits will increase proportionately requiring significant investments in storage and pumping capacity.

The City has groundwater rights that can be beneficial for storage, fire flow and peak hourly flow circumstances but these cannot be developed as viable alternatives or to meaningfully add to JWC Water.

Because of the supply and predictability of North Plains’ water and the fact that the City does not control its water source, the Urban Growth Boundary expansion area is likely not suitable for land uses that are water use intensive and require long-term irrevocable water commitments. This includes microchip manufacturing - “fab plants.”

Another consideration for future land use planning is that North Plains may be at a disadvantage in future negotiations with JWC and Hillsboro for water in the mid to long-term. JWC’s agreement is specific that it will, “not be liable for breach of the agreement if it is unable to provide water due to inadequate water supply availability despite its projections and the reasonable exercise of judgment, or for any other reason than interruptions caused by intentional misconduct or negligence. “What comes to mind are the impacts of climate change, including on the whole Willamette River watershed and future population and industrial growth in Hillsboro, Forest Grove and elsewhere resulting in competing demands. This is significant because Washington County is projected to have the highest growth in water demand in the state per [Oregon’s Integrated Water Strategy - Water Demand Forecast](#).

The [Willamette River Supply Project](#) will provide adequate water to meet projected demand for the Tualatin Valley Water District and Hillsboro for the foreseeable future.

The project will be completed in 2026 and will be connected to existing water distribution systems. The City of Hillsboro will initially receive 15 million gallons per day (mgd) and ultimately 36.2 mgd. This will take some pressure off the JWC source of water as the sole source of water for its owners and provide additional capacity for it to wholesale water to others, such as North Plains. This likely depends on how much water JWC owners/members wish to reserve for themselves to serve their expected population and economic development objectives especially in view of expected growth of high-water consuming manufacturing.

4Bb) Water Demand Associated with North Plains' Proposed Urban Growth Boundary Expansion

Introduction: The following evaluates the magnitude of need for domestic water for North Plains associated with its proposal to expand the City's Urban Growth Boundary (UGB) by 855 acres. The expansion consists of 687.8 acres of future commercial and industrial land uses and 110 acres for housing and 57 for parks and open space. The need for future water combines estimated usage by both existing and future residential and commercial uses to arrive at a water usage scenario based on build out of both future and existing UGB lands.

This analysis focuses on the magnitude of total water use and not on specific development proposals. Also, land uses such as microchip manufacturing, and data centers are major water and power users and are discussed separately as to how these would impact water demand. For reasons discussed later microchip manufacturing is not considered as a viable land use for the expansion area.

Water Use Intensity (WUI) for residential lands is based on water demand per residential unit as per the City's 2019 Water Master Plan. Two methods were used to determine the range of general water demand for the 687.8 acres of future North Plains employment lands. They are an assessment of WUI based on number of employees per acre (EA) and the WUI based on gross square feet of estimated floor area of commercial and industrial uses expressed as gallons per thousand square feet per day (g/pkf/d).

These methodologies compare a low Employees per Acre (EA) to a mid- range (g/kfs/f) water use scenario. The EA method envisions a mix of commercial and industrial land uses where there is a relatively low amount of water used in the process of manufacturing, assembling, and finishing products. The g/kfs/f method does consider water as intrinsic to some manufacturing processes/service delivery. These are industries such as food processing, wood products, materials manufacturing, chemical manufacturing, metal fabrication/coating or others that require water for temperature moderation, washing and cooling.

It is important to acknowledge that industrial and commercial water peaking demands (Peak Hour) are different from residential uses as is maximum daily demand. Water use by residential, commercial, and industrial land uses are not homogenous. Differentiating between the two requires much more information than is available from current sources. Therefore industrial, commercial residential maximum and peak demands are added together to arrive at an “order of magnitude peak hour” water use.

Non-residential land uses as proposed by North Plains require water utilities to invest in collecting data from their customers to use for planning future water delivery. For smaller towns, such as North Plains this has not been an issue because of its relatively low population, geographical area, and small amount of industrial and commercial land uses. It will, however, be an issue if industrial and commercial development in the UGB expansion area occurs at the scale imagined. Capital investment in the water system will be necessary to accommodate multiple peak situations. Furthermore, fire flow requirements will be much greater and more complex than exists currently.

The following Tables 10-12 presents estimated water use by 2040 and illustrates the extent by which future development will exceed water delivered by the Joint Water Commission of Washington County.

**Table 10. Summary Conclusion
2040 Projected Water Demand: Housing, 2022 Commercial/Industrial and UGB
Expansion Area Low- to Mid-Range Water Use Intensity (WUI)**

Land Use Category	Avg. Day Demand	Max Day Demand	Peak Hour Demand
2040 Housing	.883	1.943	2.914
Existing C/I	.100	.220	.330
UGB Lands: Low- to Mid-Range WUI	.879	1.934	2.901
Totals	1.862	4.097	6.145

**Table 11. Summary Conclusion
2040 Projected Water Demand: Housing, 2022 Commercial/Industrial and UGB
Expansion Area Mid-Range WUI**

Land Use Category	Avg. Day Demand	Max Day Demand	Peak Hour Demand
2040 Housing	.883	1.943	2.914
Existing C/I	.100	.220	.330
UGB Lands: Mid Range (WUI)	1.688	3.714	5.571
Totals	2.671	5.568	8.815

These scenarios do not consider the siting of a micro-chip factory in the UGB Expansion Area because existing water supply to the does not have the stability and reliability required by the industry. A medium sized fab factor could use between two to four million gallons (2-4 mgd) a day.

Water and Residential Land Use – Existing Conditions and Future Projections

The following Table 1 is from the North Plains Water Master Plan completed in 2019. The Water Plan’s study encompassed lands only within the city limits at the time and only for residential uses. Also as shown, its population estimates were greater than those used by 2022 North Plains’ Housing (HNA) and Economic Opportunities Analysis (HNA and EOA). It does forecast that North Plains is on an upward growth trend and provides a model for projected water demand.

