

Multifamily Housing Demand and the effects of Transit Oriented Development in Walnut
Station Mixed Use Center

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Introduction

The study area known as Walnut Station Mixed Use Center is one of several areas where the City of Eugene is looking to sponsor redevelopment in order to increase the general visual aesthetic and economic prosperity of the city. The study area comprises all land on both sides of Franklin Boulevard from the I-5 off ramp to Onyx Street, except the areas owned by the University of Oregon. The city planning department and private developers feel that this area is enhanced by high levels of traffic on the local arterial (Franklin Boulevard) along with the Bus Rapid Transit (EmX) that runs along Franklin, and thus a candidate for mixed-use development.

Mixed-use development is the process of developing land with tightly compact commercial and residential units, sometimes with them sharing the same plot of land, such as retail on the first floor and apartments / condominiums above. The idea is to both, increase residential density, and thus limit urban sprawl that plagues cities all over the nation, and to reduce the emphasis on personal vehicle transportation.

Currently there have been two major mixed use developments in Eugene. Broadway Place, an apartment complex, with retail on the first floor, located downtown near the Eugene Bus Transit Center, and Crescent Village, a small suburban-like community of town homes, apartments, small and large retail stores, and commercial offices. Both have been very successful in the residential side, but the retail components have struggled. Hugh Prichard, a long time private developer in Eugene, believes that the problem with both of these developments is that the sales from nearby residents are not enough to support these retail stores. Also and their locations prevent them from seeing the necessary number of other consumer traffic outside of their local residents to survive.

Walnut Station area already sees a significant amount of traffic on Franklin Boulevard, roughly 30,000 cars a day, especially in commuter traffic between Springfield and Eugene. This traffic already assists the current establishments in the area including a grocery store, Market of Choice, an all purpose general store, Hiron, and several local restaurants and fast food stores. There are also several hotels on the northern side of Franklin, which receive much of their business from people visiting the university whether to see a sports game or visit students. With construction of the new Matthew Knight Arena, hereafter referred to as the Arena, on the corner of 13th and Franklin Boulevard, substantial tourist traffic will be seen for both the basketball games and other non-sports related events in the Arena. Other traffic from tourists coming to the area to see the University either to visit friends / family, tour the university as prospective students, or just to attend university related events, will likely be significant at times, but it is sporadic and typically incapable of supporting local retail outlets by itself.

There are also a number of commuters on the Emerald Valley Express (EmX) Green Line substantial traffic on the EmX, a special bus line that runs along Franklin Boulevard. The EmX functions similarly to the MAX light rail system in Portland by having its own lane and queue jumpers to limit the amount of waiting the bus has to do. It is also important to note that outside of the EmX, there is only one other bus that runs through the study area, the 27 Fairmount bus, which only makes limited trips along Franklin. Since that bus travels serves predominantly as a feeder from the rural communities surrounding the University of Oregon to the Eugene Station, and since EmX already offers a faster means of transit to Eugene Station, we will assume that the majority of riders in the study area will use EmX. There is a need to differentiate the

Green Line, from the Gateway Extension, which will open in January 2011 going from the Springfield Station past Sacred Heart and looping back around Gateway Mall. While the Gateway Extension will likely increase ridership of the EmX, it is difficult to gauge whether or not the majority of the increase will be felt during peak hours or non-peak hours.

The purpose of this paper is twofold, estimate the increased demand for multifamily housing in Eugene. Then, using research data and case studies from other transit oriented developments (TOD), looking at the current support of public transit in the area and estimating the effect this mixed-use development will have on transit ridership. The commercial aspect of mixed-use development will be discussed in its correlation with transit efficiency and commuter traffic on Franklin Boulevard. There is no direct economic analysis of any specific commercial development or viability of such a development, as this was seen as too general of a topic and outside the scope of this paper.

Given the increasing enrollment in the University of Oregon, especially in those over the age of 24, the demand for multifamily housing near the university will continue to grow. New residents coming to Eugene, especially those with college degrees or recent graduates of the university who choose to stay in Eugene, are more likely to desire high density housing near the university. Franklin Boulevard's already significant traffic volume will aid in supporting commercial redevelopment in the Walnut Station area, and given proper development of these commercial units, this in turn will increase the efficiency of public transportation.

Literature Review

The multifamily housing demand part of this analysis is in some ways very simple and in others quite difficult. Multifamily housing has grown in demand over the last several years due in great part to the shift in the baby boomers from predominantly raising their children in suburbs through the 90s, to many of those children now being in college or having already graduated. This leaves aging baby boomers looking for a new place to live that has a wider variety of activities in close proximity to where they live. Several articles we have read discuss these issues in passing but so far nothing has been too specific. Currently most papers we have found were done in the 90s or earlier and we will continue to look for a more recent article discussing these issues.

Due to the relative newness of transit oriented developments (TOD) and few truly successful ones, there is a limited amount of literature that actually offers statistical data about the effects of TODs. The primary research that we found on such work, and providing an excellent overview of the effects of TODs, are from 2 papers (Cervero, 2004, Cervero 2007). A third paper (Cervero, 2002) brings up additional useful information on the effects of density on work commute transportation, both at the origin and destination. While all three are from the same author, the analysis provided in these papers proved to be the most informative and statistically supported information we could find.

