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# **Long-Term Enrollment Forecasting**

**Methodology and Impact on NW Denver**

**May 2015**

# Purpose of this Document

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- Provide an overview of the methodology used to calculate long-term forecasts
  - Major data points
  - Approach
  - Assumptions
- Highlight the results on NW Denver enrollment at the middle school level through 2020

## Overview of DPS Planning & Analysis

- Supports the Denver Plan 2020 by identifying both short and long-term capacity needs for K-12 students, pre-school programs as well as language and secondary pathway opportunities
- Team includes PhD's in applied mathematics and industrial engineering; Management consultants, geographic information systems (GIS) specialists, real estate developers, and urban planning researchers.

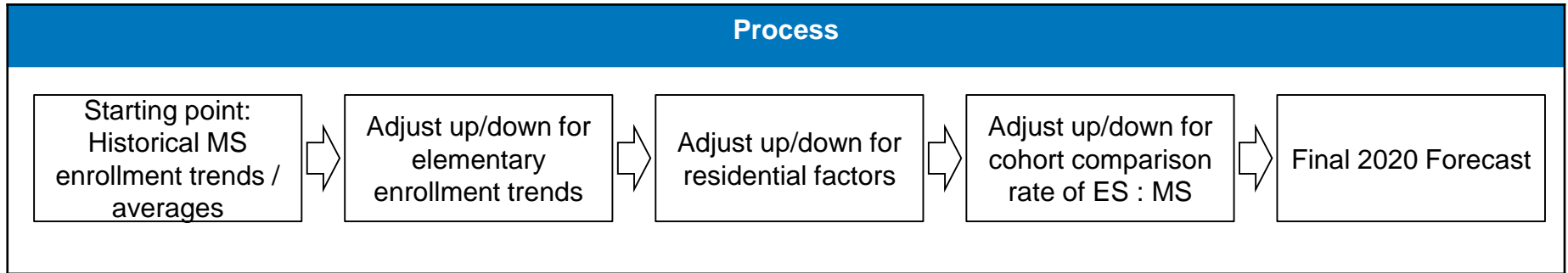
# Defining the Student Population in DPS Forecasts

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- DPS Planning forecasts the number of students who reside in a given census block group in a given year and will attend any DPS school. This forecast is agnostic of the choice behavior of this students, meaning that whether a student decides to attend their boundary school or choice-out to a school across town, they are counted for in the forecast.
- One primary reason for not incorporating choice into a 5-year forecast is the possibility that programs or boundaries may change between now and 5 years out.
- The forecasted population must attend a DPS school. It does not include students who may live in the area but attend private school, another district, or are home schooled. It also does not include students living outside of Denver who may want to choice-in to DPS.

# Summary Process for Residing Student Population Forecasting



## Timing

DPS Planning issues forecasts each spring looking out 5 years

## Forecast Level

Forecasts are created by grade level by census block group. There are three grade levels that are forecasted: elementary, middle, and high school. There are 481 census block groups that are forecasted for each of the grade levels.

## Feedback Loop

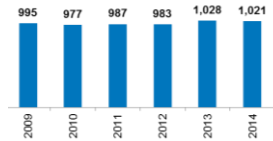
The primary data points that are used for the forecast are updated each spring to incorporate the latest findings.

## Impact of Choice

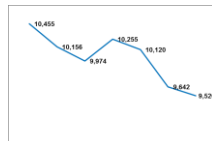
This approach looks at the students residing in an area attending any DPS school, not the local boundary/zone school. Choice behavior occurs outside of this forecast. Note that in 2014, 87 6<sup>th</sup> grade students choiced-out of the study area and 115 students choiced-in.