Table 12: North Plains 2019 Water Master Plan Projection of Existing Demand

Year	Population	Avg. Daily Demand	Max. Day Demand	Peak Hr. Demand
2019	3,922	0.41	0.91	1.87
2024	4,221	0.53	1.16	1.74
2029	5,413	0.68	1.49	2.23
2034	6,942	0.87	1.91	2.86
2040	8,902	1.11	2.24	3.67

- Average Day Demand equals the population multiplied by the estimated average daily per capita usage for the service area (125 gallons per capita per day – gpcd).
- Maximum Day Demand equals the population multiplied by the estimated maximum daily per capita usage for this service area (275 gpcd) – a factor of 2.2.
- Peak hour demand equals 1.5 times the Maximum Day Demand

Table 13 illustrates projected water demand using the population estimates in the 2022 North Plains Housing Needs Analysis (HNA) for 2040. For comparison, the [2023 Portland State Population Research Center’s estimate](#) for North Plains has been included.

Table 13: North Plains' Projection of Estimated Water Demand
 Comparing Demand by Estimated Population in years 2020, 2023, and 2040 (projected)

Year	Population	Avg. Daily Demand (ADD)	Max Day Demand (MDD)	Peak Hr. Demand (PHD)
2020	3,410	0.426	0.9375	1.406
2023	3,663	0.4578	1.007	1.511
2040	7,066	0.883	1.943	2.914

Commercial and Industrial Land Uses – Existing Conditions and Assessment of Water Use

The 2019 North Plains Water Master Plan did not consider existing industrial and commercial water use. However, for this study it is important to have a complete understanding of all water use in the City. The following three tables illustrate the probable range of existing water use by these land categories, based on an employee per acre methodology.

Table 14: Estimated 2021 Water Demand of Existing North Plains Commercial and Industrial Land
 Employee Density Per Acre – H2O/Emp/Day

Land Use	Acres	Employees/Acre	Total	H2O use Employee per/day	Avg. Daily Demand
<i>Commercial</i>	22	17.3	381	140 (Avg)	.05328 mgd
<i>Office</i>				127	
<i>Institutional</i>				153	
<i>Retail</i>				153	
<i>Industrial</i>	86	8.94	769	45 (Avg)	.04605 mgd
<i>Flex/Bus Park</i>				75	
<i>General Indus.</i>				40	
<i>Warehouse</i>				20	
		Total Employees	1,150	Total	.1mgd

Table 15: North Plains Existing Commercial and Industrial Land Maximum Daily Demand (mgd) and Peak hour Demand

Year	Avg. Daily Demand/mgd	Max Day Demand /mgd	Peak Hr. Demand/mgd
2020	.1	.22	.33

Table 16: Combined Estimated Existing North Plains Residential, Commercial, and Industrial Water Demand

Year 2023	Residential Avg Daily Demand (mgd)	Residential Maximum Daily Demand (mgd)	Residential Peak Hr. Demand (mgd)
<i>Residential land uses</i>	0.458	1.007	1.511
<i>Existing Industrial and commercial</i>	0.100	0.222	0.333
Totals	0.548	1.229	1.844

Table 17 calculates water use in the future UGB area by [multiplying employee density per acre](#) in each employment and use category by a metric of gallons of water per employee per day.

Table 17: Estimated Low to Mid Projected WUI of North Plains Commercial and Industrial Land UGB Proposal
Employee Density Per Acre (EDA)

Land Use	Acres	Projected Employees/Acre	Total	Gallons Per Day	Avg. Daily Demand
Commercial	172.4	22 (avg all categories)	3,792.8	140 (Avg)	.531 mgd
<i>Office</i>	91.5		127	127	
<i>Institutional</i>	21.2		153	153	
<i>Retail</i>	72.3		153	153	
Industrial	515.4	15 (avg all categories)	7,731	45 (Avg)	.348 mgd
<i>Flex/Bus Park</i>	167.6			75	
<i>General Indus.</i>	324.5			40	
<i>Warehouse</i>	52.9			20	
				Total MGD	.879 mgd

Table 18: North Plains Low to Mid-Range Future Water Demand

Future Commercial and Industrial Employees per acre

Year	Avg. Daily Demand/mgd	Max Day Demand /mgd	Peak Hr. Demand/mgd
2040	.879 mgd	1.934 mgd	2.90 mgd

Table 19: North Plains: UGB Expansion Area Water Use Intensity (WUI)
Using Assumed Gross Building Area Square Footage (gallons per square feet per day, or g/ksf/d)

Land Use	Acres	Adjusted Acres (.65)	Total Bldg. Sq. Feet Expressed as 1000's	g/ksf/d		Daily water Use (mgd)
Commercial	172.4	112.06	4,8841.33			
<i>Office</i>	91.5	59.75	2,602.71	88		0.2290
<i>Institutional</i>	21.2	13.78	600.26	88		0.0528
<i>Retail</i>	72.3	47.00	2,047.32	100		0.2047
					Subtotal	0.4866
Industrial	515.4	335.01				
<i>Flex/Bus Park</i>	167.6	108.94	4,745.423	55		0.2609
<i>General Indus.</i>	324.5	210.93	9,188.111	100		0.9188
<i>Warehouse</i>	52.9	34.39	1,498.028	15		0.0225
					Subtotal	1.2022
					Total	.4866 + 1.202 1.6888

Table 20: North Plains Mid-Range Future Water Demand
Future Commercial and Industrial Employees per acre

Year	Avg. Daily Demand/mgd	Max Day Demand /mgd	Peak Hr. Demand/mgd
	1.688	3.713 mgd	5.570mgd

4Bc) Microchip Manufacturing, Data Centers, and Water Use Determination Sources and Methodologies

Computer microchip fabrication plants have not been assumed to be part of the North Plains' land use scenario. The major reasons are that North Plains does not own its own

water source and must contract with others, and that there is no other water to source from. A large microchip manufacturer can use up to five million gallons of water (mgd) a day. The average plant will easily use two to four mgd. It is noted there have been major advances in the recycling of water and re-use and that water use may decrease as technology advances. However, before firms make major investments in locating they must be assured of the [ability of a region to delivery w](#)ater and energy on a very long term basis to justify the major investment of building a fabrication plant.

Data centers as land uses have evolved quickly over the last decades in tandem with major advances in computing and data storage technology. Data center sizes and technologies depend on the entity or entities they are supporting. They vary in size from very large facilities of many hundreds of thousands of square feet that are owned and managed by companies like Google, Microsoft, and Amazon, to relatively small operations.