Density as a mechanism for promoting public transportation ridership has been a popular tool by city governments since before the new millennium. Cervero (2002) built upon many of the studies done before by not looking at just distance of residences / jobs from the transit stations, but at the densities of residents and employees near the stations as well. The paper used data from Montgomery County, Maryland, approximately 850,000 residents, which had a housing travel survey compiled in 1994. The data

consisted of 5167 observations, which was comprised of multiple trips for each household surveyed. Additional data was added to the original dataset to study other effects like the ratio of travel time by car to travel by transit, but these effects are outside of the scope of this paper. The models Cervero uses are all logit choice models that are useful for giving the direction of an effect, whether it decreases or increases the likelihood of the individual choosing, and but it becomes difficult to gauge which variables have the strongest effects. These models are also quite complex and the coefficients that they produce are not linear, and as such they cannot be used to establish a relationship between the change in a variable and the individual's choice without rigorous computations in the model equations. Thankfully Cervero also provided elasticities derived from these models.

He did this by taking each build environment variable in the equation and increasing it 1% at a time, and evaluating the effect, with all other variables set at their means. These elasticities can be used to say that if a 1% change in a specific build environment, in our case we will most heavily look at gross density (population + employment) increase, a certain percentage change in the probability of an individual choosing transit will occur. It is important to note that this is a multiplicative change, i.e. if the current transit ridership is 10% and the percentage change from increasing density is 15%, the new transit ridership percentage should be $10\% + (10\% * 15\%) = 11.5\%$, not 25%. We will go into the various elasticities later, but it is important to note that these estimates come from the choices of people in environments that are very different than Eugene. The mean for travel time to work was 24 minutes, around double what is experienced in Walnut Station according to the 2000 Census, and the mean gross density

is around 16,000 per square mile, 5 times the roughly 3,000 in the study area. However as this is the best data that we could find, and the resulting estimates seem reasonable, we decided to use them.

While the bonus in ridership from increasing density near the station may seem a bit far fetched as increasing density where one lives, doesn't seem like it should change one's opinion of riding public transportation, a later study (Cervero, 2007) shows that approximately 40% of the "bonus" that is observed from increasing density near transit stations is from self selection. The idea is that people that already prefer to ride public transportation will move to areas with easy access. The question becomes, what type of people prefer to use public transit and for this we will look at LTD's on-board survey that was done in October 2007.

We would also like to note that a couple other papers have already been written about Walnut Station. The first was another research paper done by the Economics department at the University of Oregon in 2006, *Housing Price Models for the Walnut Station Redevelopment Area*. This paper focused exclusively on determining apartment and condominium prices of any newly constructed units in the area. It should be noted though that since this paper was done, several high value apartment complexes have been constructed on the west side of the university that would have significantly changed the estimates in their paper. The most important part was the discussions on rent premiums that residents are willing to pay to live in mixed-use developments and the negative effects of traffic noise on rents. While this paper does not estimate the rents for housing, it is important to note that most of the recent high value apartment complexes reside on the west side of the university in a much quieter and lower traffic volume area. This

would likely make it more difficult to sell high value multifamily housing along Franklin Boulevard, as studies have found that noise levels are more important to high income individuals and thus they would be less likely to purchase land along Franklin Boulevard.

The second paper focuses on the financial feasibility of four different redevelopment projects designed by the city of Eugene. The analysis was contracted to Johnson and Gardner by the city of Eugene. The initial report was completed in 2007 with a revision and expansion performed in 2008. The projects range from a vertical mixed-use building on Franklin, commercial on the first floor with apartments / condominiums above, to a multifamily housing complex near the residential area south of Franklin, and finally a retail building with parking along Franklin. Since that paper already went into the viability of each project additional feasibility of retail in the area would have been redundant. Instead we focused on the network effects of public transportation usage and commercial development near transit stations. We should note that the paper found all of the projects to be barely feasible if at all. However we still feel, as do some developers, that Walnut Station is a candidate for mixed-use redevelopment, and the inclusion of the EmX in the station area makes it an even stronger candidate for improving Eugene's transit ridership.

Methodology and Data

Most of this paper relies on benefit cost analysis with some case study discussion on previous mixed-use developments in Eugene. The cost analysis is fairly vague though, as the generality of this project lends itself to a wide variety of costs that could be done, but without specifics we will just do a general overview of potential costs. The data used

in this project comes from a variety of sources as we took what we believed to be the most accurate data for the given analysis.

For the multifamily housing demand portion, we estimated the expected increase in 2 groups, college students at the University of Oregon and the population of Eugene. For general population, we used estimates given to us by the city of Eugene, at approximately 19280 new residents over the next 10 years. This estimate from the city was developed by Portland State University's population forecast for Lane County, which also specifically looks at Eugene. This estimate is based initially off of the 2000 Census data which was revised by a smaller 3 year analysis performed from 2006 -2008 American Community Survey. PSU then derived the 2010 – 2030 estimates by looking at many factors of the city of Eugene, including gender and age structure, fertility and mortality rates, and in-migration. The estimate used was the medium growth estimate, the low and high estimates only differed by about 8%.

College student enrollment was taken from a data set of student enrollment in all four terms from the 2002-2003 academic year to the present, along with projections for fall term enrollment for fall 2010 to 2016. This data set came from JP Monroe, who is the Director of Institutional Research at the university. The Office of Institutional Research keeps track of a wide variety of statistics for the university, including enrollment, degrees awarded, and term-to-term continuation ratios for students. The data was broken down into the number of undergraduates and graduates by residency. Combining this with another piece of data from the Office of Institutional Research website that showed which county Oregon resident students came from, we got a percentage of resident status students that come from Lane County. Since Eugene

accounts for roughly 45% of Lane County's population, and the Eugene-Springfield area accounts for over 70%, we figured it was safe to say that most of the students that come from Lane County come from either Eugene or Springfield. Multiplying the percentage of Lane County students by the number of new students gave us a conservative estimate of how many of the new students would be from outside of the Eugene-Springfield area and thus bring new money to Eugene and also need housing.