# Visual Summary of the Approach to Forecasting

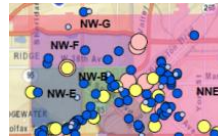
## Inputs: Major Data Points



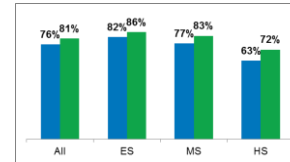
**Historical October Count Enrollment**



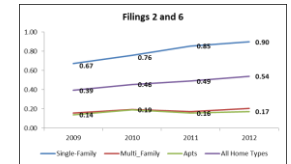
**Birth Rates**



**Residential Development**

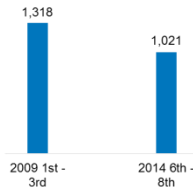


**Capture Rates**

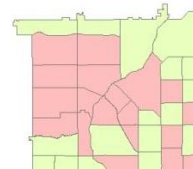


**Yield Rates**

## Assumptions



**Cohort Comparison**

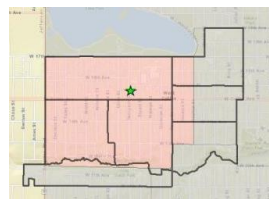


**Future Growth**

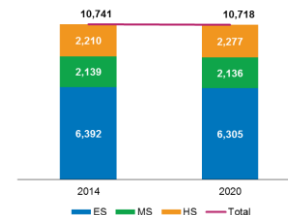


**Housing Impact**

## Resulting Forecast by Level



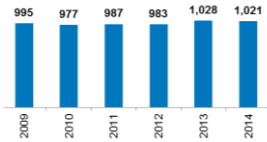
**Block Group**



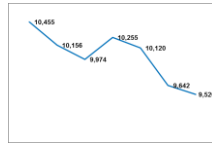
**Boundary / Regional**

# Data Sources for Major Data Points used in Forecasting

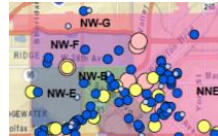
## Major Data Points



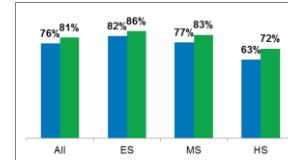
**Historical October Count Enrollment**



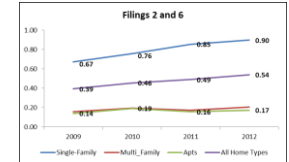
**Birth Rates**



**Residential Development**



**Capture Rates**



**Yield Rates**



**DENVER**  
THE MILE HIGH CITY



Name and age of student by address by year since 2000.

Audited by the Colorado Department of Education

Date of birth by latitude and longitude of residence for every child born in the state of Colorado by birth certificate

Permitting data for every residential and commercial construction project in development or approved by the City of Denver Planning Office

Percentage of student-age population (5-17 years old) residing in Denver versus the percentage that attend DPS

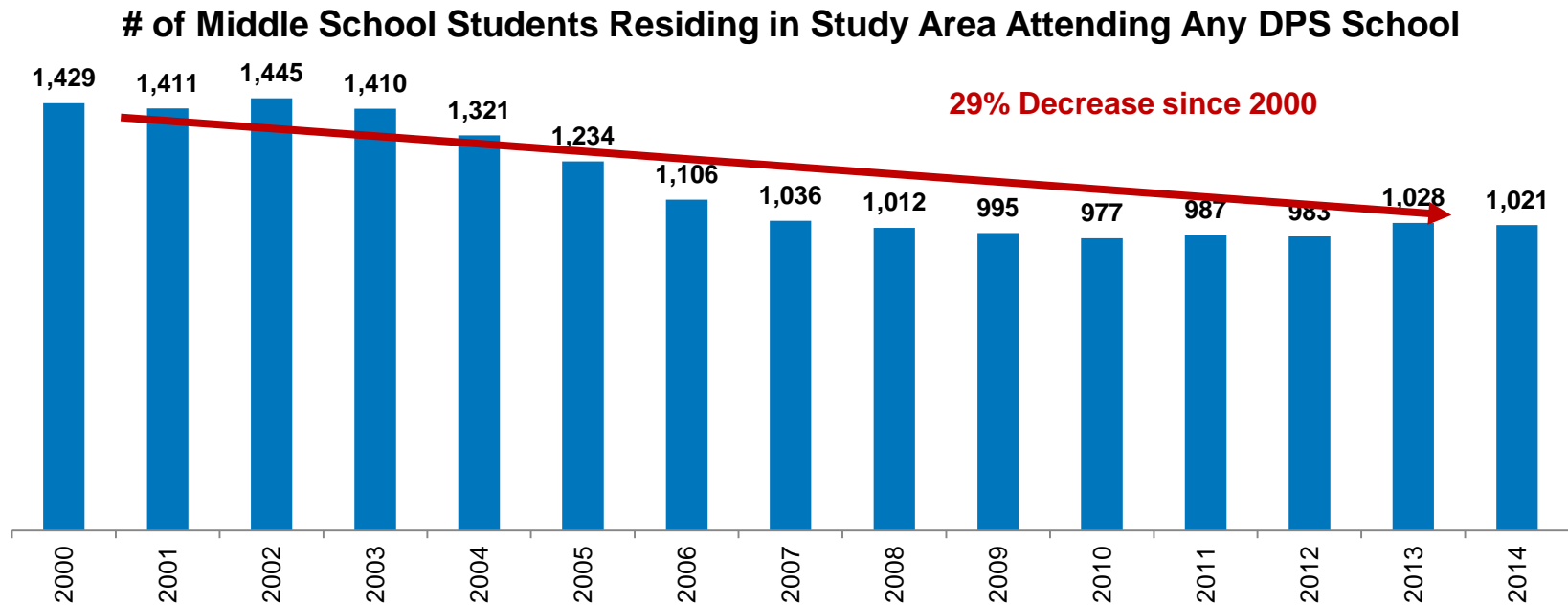
Number of DPS students per housing unit by type: affordable, apartment, attached, detached