Very large data centers can have water use between .125 mgd to .5mgd a day. Some data centers can be much smaller comprising, a few thousand square feet that require much less cooling but in aggregate they can be significant water and energy users. Data centers are a business enterprise for many firms that provide data storage and management as a service or places where data storage space is rented out.

From a [land use perspective](#), applicable to North Plains, data centers are [very low employment. They may have significant tax breaks](#), which would not help North Plains address its stated municipal finance issues.

4Bd) The following provides [the basis for using the above metrics](#) for determining WUI for Industrial uses by using gallons per 1,000 square feet per day (g/ksf/d)

Commercial Uses – Offices, Institutional and Retail

Offices: Water use intensity for office buildings (WUI) range from 25 gallons per 1000 square feet per day g/ksf/d) to 129 g/ksf/d). These uses are typically medical, personal, and professional services, finance, engineering, marketing, administration, communication, and technology services. In many instances offices are also used as flexible workspace. A reported average of several utilities have reported a weighted average of 88 g/ksf/d.

Institutional: institutional water use is highly variable depending on the specific use. For example, hospitals, elderly care facilities , and outpatient clinics have much higher WUI than schools or public buildings. For example, hospitals generally use water at about 150 g/ksf/d, but some facilities can have WUI as high as 400 g/ksf/d. The average WUI of elderly care facilities is variable and ranges from 277 to 170 g/ksf/d. Schools range

from 22 to 24 g/ksf/d for outdoor use – 110 to 255 g/ksf/d – primarily irrigation for athletic and playfields.

Retail: Retail uses are generally mercantile or commercial uses encompassing retail sales of food, drink, hardware, clothing, and entertainment Office uses and retail uses are often mixed in the same land use category . Shopping centers, car dealerships, retail outlets, strip commercial, lodging, and enclosed malls are common in suburban retail districts.

Studies have found WUI of retail uses vary depending on the type of commercial activity. Retail Food stores surveyed had WUI intensity ranging from 113 g/ksf/to 295 g/ksf/d. Restaurants and food service uses have very high WUI ranging from 400 to 600 g/ksf/recent studies. Small single retail buildings were assessed between 40 and 98 g/ksf/d. Studies of retail outlets yielded WUI of 115 g/ksf/d.

Refinements of Industrial Use Definitions Pertaining to Water Use

Manufacturing: Most manufacturers in the United States have access to their own water and are not entirely dependent on a public source, as would be the case in the future UGB area. Manufacturers may buy some amount of municipal water but use private sources for much of their manufacturing. The average industrial use WUI nationwide is about 215 g/ksf/d. Some of these companies are heavy industry, such as primary metals, petroleum products, and machinery fabrication. It is unlikely that similar land uses would be located near North Plains because they require significant amounts of water, proximity to raw materials, and access to heavy freight routes. Therefore, future uses in the area will be those that use a relatively low to moderate amount of water in manufacturing processes.

Flex /Business Parks are assumed to have an employment mix of light manufacturing, professional services, medical, technology services, specialized industrial and research, technology support services, and personal services. Flex/business parks can also accommodate some retail uses, food services, wholesale sales and high value product storage and sales. They are often a hybrid mix of retail and light-manufacturing uses.

Non-Water Intensive Light Industrial / Light Manufacturing consists of fabricating, assembling of component parts including technology hardware and scientific instruments, medical products, assembly of pre-made parts, machine and instrument repair, applied research, and materials testing.

More Water Intensive General Industrial uses are industries such as food processing, wood products, materials manufacturing, chemical manufacturing, surface coating or uses that require water for temperature moderation and cooling, such as data centers complexes.

Warehousing is assumed to be both heated and unheated space ranging from raw material storage to specialized storage handling and packing with truck parking and transfer facilities. Wholesale sales of bulk materials often occurs in warehousing districts.

5) Transportation Impacts of North Plains' UGB Expansion

5A) Order of Magnitude Transportation Costs

Tables 21 and 22 show the magnitude of scale cost estimates of building a transportation network to serve Urban Growth Boundary expansion. This includes the cost of higher capacity collector and arterial streets and of improving Highway 26 interchanges. Future improvements to throughlanes of Highway 26 are not included because additional detailed conversations with ODOT are needed.

Table 21: Order of Magnitude Costs to Construct and Arterial and Collector Street Network to Accommodate Traffic Generated by the UGB Expansion

Jackson School Road	<p>Improve to 6,000 feet major arterial status to accommodate freight with 2 lanes with protected left turn lanes</p> <p>2 signalized intersections at West Union Road and ½ mile from Hwy 26 w/ radius</p> <p>Improved rail crossing at terminus of city limits</p>	<p>1.136mi. (\$4.M) = \$4.54 M</p> <p>\$375K with radius x 2 = \$.75M</p> <p>\$.100M</p>
Arterial System Internal to East UGB Area	Construct 6,500 ft of new 2 lane arterial street to connect West Union Road to Jacksons School Road	1.23mi (\$7.0) = \$8.61m
Collector System Internal to East UGB Area	Construct 4,000 ft of 2 lane collector	.76mi x \$5.6M. = \$4.25M
Collector Internal to NE UGB Area	Construct 3500 ft of 2 lane connector	.66 mi x \$5.6M = \$ 3.7 M
Arterial and Collector Streets in Existing City Limits	Reconstruct 18,000 feet of existing road to higher volume arterial status, including West Union Road, Commercial or Hillcrest to boundary of West UGB.	1.136mi (\$3.2M) = \$3.64M 2.24 mi x(\$8.5M) \$19.04M
Reconstruct Glencoe Road to arterial status connect to midtown arterial above	Reconstruct 4,000 feet of existing road to higher volume arterial status.	.75mi x (7.0M) = \$5,25 M
Signalization at Pacific and West Union Road	Signalization with radius	1x \$375K = \$.375M
Reconstruct local City streets to a Collector Street System Status in existing City limits.	Reconstruct 11,000 feet of local streets to collector status.	2.1mi x (\$7.0) =14.7M
Signalization	Signalization at 5 locations with radius	\$375K ea. x 5 = \$1.875M
West UGB and 34-acre Piece South of Hwy 26 Construct Arterial Street System	Construct 10, 500 feet of Arterial Street	1.99mi x 7 million = \$13.93M
Reconstruct existing Gordon Road to arterial status with turn lanes to connect to West UGB Area.	Reconstruct 3,000 feet as arterial.	.57mi x (\$4.0M)=. \$2.28M
Signalization	Signalization with radius at intersection with West UGB Intersection	\$375Kea = \$.375M
Collector System	Construct 10,000 ft of collectorsSystem	

		1.89 x (\$5.6mi) = \$10.60M
	Total	\$93.3 million

Note that the above order of magnitude costs varies because building new or reconstructing existing streets to accommodate more traffic and freight within developed areas is different from doing the same in undeveloped areas. However, note that these costs do not consider the added expense of rebuilding impacted utilities that occupy the street right-of-way.