There is a problem in this estimate though as some students will live in university related housing, such as freshmen in the dorms and other undergraduates in sororities or fraternities. The first question that comes to mind is the issue of demand for university dorm rooms, and after talking with the Office of Student Housing, they are currently just barely meeting demand and are already planning to build a new dorm in the near future to meet their expected increase in demand over the coming years. For this reason we will assume that all students who wish to live in the dorms will be capable of doing so. The next problem is estimating the number of students who will live in university sponsored / affiliated housing. The Office of Institutional Research has the percentage for this that we will use from their 2009-2010 Common Data Set. This includes the percentage of undergraduate men and women in fraternities and sororities respectively, along with the percent who live in college affiliated housing and the percent who live off campus. All of that data is broken down into all undergraduates and first time students / freshmen. It does not include graduates, however, outside of the graduate student apartments, graduate students predominantly rent from non-university affiliated housing. Since the graduate student apartments are always filled, we will assume that any new graduate students will need off-campus housing.

Census density from 2000 census data for the 97401 zip code puts the density of the study area at 3,584 people per square mile. While growth has definitely happened since 2000, the majority of that has been outside of this area, as it is predominantly commercial, and as such we feel that 3,584 is a bit dated but reasonable estimate. This will however change due to the construction of a new apartment complex in the study area, Courtside Apartments, which is being built behind Market of Choice. We have the number of apartments that will be available for this new complex along with an idea of the number of people that can live there, and will take this into account when we do our estimate.

Lane Transit District ridership information for the EmX, was given to us by Will Mueller, a service planner at LTD for to the EmX line. Peak load ridership was taken as a rough average from the data listed at all time periods for the month of October. The reason for using October is that there are two months in the year that LTD typically sees its highest ridership, April and October. Since we got our data in the middle of April, the most current set available at the time was October 2009. Since this is a peak ridership month these values are not reflective of ridership levels the EmX sees over the course of an entire year. The data we were given was for 4 sets of weekdays in October, October 5th – 30th, with the number of passengers on the bus when it reaches the station. As there was no weekend data, we are unable to say anything about weekend ridership, except that on average all of LTD sees an approximate 26% drop in ridership on the weekend (October 2009 performance report). The data itself is comprised of 85 bus schedule times for each direction at both Agate Station and Walnut Station, for each of the 20 weekdays. There were 1 or 2 earlier buses for each station, but much of that data was

empty and thus we decided to not include those schedule times. We should note that not all of the 1700 possible data points for each station and direction were given in the data set. However for Agate Station at least 95% of the data points were valid. Walnut Station's data was less useful as only around 85% of the data points were valid, and its range was roughly similar to Agate Station, therefore we will focus on Agate Station. We did do the same graphs for Walnut Station, just to be sure, and they were very similar to the ones for Agate Station.

Due to the large number of data points we took averages at each time slot along with the standard deviation. We then used the average plus and minus 1.5 standard deviations to get a range of values where the majority of ridership levels would fall into. This obviously leaves out the extremes, both high and low, but we found that doing 2 standard deviations started giving us lots of negative values for the lower range and started to overestimate even the extremes in the data. A standard deviation of 1 only captured roughly 66% of the data, whereas 1.5 got at least 85% on almost all schedule times, with most being 90% or higher. This gave us a few negative values, but they were small, typically between -1 and zero, and we just set them to zero.

The other problem with this totaling is that the schedule times for westbound and eastbound at each station differ in their morning hours, and as such the comparisons are off by about 5-10 minutes. This can hurt the averages, especially when they are done with one bus schedule time is at a peak ridership and the other direction is the schedule time before or after than one. We acknowledge this error, but due to the differences in morning schedules times for each direction, this is how the data ended up.

For helping to determine what the current trends are in LTD ridership, both to compare them to the study data that was presented in Cervero's papers, and also to get an idea of what type of people would likely be interested in moving to a transit oriented development, we looked at the on-board survey done by LTD in October of 2007. This survey was taken by 6864 riders and was composed of a variety of questions from the frequency of ridership to household income and means of getting to, and distance from, the transit station. The survey was new enough to include specific data on the EmX, however due to the EmX only being active since 2006 and being free at the time, we are uncertain how similar the data is today, along with having little idea as to the change in ridership since then. This paper also discussed the roughly 30% increase in transit ridership that LTD experienced from 2004 to the time of the study paper, October 2007, however looking at the February 2010 report on LTD's website, that trend ended at the end of 2008 and has since been trending down. It does appear to be bottoming out in February 2010, but since there is no more recent data, we can't assert that.

Multifamily Housing Demand

Only traditional students are going to be analyzed in this estimate, as non-admitted students, as the enrollment data sets categorize them, are people enrolled in the Community Education Program, which allows the general public to enroll in a class or two at the university without actually being admitted to the university. Since these people are more than likely already a part of the community, they are not likely to be part of the new multifamily housing demand. However it is a definite possibility that they might desire moving closer to the university if they plan on continuing to be a part of the CEP. Given that these students comprise about 4% of university students, their effect

will be minimal. Over the next 10 years, about 3%, or 100 students, of the expected increase in university enrollment will come from CEP.