## Source and Summary Description



# Context Setting: MS Enrollment residing in Skinner / Trevista Area

Source: Colorado Department of Education



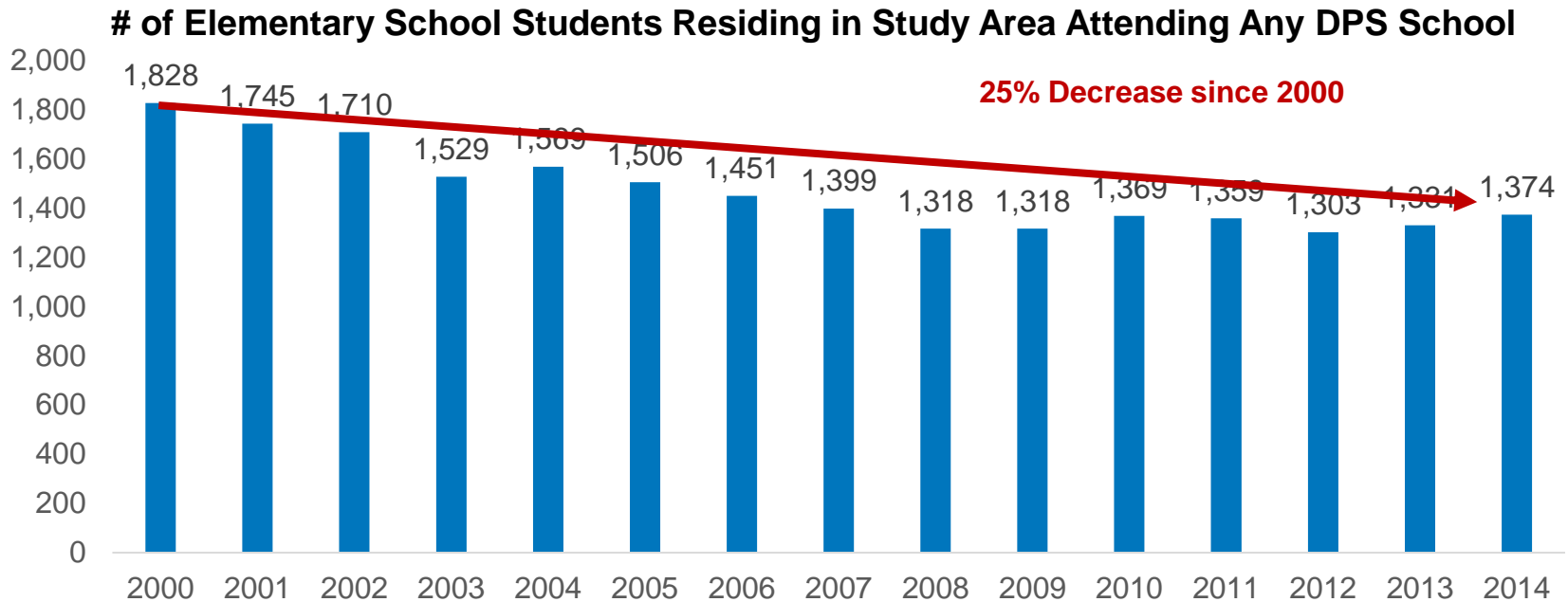
## Comments

- In the study area, the number of middle school age students attending any DPS school has declined 29%.
- The number of students has increased 3% over 4 years, or roughly 10 students per year.
- This number includes the students residing within the Skinner/Trevista area that attend any DPS school, but does not include students that live in Denver that do not attend DPS or students that live outside of the district that attend any DPS school.