Table 22: Order of Magnitude UGB Expansion Oregon Highway 26 Costs
City of North Plains Transportation System Plan

US 26 at Gordon Road	New Interchange	\$20.0 Million
Glencoe Road	2nd westbound right turn lane and separate southbound right turn lane and 2nd northbound through lane.	\$10.25 Million
Jackson School Road	Reconstruction to provide additional through and turn lanes to accommodate traffic volume including freight	\$15 Million
	Total	\$45.25 Million

In summary the magnitude of scale transportation costs of the UGB expansion are projected to be \$138.55 million.

This magnitude of scale analysis concludes that it is not practically possible to accommodate the transportation needs of the land uses proposed by North Plains' 855-acre UGB expansion as described in the [City's Urban Growth Boundary Expansion Report](#). Building a road system to serve even a portion of traffic generated by 20 million square feet of commercial and building space, 11,500 projected employees, and 1,350 homes would be financially impractical and fundamentally change the character of the City. The magnitude of cost would likely exceed \$138 million. For a magnitude level comparison, the UGB area is one-third larger than the City of Portland, Oregon's downtown core. From a building coverage perspective, the main Washington Square Mall building in Tigard is about 1.5 million square feet compared to the UGB's estimated 20 million square feet.

The only feasible way to partially mitigate the UGB expansion's transportation impacts would be if a substantial portion of its area was used to accommodate extraordinarily low employment density land uses such as data centers, and very large warehousing/logistic facilities. This has been mentioned in the North Plains 2022 Economic Opportunities Analysis – Target Industries Report, which proposed that the area would accommodate 3,300 employees over the planning period 2021-2041. However, this is far less than 11,500 employees projected if the area developed at a

density consistent with build-out of proposed land uses in Portland suburbs and with North Plains' UGB expansion proponents' desire to be like North Hillsboro.

5Aa) Transportation Context of North Plains

North Plains developed over time as a farm service and wood products-oriented town along Oregon Highway 26 (Hwy 26.) and on both sides of a railroad line, currently Portland & Western. The City is connected to the state highway system at interchanges by three widely spaced Washington County rural standard roads running north and south. Its local transportation system of residential and commercial streets has developed to serve the historical city limits and is not connected to any other cities except by these rural roads.

The proposed UGB expansion both east and west would create a relatively narrow city boundary bordered by Hwy 26 to the south and farmland to the north with no east west conenting road system outside of the city limits. This would require local traffic generated by the UGB expansion to be accommodated locally as much as possible. This is because the Oregon Department of Transportation (ODOT) must both ensure the capacity of the three interchanges adjacent to North Plains to serve adjoining lands and maintain free flow of through traffic. ODOT would discourage traffic generated by the proposed UGB expansion from using Hwy 26 as a connector. To the extent that new traffic caused by the UGB expansion would use Hwy. 26, ODOT would exact proportional payment or improvements to maintain the capacity of the interchange and the road itself.

Other significant traffic capacity impacts would occur on the Washington County road system, particularly roads that connect to Hillsboro and to Hwy 26. Washington County would most likely seek exactions to ensure these roads' capacity.

5Ab) Consequences Of New Arterial and Collector Street Network on North Plains

Usually, smaller communities scale their expansion plans in view of their historical growth, existing and desired town form, existing and future capacity of public facilities and services, and a desire to maintain a quality of life for residents. These typically are incremental changes that occur as needed over time. The proposed North Plains UGB expansion is an extreme exception to this traditional, incremental, community-first approach.

From a town-planning perspective, building the needed east-west arterial and collector streets network to accommodate both car and truck/freight traffic through North Plains would result in major alteration of the City's physical form. Both residential and commercial areas would be impacted. This is because there is likely not enough space to build new major streets within existing right of ways. Most likely it would be necessary to take a significant amount of private property to build this network.

Table 23 illustrates that the Average Daily Traffic (ADT) expected to be generated by existing new industrial commercial and residential land uses would approach 200,000 trips. This is an extremely high amount of traffic, but is consistent with the development potential of 855 acres of urban land at the density of land uses proposed by the City’s UGB proposal. Attachment 5-1 shows the methodology used to determine the magnitude of traffic generation.

Table 23: Projected Combined Daily Traffic Generation (ADT) for North Plains UGB Expansion and Existing land Uses

Combined Existing and Proposed UGB Residential ADT Traffic Generation	24,217
Combined Existing and Proposed UGB Commercial and Industrial ADT Traffic Generation	188,084
Total	212,301

One might reasonably assume that it is not possible to redevelop North Plains' existing street system and possibly Hwy 26 and its interchanges in order to accommodate the traffic expected to be generated by the UGB expansion. The exception would be if the City of North Plains itself would be substantially redeveloped, such as with a major four-lane principal arterial bisecting the community and commensurate major scale improvements occurring on adjacent highways and roads. The other exception, as previously mentioned, is large-scale development of ultra-low employment density and low traffic generating land uses with some supporting commercial office uses. An important caveat is that this scenario would likely include warehousing/logistics which would involve a lot of freight traffic.

5Ac) How to Realistically Accommodate Some UGB Expansion Traffic

North Plains would need to accept a fundamental change to its street network to accommodate a fraction of the traffic that could be generated by urban level development of the UGB. At the most, this would be to accommodate traffic in the 45 – 35 thousand ADT range while retaining some semblance of the original community. This would require developing a larger network of urban-scale arterial and collector streets with much greater capacity than what exists now with associated intersections, redevelopment, and improved railroad crossings. This scenario would require necessary high-volume arterial and major collector streets to be constructed within and on the edges of established commercial and residential neighborhoods to connect the two UGB expansion areas. Attachment 5-1. generally defines the types and functions of these streets.