For traditional students we simply took the total number of traditional undergraduates projected in Fall 2020 and subtracted it from Fall 2009 estimate, which gives us an 11 year estimate but it puts us in line with the estimate for Eugene population growth. We could have had a more accurate estimate if we used the Spring 2010 results from the OIR data, but due to them separating out the undergraduate, graduate and CEP students defined as “self-support” and combining them into one group, we would not be able to accurately separate the undergraduates and graduates out of that to make the estimate. The result was 2438 additional undergraduate and 753 additional graduate students. We need to note that the projected total enrollment in Fall 2020, is 25,433. Brian Henley, the Director of Admissions, also stated when he sent these enrollment projections that they are done without taking into consideration of the university capping total student enrollment. He suggested that the university may end up limiting enrollment to around 24,000, but as new students, at least non-resident students, means more money for the university, it is hard to say if that outcome will actually occur. Thus we will do our estimate assuming that it will not be capped, but we acknowledge the possibility. A quick note on this is if they due indeed choose to cap at 24,000 students, given their enrollment estimates, the university will hit that cap around 2015-2016.

To estimate how many housing units these new students will demand we first need to estimate how many of those students come from outside of the Eugene-Springfield area, as they will likely already have housing. Currently a little over 66% of undergraduates are Oregon residents, however this has been decreasing over the last 8

years, due to fairly constant resident numbers but consistently increasing nonresidents, over a 10% growth per year in nonresidents over the last 3 years(OIR enrollment data). Whether this trend holds for the next 10 years is unknown, but assuming it does, as we have no basis to say otherwise, but this increase in nonresident students has accounted for roughly 70-80% of the increase in enrollment over the last several years and if that continues, about 1,800 – 1,900 of the additional students will be nonresidents. We will assume 1,850 nonresidents, leaving 588 resident students. Now from OIR's website we got the percentage of resident students from Fall 2009 that are from Lane County, 29.6%, and from Portland State University's population forecast, Eugene-Springfield account for 70% of Lane County's population, thus roughly 20.7% of the resident students, or 122 will come from Eugene-Springfield. We would like to note that the Eugene-Springfield population is projected to grow at a slightly faster rate than the rest of Lane County, and thus will account for a larger percentage of the population in the future. However this change is small and our estimate would not have been significantly affected by it. We also acknowledge that the majority of freshmen live in the university dorms, we will discuss that later.

The ratio of resident graduate students to nonresidents has been fairly constant over the last few years, about 36% are Oregon residents. Since there has been little change in the ratio, we will assume it holds, and thus of the projected 753 additional graduate enrollment, 271 are residents and 56 are from Eugene-Springfield. It is quite likely that few to none are actually from Eugene-Springfield, as universities typically try to avoid having their undergraduate students become graduate students, to diversify the educational experiences of graduate students. However we have no specific data, so we

will assume 56 are from Eugene-Springfield and state that it is highly likely to be a gross over estimate.

Total we have 681 nonEugene-Springfield resident students and 2,332 nonresident students who will need housing in the local community. For the average apartment size we did a little bit of estimating on our own. The 2006-2008 American Community Survey has an estimate of 1.99 for the average household size for rental units. This seems reasonable, however it does take rental houses into account, along with mobile homes, and having rental rates far below what a student in the area is likely to face. We will still use this estimate though as 2 bedroom units count for almost 42% of total rental units in Eugene, and 2 bedroom apartments seems to be the standard in Eugene, with 1 and 3+ bedroom units supplementing them. Including on top of this the data from OIR's common data set for the 2009 – 2010 academic year, which has 17% of freshmen living off campus and 20% of all undergraduates living in non-university affiliated housing, we will assume that 80% of the new undergraduate students will want off campus housing. However due to their likely being overlap in Eugene-Springfield resident students also wanting to live in university affiliated housing, we have no way of separating those two, so we will take the average of the estimates for 80% of all undergraduates and 80% of just those that we estimate came from outside of Eugene-Springfield. This gives about 1,950 undergraduates that will live off campus. A portion of these students though will choose to live in rental houses. We would guess that around 15% or less of undergraduate students live in rental houses. This leads to undergraduate student demand for multifamily housing being 833 units.

Graduate students have far less options for university affiliated housing, the main one being the Graduate Village, which is on Villard Street, just outside of the study area. Again due to the Graduate Village being full all the time, we will assume any new graduates will need to find of campus housing. We believe graduate students to be less likely rent houses than undergraduates, due to them focusing on more on their studies than the community atmosphere that make rental houses appealing to undergraduates. We will assume that approximately 10% of graduate students live in a rental. Again we will average the demand between all additional graduate students and our estimate of the ones just from outside of Eugene-Springfield area. This results in the additional graduate student's demand of 328 units, for a total additional college student demand of 1161 over the next 10 years.

As we said before, there is also the consideration of new complexes already being built. We know of 2 specifically, The Sonja, which is outside of the study area on the west side of the university, and Courtside Apartments, which is in the study area, behind the Market of Choice. We have no data on how many students the Sonja will be able to accommodate, but it will likely be around 100, given its size and the fact that it has 1, 2, 3, and 4 bedroom apartments, with the 1 bedroom units especially limiting the amount of people that would be living there. Courtside Apartments feature 3 and 4 bedroom units, with 47 units but we don't know how many 3 and 4 bedrooms specifically, thus roughly holding 165 residents. With these new complexes being available for rent in the fall, assuming that they are filled, which is debatable, this would lead to only 896 additional multifamily housing units demanded by university students over the next 10 years. This

is of course assuming that there is no vacancy. With the 2006-2008 ACS data, the vacancy rate for “for rent” units in Eugene was 1.7%, changing demand to 917 units.