# Context Setting: Grade 1-3 Enrollment residing in Study Area

Source: Colorado Department of Education



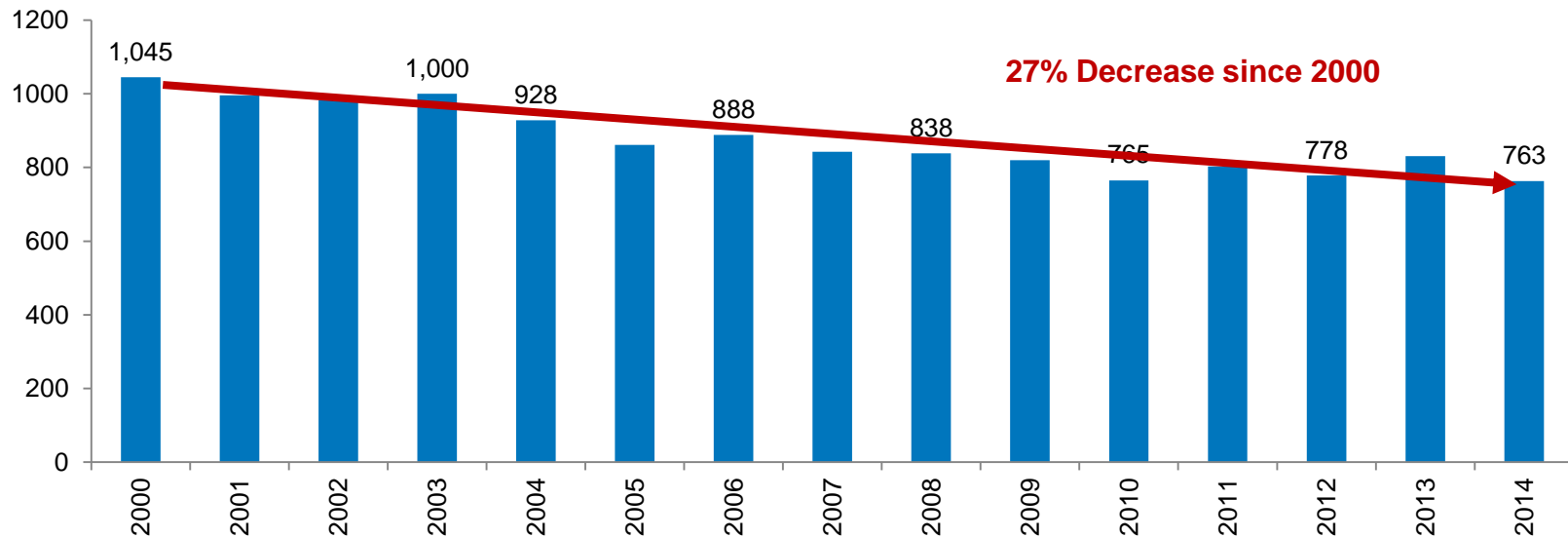
## Comments

- In the study area, the number of students in grades 1-3 attending any DPS school has declined 25%.
- The number of students is flat since 2010
- This number includes the students residing within the Skinner/Trevista area that attend any DPS school, but does not include students that live in Denver that do not attend DPS or students that live outside of the district that attend any DPS school.