5B) Relationship and Consistency of UGB Transportation Improvements with the City of North Plains' Transportation System Plan (TSP) and Projected Costs

The UGB Expansion Proposal was not coordinated with North Plains' adopted [2019-2040 Transportation System Plan](#), which mentions UGB expansion briefly and only in conceptual terms related to Hwy 26 improvements. Therefore, by association, this study and its demonstration of how to accommodate a portion of the UGB expansion's traffic is also inconsistent with the direction of the TSP and many of its recommendations for future capital projects, most of which emphasize traffic safety, community accessibility, and maintenance of community character.

The cost of building a transportation system to accommodate the UGB expansion's land uses far exceeds North Plains' ability to access funding over a 20-year planning period. This is emphasized on pages 33 through 42 of the TSP, which illustrates that North Plains is projected to not be able to even fund the needed improvements within the current city limits to create a safe and efficient transportation network.

5C) Attachment 5-1: North Plains Proposed UGB Expansion PM Peak and ADT Traffic

Table 24: North Plains Urban Growth Boundary Expansion Proposal
PM Peak Traffic Generation for Projected Commercial and Industrial uses at Build Out

Land Use	Acres	Adjusted Acres (.65)	Total Bldg. Sq. Ft. Expressed as 1000's	PM Peak Traffic Rates	PM Peak Traffic
Commercial	172.4	112.06	4,884.133		
<i>Office</i>	91.5	59.75	2,602.71	1.89/k sq. ft	4,918
<i>Institutional</i>	21.2	13.78	600.26	1.00/k sq. ft	600
<i>Retail</i>	72.3	47.00	2,047.32	4.00/k sq. ft	8,282
					13,800
Industrial	515.4	335.01	15,431.562		
<i>Flex/Bus Park</i>	167.6	108.94	4,745.423	.99/k sq. ft	4,708
<i>General Indus.</i>	324.5	210.93	9,188.111	.63/k sq. ft	5,789
<i>Warehouse</i>	52.9	34.39	1,498.028	.19/k sq. ft	284
					10,781
Total Proposed UGB Expansion PM Peak Traffic Generation for Commercial and Industrial Uses					24,581

Table 25: North Plains PM Peak Traffic Generation for Existing Industrial and Commercial Land Uses

Land Use	Acres 20121	Adjusted Acres (.65)	Total Bldg. Sq. Ft. Expressed as 1000's	PM Peak Traffic Rates	PM Peak Traffic
Commercial (Includes Office and Retail)	22	14.3	622.91	2.5./k sq. ft	1,557
Industrial	86	55.9	2,435.00	.63/k sq. ft	1,534
Total Existing North Plains Commercial and Industrial land PM Peak Traffic Generation					3,091

Existing and Proposed UGB Expansion PM Peak Traffic Generation is 27,672.

Table 26: North Plains Existing 2021 Housing, PM Peak Traffic Generation

Current Population (2021)	Current Housing Units (2021)	PM Peak Traffic Generation Per DU	PM Peak Traffic
3,400	1,253	.99	1,240 Total

Table 27: North Plains Projected 2040 Housing PM Peak Traffic Generation

Projected Population Growth (2040)	New Housing Units Needed	PM Peak Traffic Generation Per DU	PM Peak Traffic
3,650	1,350		
	1,350 x .70 SF/DU = 945	x.99	936
	1,350 x .20 MF/DU = 270	x.56	151
	1,350 x .10 SFA/DU = 135	x.70	95
			1,182 Total

Total existing and projected (2040) Residential PM Peak Traffic (2040) is 2,422.

Table 28: Summary of North Plains 2040 PM Peak Hour Traffic Generation

Combined Existing and Proposed UGB Residential PM Peak Traffic Generation	2,422
Combined Existing and Proposed UGB Commercial and Industrial PM Peak Expansion	27,672
Total	30,094

Table 29: North Plains Urban Growth Boundary Expansion Daily Traffic Generation Estimate (ADT)

Land Use	Acres	Adjusted Acres (.65)	Total Bldg. Sq. Ft. Expressed as 1000's	Daily Traffic Generated (ADT)/1000 sq. ft	Conversion Factor	ADT Traffic
Commercial	172.4	112.06	4,884.133			
<i>Office</i>	91.5	59.75	2,602.71	10/k sq. ft		26,020
<i>Institutional</i>	21.2	13.78	600.26	5.2/k sq.ft	5.2 x Peak Hr. (1) =5.2	3,121
<i>Retail</i>	72.3	47.00	2,047.32	38/k sq. ft		77,798
						106,939
Industrial	515.4	335.01	15,431.562			
<i>Flex/Bus Park</i>	167.6	108.94	4,745.423	5.15/k sq. ft	5.2 x Peak Hr. (.99)= 5.15	24,434
<i>General Indus.</i>	324.5	210.93	9,188.111	5.0/k sq. ft		45,940
<i>Warehouse</i>	52.9	34.39	1,498.028	.19/k sq. ft	5.2 x Peak Hr (.19) = 1	1,498

						71,872
Total Commercial and Industrial Daily Traffic Generation (ADT)						181,811

Table 30: North Plains ADT Traffic Generation for Existing Industrial and Commercial Land Uses

Land Use	Acres 2021	Adjusted Acres (.65)	Total Bldg. Sq. Ft. Expressed as 1000's	Estimate d Pm Peak Factor	PM Peak Traffic	Conversion Factor for ADT	ADT Traffic
Commercial (Includes Office and Retail)	22	14.3	622.91	2.5/k sq. ft	1,557	Peak Hr. Traffic x (3.0)	4,671
Industrial	86	55.9	2,435.00	.63/k sq. ft.	1,534	Peak Hr. Traffic x (1.89)	4,602
Totals	108	70.2	3,057.91		3,091		9,273

For the purposes of this order of magnitude study it is not assumed that existing commercial and industrial land will re-develop at the intensities of new lands proposed to be added to the UGB.