There is a potential issue with both Courtside Apartments and the Sonja, along with several new apartment complexes that have been built near the Sonja, in that there are renting at rates substantially above their local market. Individual rents in the neighborhood of \$400 - \$600 per person are fairly typical of apartments in Eugene, with 1 bedrooms going up to \$700. However Courtside Apartments is looking at \$700+ per person for 3 and 4 bedroom apartments, something that can be easily be found for under \$450 per person a mile or 2 outside of the study area. The Sonja is looking for around \$650 per person for 2+ bedrooms and over \$900 for a 1 bedroom. It should be noted that these are fully furnished apartments which are both very close to the university, while Courtside is playing on the new basketball arena that is being built right next to it. While there may indeed be demand for these higher quality apartments, considering that they are in the top 10% of rental rates in Eugene, there is likely very limited demand for them, especially among college students. How these properties end up fairing this fall, will certainly affect the market.

For new permanent residents the estimate was far simpler. Given multifamily housing according to the 2006-2008 ACS of approximately 34% of total housing in Eugene, and the fact that cities having been seeing a shift to multifamily housing over the last decade and they assume it will continue to grow, we will assume roughly a 5% increase relative to total housing increase over the next 10 years, or approximately 35% of housing being multifamily. Thus not only do we need to estimate the percentage of new residents that will want multifamily housing, but the shift from current residents as

well. For current residents there will be a shift of roughly 1.5% of the population to multifamily housing, which given the estimate of 2010 population from the Portland State University population forecast of 156,844, this would lead to 1202 new multifamily units demanded by the current population over the next 10 years, given a vacancy rate of 1.7%. The increase in population as we stated before is estimated to be 19,280, which leads to 6,748 (35%) of them demanding multifamily housing. This will increase the demand by 3,459, again given 1.99 persons per rental unit and 1.7% vacancy rate. The total demand then for permanent residents is 4,661 units over the next 10 years.

It is important to note that both the change in percentage of the population being multifamily housing was purely a guess on our part and also that the size of households has been falling the last several years, implying the 1.99 persons per unit may be too high of an estimate. Our personal judgment is that the 1.99 is fairly accurate for college students, but it is likely an over estimate for higher income permanent residents, as they tend to prefer, and are more capable of affording, 1 bedroom units, or maybe 2, whereas college students focus more on 2+ bedrooms. Whether our estimate is under or over, is completely ambiguous though. Also worth noting is that the student demand does not differentiate between students who will live in Eugene, and those who will choose Springfield, however the vast majority choose to live in Eugene, and thus we consider that estimate to be reflective of Eugene's specific demand.

Total Multifamily Housing Demand (Over 10 Years): 5,578 units

Impact of College Student Spending

The impact of college student spending is quite rough but we felt that a general idea as to the effect of new college students, especially since they would likely want to live, or at least potentially shop in the study area.

we made an estimate of our own, although it is not far off of this one. We took the ACS data which had rental rates by the number of bedrooms, and computed a new estimate based on what we feel is an acceptable range of rents, \$300-\$749 for a studio, \$500-\$1,000+ for a 1 bedroom, \$500 - \$1000+ for a 2 bedroom, \$750 - \$1,000+ for 3 or more bedrooms. This totaled 25,647 units or 82% of total rental units in Eugene. Given that only 67% of rental units in Eugene are multifamily, this means that we are getting rental houses in this estimate, likely in the 3+ bedroom units, but there is nothing that we can do about that with the data we have.

We will assume that that all bedrooms are occupied by a single occupant and for the 3

73.2% of expected 2020 enrollment is traditional undergraduate, 17% of grads are.

The 2006 – 2008 American community survey has medium rental contract amount at \$670, which seemed low to us, considering that average household size for renters is 1.99 people, that means that the contract rent is likely for a 2 bedroom apartment, which would make it so we looked at a breakdown upper quartile \$855

24355 this came from summing the \$500-\$1,000+ for 1 bedroom, \$500-\$1000+ for 2 bedrooms, and \$750 - \$1000+ for 3 or more bedrooms.