# Context Setting: NW Denver Birth Rates

Source: Colorado Department of Health & Human Services

### Births per Year Residing in NW Denver

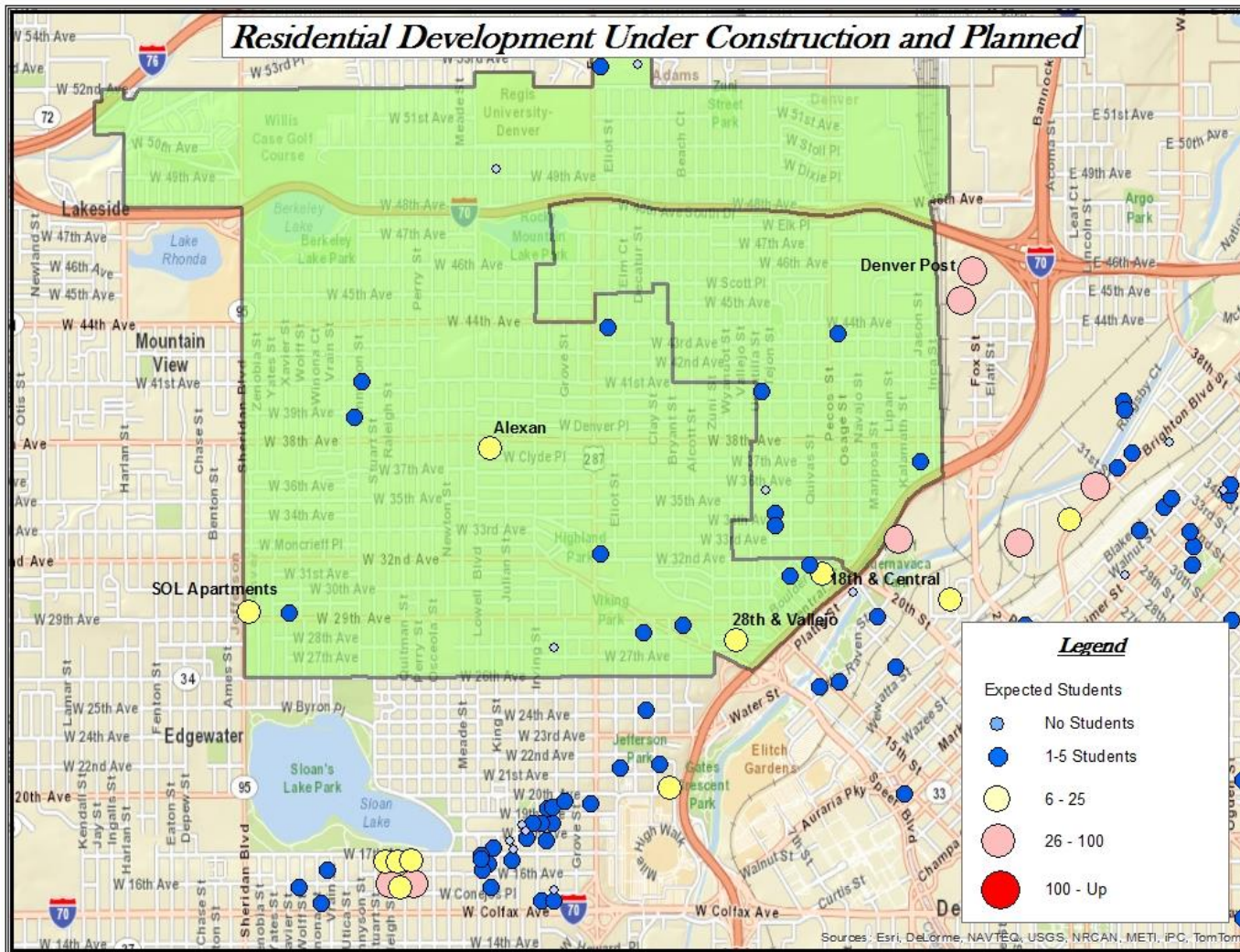


### Comments

- Births rates have declined nationally, within the state of Colorado, within Denver, and also in NW Denver.
- This number includes any child born to a parent residing in the Skinner/Trevista area at the time of birth, but not babies that were born to parents residing outside of the study area.

# Context Setting: Residential Development

## Source: City of Denver Planning Office



- There continues to be high levels of development in the city and NW Denver in particular.
- Many of the projects will yield little in the way of students due to new residences being targeted at young professionals and empty nesters
- There are several NW Denver projects that are more likely to yield students, including the Denver Post site development.
- Note that “scrapes” or “pop-tops” are not captured in the data on this chart.

# Context Setting: Residential Development Impact on Student Yields

## Source: City of Denver Planning Office; Official October Count Enrollment

**Yield Rate:** The number of students that matriculate from a unit of housing. For instance, if there are 10 houses and 5 children attend any school in DPS, the yield is 5 students / 10 houses = 0.5 yield.