Using ADT conversion factors of four to eight times the PM peak is likely too high for existing North Plains office and commercial uses. Many smaller towns do not have the full range of urban level commercial services and are focused on serving local needs or are specialized to the extent that that attracts fewer clients and customers than, for example, downtown Hillsboro or Beaverton. In North Plains there are no retail discount stores, supermarkets, athletic clubs etc. Therefore, a conversion factor of 3.0 was used – $3 \times 1557 = 4,671$. Thus, for the purposes of magnitude of scale, industrial uses also used a conversion factor of 3 x PM Peak Number (1,534) in Table 7 = 4,602.

Table 31: North Plains Existing 2021 Housing, Daily Traffic Generation (ADT)

Current Population (2021)	Current Housing Units (2021)	PM Peak Traffic Generation Per DU	PM Peak Traffic
3,400	1,253	9.9	12,405

Table 32: North Plains Projected 2040 Housing Average Daily Traffic Generation (ADT)

Projected Population Growth (2040)	New Housing Units Needed	PM Peak Traffic Generation Per DU	PM Peak Traffic
3,650	1,350		
	1,350 x .70 SF/D = 945	X 9.9	9,355
	1,350 x .20 MF/DU = 270	x.5.6	1,512
	1,350 x .10 SFA/DU = 135	x.7.0	945
			11,812

Total existing and projected (2040) Residential Daily Traffic Generation is 24,217 ADT.

Table 33: Projected Combined Daily Traffic Generation (ADT) for North Plains UGB Expansion and Existing land Uses

Residential Land Uses	24,217
Commercial	111,610
Industrial	76,474
Total	212,301

5D) Attachment 5-2: Definition of Arterial and Collector Streets

Within a relatively small area such as North Plains, two primary types of streets are proposed to move traffic through the community, but due to the City's form (layout) with a railroad bisecting east and west and few connections to intercity routes it is plausible that there will be considerable traffic impacts beyond the proposed arterial and collector street system.

Arterials

Arterials as used in this study provide travel service (high mobility) for major traffic movement, including freight trips, within North Plains and to connect directly with adjacent major county roads and the state highway system. They are intended to collect and to distribute traffic to and from the collector street system and are subject to controlled access to accommodate the collected traffic of the community's major trip generators. They are intended to be the highest volume corridors in a city and frequently serve as interurban and intercity bus routes. The Average Daily Traffic (ADT) is typically in the range of 12,000 to 40,000 vehicles per day. The spacing of principal arterials is usually about one mile, although lower order of scale arterials may be spaced closer. Service to abutting land should be subordinate to the need to provide for major traffic movements. The preference is for principal arterials to be located outside of community and neighborhood boundaries or adjacent to but not through homogenous

areas such as parks, commercial nodes, or natural areas. Link configurations can be up to four lanes and as little as two lanes with turn refuges and controlled access.

Major and Minor Collectors

Major collector streets aggregate traffic from the local roads and channel it onto the arterial system. These streets directly serve major traffic generators, but also carry a high portion of local traffic with an origin or destination within an area. Major collector streets provide both land access and traffic mobility, with emphasis given to access arterials. Average Daily Traffic on major collectors ranges from 1500 to 8000 vehicles per day.

Minor collector streets generally served discreet areas – typically a combination of smaller developments that connect to major collection and the arterial systems at controlled intersections within urban areas. They serve little or no through traffic generated outside of the area. The Average Daily Traffic is generally in the range of 500 to 2000 vehicles per day.

Major collectors can be up to two lanes with center turn lanes and controlled access. Minor collectors are typically two lanes with intersection turn refuges. They have wider lane widths than local streets, and sometimes turn radius to accommodate freight and often restrict parking.

6) Sanitary Sewer and Surface Water Impacts of North Plains' UGB Expansion

Water Quality Services including sanitary sewer and surface water management in North Plains and other urban areas of Washington County are the responsibility of [Clean Water Services of Washington County \(CWS\)](#). This includes other smaller Washington County cities such as Cornelius, Gaston, and Banks that are not within the Portland [Metropolitan Area Urban Growth Boundary \(UGB\)](#). Overall, the agency serves about 600,000 people in all urban Washington County including all or part of 12 different cities. Another important role of the agency is to ensure water quality within the urban portions of the [Tualatin River watershed](#) that generally follows the boundary of the Metro Area UGB.

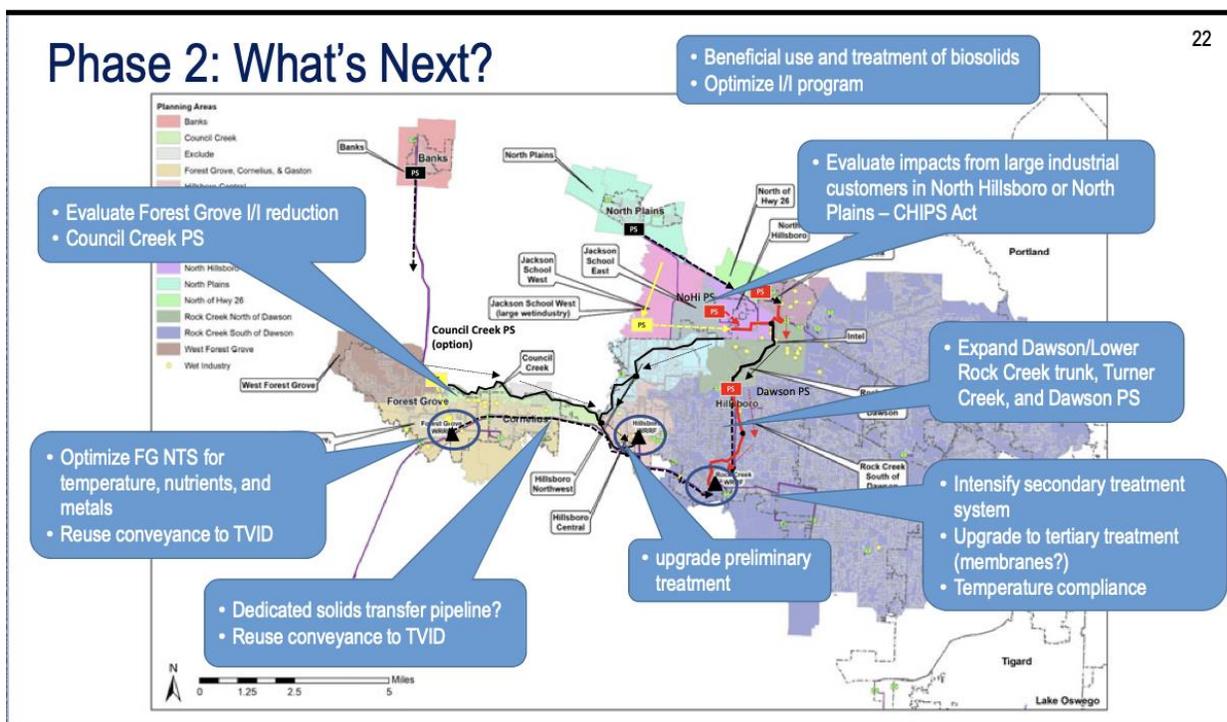
Within its services boundary, [CWS is responsible](#) for planning, design, construction oversight, operations, and maintenance of CWS's surface water and sanitary conveyance systems. Local jurisdictions, such as North Plains, have the responsibility to coordinate their growth plans and participate in long planning for future services. From a sewer system development perspective, Clean Water Services [reviews development plans](#) and issues [development permits](#) to ensure compliance with sanitary and storm sewer requirements within unincorporated Washington County and some smaller cities including North Plains. Future development pays for extension of sewer services, and any charges associated with reimbursement or local improvement districts. Those doing development would also pay system development charges (SDCs). Major capital projects such as the construction of major conveyance systems, significant system reconstruction, or treatment plant expansions are funded through a combination of SDCs, bond revenues, and transfers from CWS general fund.