Impact of new college students

Transit Oriented Development

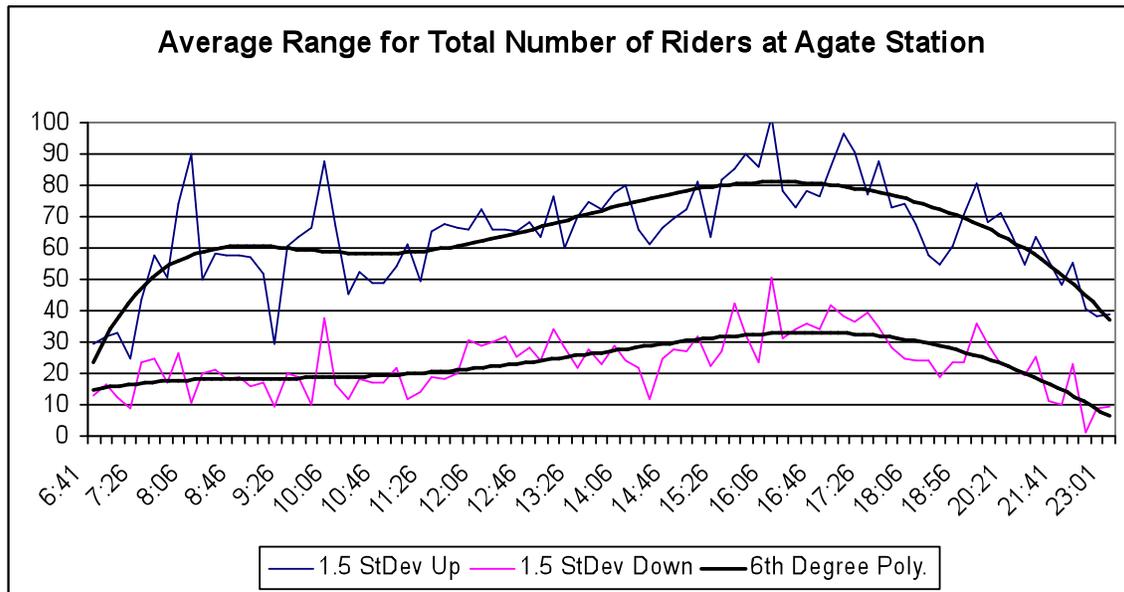
For this section we will look at the current trend in transit ridership in the Walnut Station area and then estimate how that will change given an increase in population density and potentially commercial density in the area.

To get an idea of the range of the data we took the average of all 20 weekday ridership values and averaged them for each direction, along with getting their standard deviations. We then took the averages and added or subtracted 1.5 times the standard deviation for that schedule time to get the upper and lower estimates for that time and direction. We then combined the averages for each time to get the total number of riders in both directions for each time slot. This is not optimal, as it would have been preferred to have averaged total number of riders for each scheduled time and then do the standard deviation on that. However, given the holes in the data set for each direction, but in different places, this would have caused these totals to be less than they should be by having ridership data for one direction, while no data for the opposite direction at that schedule time. This would have affected both the average and standard deviation and given less accurate results, as those holes were correctly ignored when calculating the values for each direction separately.

Below Fig.1 shows the range of total ridership loads seen at Agate station. As we said before this data came from taking the average ridership loads for a schedule time and adding or subtracting 1.5 times the standard deviation for that time. Theoretically this

should mean that between 66% and 95% of the data should be between 1.5 standard deviations above and below the average. We calculated and found that on average, 88% of the measured data was in this range.

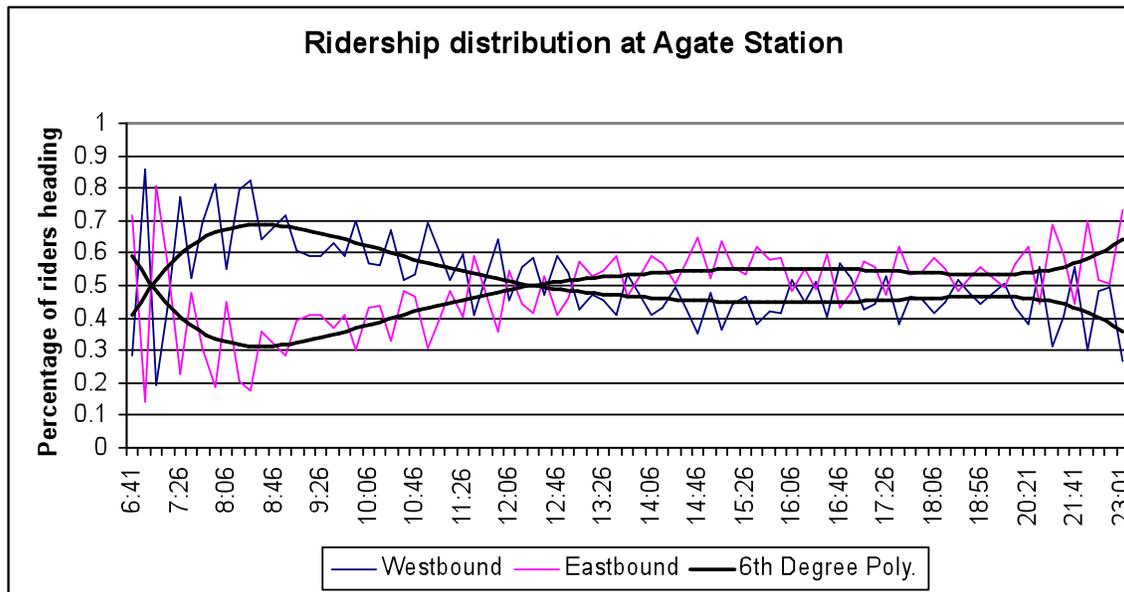
Figure 1



We feel that it is important to also talk about the data itself as averages and standard deviations are good for general ideas, but they do not give a good idea of where most of the data actually lies. Westbound ridership numbers peaks in the 60s a couple times in the morning hours, but much of the peak load, before 10am and between 4 and 6pm, is around the 40s to mid 50s. The rest of the time the bus sees loads in the 20s and 30s, dipping into the teens between noon and 2pm and after 10pm. Eastbound starts out in the teens and doesn't come into the 20s until noon and continues steadily growing in ridership until it hits the 30s and 40s around 3pm and continues in that range, often going into the 50s, until almost 6pm. It falls back into the 20s and 30s until 10pm when it dips off as the last buses run.

Ridership distribution combined both directions into one matrix and the percentage of invalid data pieces went up to 7%, so the data is quite reliable. This is another reason why we used Agate station instead of Walnut, since Walnut rose to almost 24% of the data being invalid, although the trend was very similar with the difference between the 2 trend lines being only about a percent or two further apart than the data from Agate shows. This distribution was surprising for us as we felt that ridership was much more skewed than it truly is. While the ridership in the morning hours before 10am is predominantly heading towards Eugene, around noon and thereafter they tend to stay around 55-45%, which is quite good. The importance of this comes from efficiency, as it means that a larger number of people can use the bus before additional buses need to be scheduled. This is especially important as the peak ridership for the EmX is during 4-6pm is also when the EmX is at its most efficient allocation of riders.

Figure 2



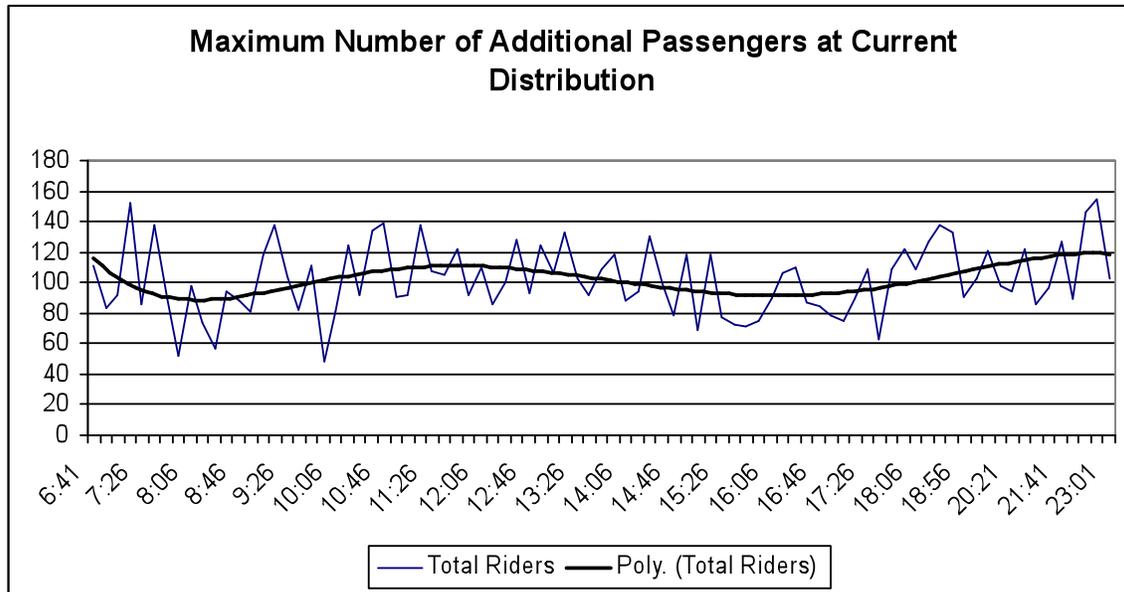
The reason we focused on this data was to show where the EmX currently stands, so that we can build an estimate of how it may grow over the next 10 years given an

increase in density in the study area from multifamily housing demand. Also we felt it was important to see how much more the current bus setup is currently capable of taking. Each bus is certified to hold 100 people, with seating for 44, and we will estimate that once ridership starts hitting 80 people on a bus, it will begin to have a noticeable negative affect on people's probability of riding the bus. Thus we will calculate the ridership cap of 100, figuring that likely it will never quite reach it as people either wait for the next bus or switch another means of transit as that limit is approached. In order to calculate the amount of additional riders the EmX can sustain, we will use total ridership taking into account the distribution of riders among the two trains at that time. The average number of total new riders possible at any time is 102, but that value dips down considerably, into the 50s at 8 and 10 am.

How we calculated this was using the percent distribution data, for each schedule time. We determined which bus had the highest distribution, and thus the largest amount of riders, and then looked at the maximum number of riders that bus had experienced in the month. We then figured that keeping the distribution the same, each new rider would statistically choose that bus at a rate consistent with the current distribution. For example, if bus a had 40% of the total ridership and the only other bus, bus b, had the remaining 60%, any additional rider assuming that they are the same as all other riders, will have a 40% chance of choosing bus a and a 60% chance of choosing bus b. Statistically then, if we had 10 new riders, 4 of them (40%) would ride on bus a, while the other 6 would ride on bus b. We used this logic to then say that given the maximum amount of people that bus has experienced, the capacity cap of 100, and the probability that the individual will ride that bus, i.e. the distribution of ridership, then we can figure out how many

additional people would need to ride the bus in order for the bus with the largest ridership to reach the 100 rider cap. It is important to note that this is the number of additional passengers, and does not reflect how many additional people are riding in total, as most riders ride the bus more than once in a day (LTD transit survey).

Figure 3



A natural progression from this is, what will it take for the current transit offering to become inadequate. Given the lowest number of possible additional passengers is in the early morning, predominantly work commuters and students, we will take the percentage of work commuters and students, 61% (LTD On-Board Survey), and assume that around 61% of the all EmX riders are on the bus at the 8 am and 10 am peak ridership. Now the EmX sees about 14%(EmX FAQ) of the total boardings for LTD, thus with a city wide transit ridership rate of 8%, approximately 1.1% of the city rides the EmX, and 0.68% of the population is a worker or a student who rides on the EmX. Given that only 50 more people can ride the EmX at its most crowded periods this would mean that between 4,464 and 7,352 people would have to come to Eugene in order to hit

the cap on the bus. It is important to note though that this is data from a peak ridership month and given that 23% of riders are students (LTD On-Board Survey), and LTD frequently sees drops in boarding between these peaks and a low ridership month of 20% or more, this is not representative of an average EmX bus run.