Capital construction and maintenance of the sewer conveyance system and of regional surface water treatment facilities with a treatment area of greater than one acre are the responsibility of the [CWS Utilities and Operations Services](#). North Plains public works does some minor maintenance on the system, including local drainage, street cleaning and roadside drainage ditch maintenance. However, ensuring the sewer and water quality system functions as intended is the responsibility of CWS.

North Plains has not done recent sanitary sewer or surface water master plans. This is because CWS, as the responsible regional services agency, does master planning of sewer and surface management systems (facilities) on a sub-basin scale every ten years for individual communities. CWS sewer facilities planning involves two sub-basins: the [East Sub-Basin Master Plan](#) (last updated in 2021) and the [West Sub-Basin Plan](#) (last updated in 2014), which includes North Plains and Banks and which is currently being updated. Work on the West Sub-Basin Plan update began at the staff

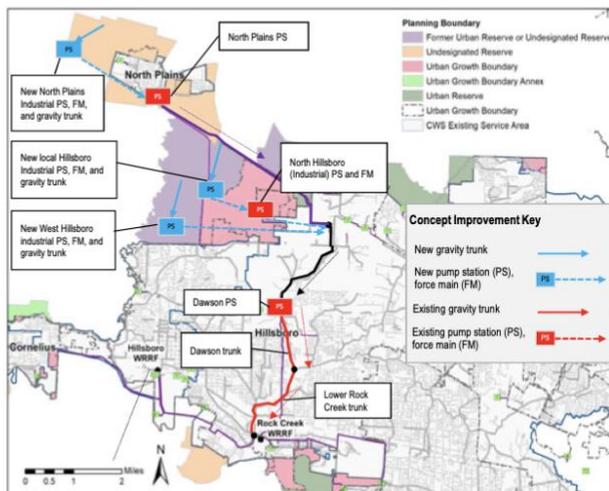
level in February 2022. The [mid-June 2023](#) agenda provides a good overview of the project, which is scheduled to be completed in 2024. Since its inception, work on the plan has involved an advisory committee and contact with affected cities, including North Plains, for input.

The current 2014 West Sub-Basin Plan shows CWS Service Boundaries as being the same as the city limits for North Plains and Banks. The 2024 West Basin Master Plan has proposed the service boundaries be expanded greatly for both cities. In North Plains', case it includes an area larger than the proposed UGB expansion and indicates an industrial pump station on the west portion of North Plains' expansion proposal. The following excerpts from a [CWS January 20, 2024 CWS Advisory Committee](#) meeting illustrate this.



CHIPS Act Planning

- Oregon Senate Bill 4
 - North Hillsboro
 - North Plains
- Infrastructure planning for 5 mgd opening day, increasing to 9 mgd in 10 years



CWS has capability to provide services to the whole of the North Plains' Urban Growth Boundary expansion area and more as evidenced on the above maps. This includes both conveyance and treatment. Under consideration is to reroute all or some of the wastewater from North Plains to the Rock Creek Treatment Plant, where there is projected to be adequate treatment capacity.

Furthermore, CWS and North Plains have an obligation to coordinate the type and scale of urban land uses proposed for the UGB expansion and its future sanitary sewer requirements. There is no evidence that this has occurred. For example, if the UGB expansion developed as proposed by the City's Final Urban Growth Boundary Report, it would use up a significant amount of projected new treatment capacity. Furthermore, it is obvious there is a significant divergence in North Plains about the future. CWS will want this resolved through its planning process.

CWS would oversee the development of the surface water management system in the new North Plains UGB expansion area in the same manner that it does the sanitary sewer system. The agency in partnership with other local governments, state, and federal agencies has responsibility to ensure the water quality and adequate stream flows in the Tualatin River Basin. Further storm drainage and water quality facilities must be designed and implemented to also manage flood risks and prevent surface water and groundwater contamination.

This will be a challenge for the proposed UGB expansion area if it develops in the manner proposed by the North Plains [Urban Growth Boundary Expansion Report](#). If, however, North Plains develops the UGB area with very low employment uses such as

data centers, warehousing, logistics and supporting uses, the impacts may be less but still substantial due to very large amounts of impervious surfaces that would be built.

The following illustrates the order of magnitude surface water run offs impacts of urbanizing the UGB expansion area at the scale proposed by North Plains by using the basic metrics of the 38.2 inches of rain a year that Hillsboro region receives on average, proposed land uses, and a basic planning scale water runoff formula.

The conclusion is that a new surface water management system would need to accommodate an additional 472.46 million gallons of water a year. The following does not estimate possible storm water peak events which the system would have to be designed for.