The effect of transit oriented development on ridership is less precise, due to the data coming from a study on TODs in California, where congestion is a serious problem, and ridership and population density is also much higher. However the estimates are fairly low and seem reasonable enough for us to utilize them.

As we stated earlier elasticities for the effects of build environment on transit ridership were estimated off of ridership data for Montgomery County, Maryland. The elasticity for the effect of a 1% change in gross density, resident population + total employees, per square mile on transit ridership is 0.511. We combine that with the gross density of the study area of about 3,584 people per square mile, and the fact that if Courtside Apartments sees standard vacancy rates, 1.7%, this density will increase to 3,746 or about 4.5%, which should increase EmX ridership by $4.5\% * 0.511 = 2.3\%$. Again this is multiplicative so at the current estimated ridership rate of 8%, the new rate for the area will be 8.2%, which results in about 6 new riders. This is really just a basis though to ensure that our estimates for growth beyond this point take Courtside Apartments into account, to prevent any bias that would result from excluding it.

Since we have no specific data on how many of the additional multifamily housing units will actually be built in the study area, we will do an analysis of what would happen if Eugene did all four redevelopment ideas that they had Johnson and Gardner perform a financial feasibility of. The first one was a vertical mixed-use

building that had 48 multifamily units and 15,000 square foot retail on the bottom. Since we have no knowledge of how many employees the retail will have, we will guess about 15. Then a townhome with around 11 units, a 5,000 square foot retail, which we will guess has around 5 employees, and 124 unit apartment complex. Given an average owned household size from the ACS to use for the townhomes of 2.52, the additional increase in density as an origin, i.e. a place to live, is 10.4%, given Courtside Apartments is filled up to the 1.7% vacancy. This would lead to a 9.1% ridership rate, again assuming that the increase in ridership from Courtside happens. This would result in an increase in ridership of about 34 people.

Bringing up the point made in literature review, a study found that 40% of the “bonus” seen in increasing ridership of public transportation is due to self selection. While in this case it only results in about 17 people, but it also brings to mind that an even bigger ridership bonus could happen. The frequency of the EmX appeals to people (On-Board Survey), and as such the bonus experienced in this area may indeed be larger due to it becoming an attractive place for people who are already transit oriented. However given that only 25% of the EmX ridership is in a position to afford the higher cost of living (on-board survey) that often accompanies transit oriented development, it may prove difficult to bring the right type of residents to this development.

Costs

The primary cost is the benefits that would be seen if a different project was supported instead of this one, however it is not feasible for us to make any specific cost analysis like this due to the variety and scope of all the different projects the city is considering. Other costs can include the limited size of the development area and the

cost that is resultant on developers. Limited parking and lot sizes may make damage the profitability of businesses that setup in the area, or cause them to not build at all. Since Walnut Station is not currently a substantial commercial area, redeveloping it to be so would likely see a transfer of funds from other areas to the study area. This may cause other businesses that currently are successful to fail. Other development specific concerns were raised in Cervero's papers in that vertical mixed-use development can potentially hurt the commercial developments by constraining their building options in order to support the multifamily housing above.

Additional traffic that Franklin Boulevard will experience from both the residential and commercial portions will increase congestion in the area thus increasing the travel time and cost of travel for each driver. Due to the study area being bordered by a river, interstate, and university / residential neighborhood, additional traffic will exacerbate congestion more so than most other areas as there are few options for the traffic to get out of the area. However looking at the traffic impact analysis performed on the new basketball stadium, Matthew Knight Arena, shows that post peak hour, around 6pm on, the addition of an estimated 2,574 vehicles by this analysis which will be in the study area, saw a congestion impact that caused roughly 10-20 second delays per car at some lights, while most saw no change greater than 10 seconds per car. Given the drastic scale of vehicle increase and the noticeable yet limited increase in congestion, makes the effects of additional resident drivers likely minimal. However there could be significant congestion if more vehicles come to shop. Though looking at the discussions in Cervero, additional vehicle congestion in the area as a destination, i.e. a place to shop or work, can

spur transit ridership, whereas just increasing congestion from resident drivers typically sees little to no increase in transit ridership.

Conclusion

While the actual numbers for the increase in transit ridership is small, again we should take into account that the estimates are based off a very different community. The other thing to consider is that the biggest importance to an increase in ridership is from increasing density and ease of walking at the transit destination, i.e. where people will shop and work. Thus this small increase in station area resident ridership can be compounded if the area becomes a transit destination for something other than returning home from work. While any successful retail in the area will be almost entirely supported by drivers, the addition of convenient and rapid transit, along with redevelopment to better support walking, can make this area a beginning towards efficient transit orient development. Given the new off ramp on Franklin Boulevard that will help to bring even more vehicle traffic to the area, Walnut Station is also in a position to support retail currently, while transit ridership slowly expands. However Eugene is not a large city and any additional retail will likely have difficulty finding enough revenue, as has been seen in both Broadway Place and Crescent Village. Both Broadway Place and Crescent Village both are in inconvenient locations for retail though, a problem that can potentially be remedied in Walnut Station.

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