Table 34: Order of Magnitude Storm Water Run-off North Plains UGB Expansion Area at Buildout

Impervious Surfaces	Acres	Sq. Ft (Millions)	Rainfall gal./yr.=3.2	Runoff Co-eff =.9	Gal/ Cubic Ft =7.48
Road System	171	7.449 M/sq/ft.	23.84	21.45	160.47M/gal/yr
Impervious surfaces: roofs, parking site circulation	582	25.352 M/sq/ft	81.126	73.02	546.14M/gal/yr
Site Landscape	102	4.443 M/sq/ft	14.22	Runoff Co-eff (.3) = 4.26	33.28M/ga/yr
Totals	855	37.243 M/sq/ft	119.186	-----	739.89M/gal/yr

**Table 35: Stormwater Planning Scale Estimate of Current Storm of Run-off
Undeveloped North Plains UGB Expansion Area**

Land Category	Acres	Sq. Ft (Millions)	Rainfall gal./yr.=3.2	Runoff Co-eff =.3	Gal/ Cubic Ft =7.48
Agricultural Land	855	37.253	119. 187	35.75	267.43M/gal/yr.

The formula for Table 34 is catchment area (acres sq. ft) x rainfall in (ft) [7.48 gal/cu.ft] x .9 (hard surface run-off coefficient). Table 35 agricultural land and landscaped area uses the same formula, but with a .3 run-off coefficient.

The consequences of adding almost a half a billion gallons of water a year to the local stormwater system would be significant. Extensive and expensive stormwater systems will be needed to mitigate flooding and protect surface and groundwater quality in the North Plains vicinity and downstream properties. Also, the annual and perennial streams in the UGB expansion area are subject to [hydromodification](#), whereby development can cause problems such as changes in flow, increased sedimentation, higher water temperature, degradation of aquatic habitat structure, and decreased water quality. It is important to properly manage hydromodification activities to reduce [nonpoint source pollution](#) in surface and groundwater.

7) Conclusions

The following are the primary conclusions of this order of magnitude study.

6A) General Conclusions

a) Planning for North Plains growth can be done in a smarter and much less expensive and harmful way.

This can be done by involving the public to craft a plan to protect the City's character and quality of life, provide jobs and housing on less land, and align with the ability to provide services.

b) The proposed North Plains UGB Expansion Plan is vague, contradictory, and does not identify or address negative consequences.

One example is that the plan proposes to provide 3,300 jobs on 687 acres. However, the mix of land uses proposed in the city's reports could yield 11,500 jobs. A low density of only 3,300 jobs on 687 acres could only be achieved with very low employment density land uses such as data centers, warehousing, and logistics with some associated commercial and office uses.

c) The UGB Expansion Plan is unrealistic and extreme.

The proposed UGB expansion area is one-third larger than the City of Portland's Central Business District. Full development yield calculated at one-story building square footage would be between 19 and 20 million sq. ft. The traffic impacts of just part of the UGB expansion at build-out would be extreme to the extent they could not be physically accommodated.

6B) Water System Conclusions

a) North Plains does not have a way to pay in a timely manner for needed upgrades and repairs to its existing water system, including earthquake protection.

Much of North Plains' water distribution system is undersized and subject to earthquake hazard. The community would be without water for weeks or months if a major earthquake damaged the City's only supply line that connects the system to its water source in Hillsboro.

b) An estimated \$50-\$80 million is needed to serve the UGB expansion area and also to make needed repairs to the existing system.

The cost would be less, but still substantial, if North Plains intends to build data centers, warehousing and associated logistic services instead of fully implementing its plans

c) North Plains is water supply-challenged. It does not have its own a water source and must contract for treated water from the Joint Water Commission (JWC) of Washington County.

There is no guarantee that North Plains can get the future water it needs for the UGB expansion from the JWC at reasonable prices, especially if it is needed by Hillsboro and other larger cities inside Metro. The City's contract with JWC lapses in 2035 and must be renegotiated.

d) The uncertainty of long term and reasonably priced water supply is a reason that water intensive industries, such as computer chip manufacturing, are unlikely to locate in the UGB expansion.

6C) Transportation Conclusions

a) The magnitude of scale cost of transportation improvements to accommodate a small portion of the UGB expansion's traffic at build-out is estimated at \$135.55 million.

b) Major improvements to the North Plains street system would be required that would physically change the community.

The Oregon Department of Transportation (ODOT) is unlikely to allow Highway (Hwy) 26 to be used to connect the east and west portions of the UGB Expansion. This would make it necessary to construct and/or improve city streets to higher capacity arterial and collector status through North Plains in order to connect the east and west parts of the UGB expansion area. Property acquisition would be necessary. ODOT would also require improvements to Hwy. 26 interchanges. Additional costs to lessen impacts on through lanes of Hwy 26 and on the Washington County's road system were not considered and would have to be assessed.

Transportation costs and impacts could be less if North Plains intends to develop the UGB expansion's employment area primarily with data centers, warehousing and logistics and supporting uses. Cost would still be substantial in this case.

c) North Plains does not now or in the future have the capacity to fund even a portion of the transportation system that would make the UGB expansion feasible.

It would take many decades of all the City's accumulated funding from current sources to pay for even a portion of the needed UGB roads and streets. This is in the context that the City is unable, per its Transportation System Plan, to fund the needed

improvements within the current city limits to create and maintain a safe and efficient transportation system plan.

6D) Sewer and Storm Drainage Conclusions

a) Plans are being made by Clean Water Services and others to provide sewer service on farmland all around North Plains.

Clean Water Services (CWS) is updating the West Basin Sewer Master Plan that includes North Plains. CWS is working with an advisory committee and has talked to cities and Washington County about his project. CWS's concept plans for North Plains show a large expansion of its sewer service boundary around North Plains, including the proposed UGB expansion area and other farmland. CWS's plans also show a future industrial sewer pump station on farmland immediately west of North Plains.

b) The UGB expansion would create many hundreds of acres of rooftops and hard surfaces that would create a risk of flooding and water pollution.

Extensive and expensive storm water systems will be needed to mitigate flooding and protect surface and groundwater quality in the North Plains vicinity and downstream properties.