One of the major impacts from gentrification is the change in housing stock. In NW Denver, there are numerous city blocks that have converted from single-family detached units to attached units, also known as townhomes or condominiums.



2005

Residential Units = 22  
Students Attending DPS = 13  
Student Yield = 0.59



2014

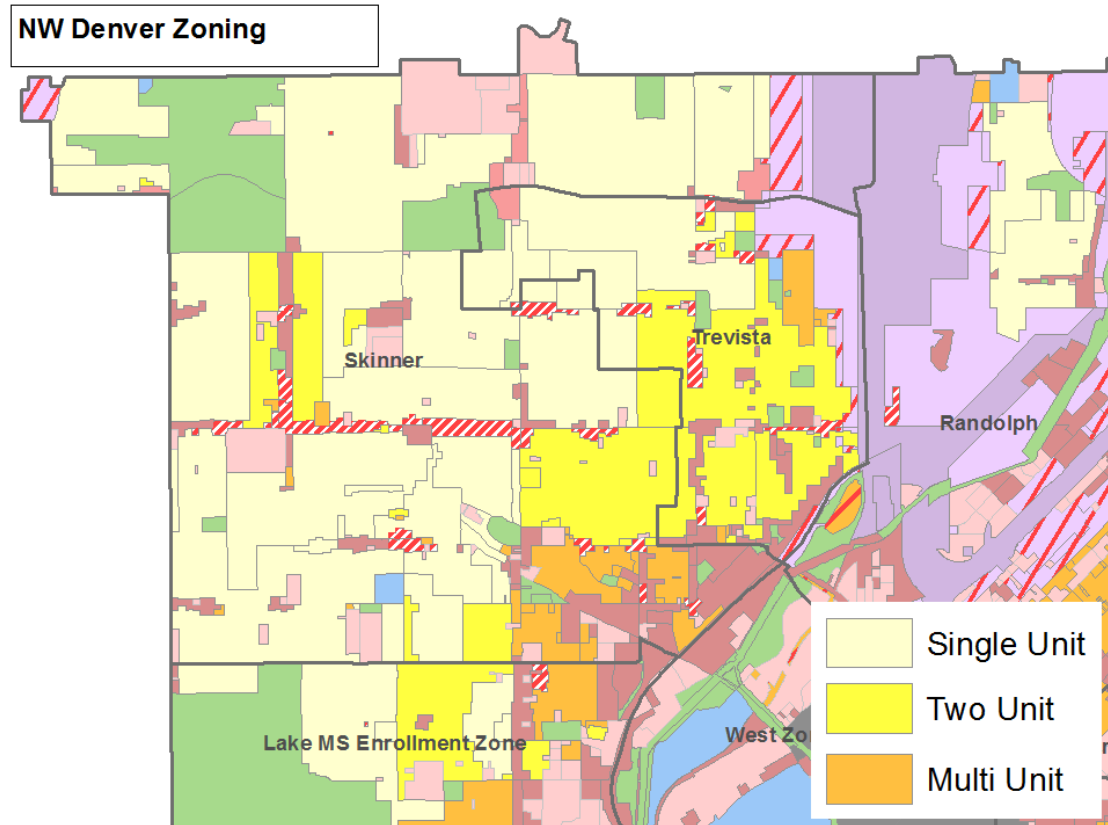
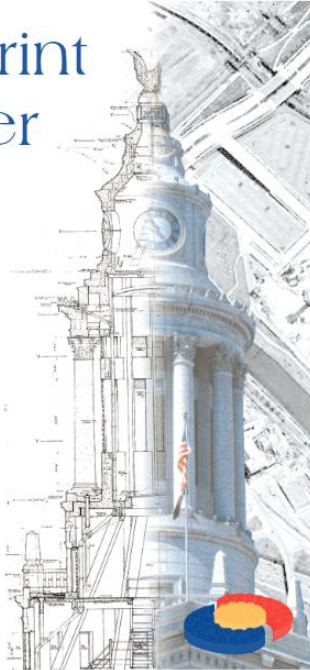
Residential Units = 48  
Students Attending DPS = 4  
Student Yield = 0.08

# Context Setting: Zoning Impact on Development Unit Mix

## Source: City of Denver Community Planning & Development

### Blueprint Denver

An Integrated  
Land Use and  
Transportation Plan

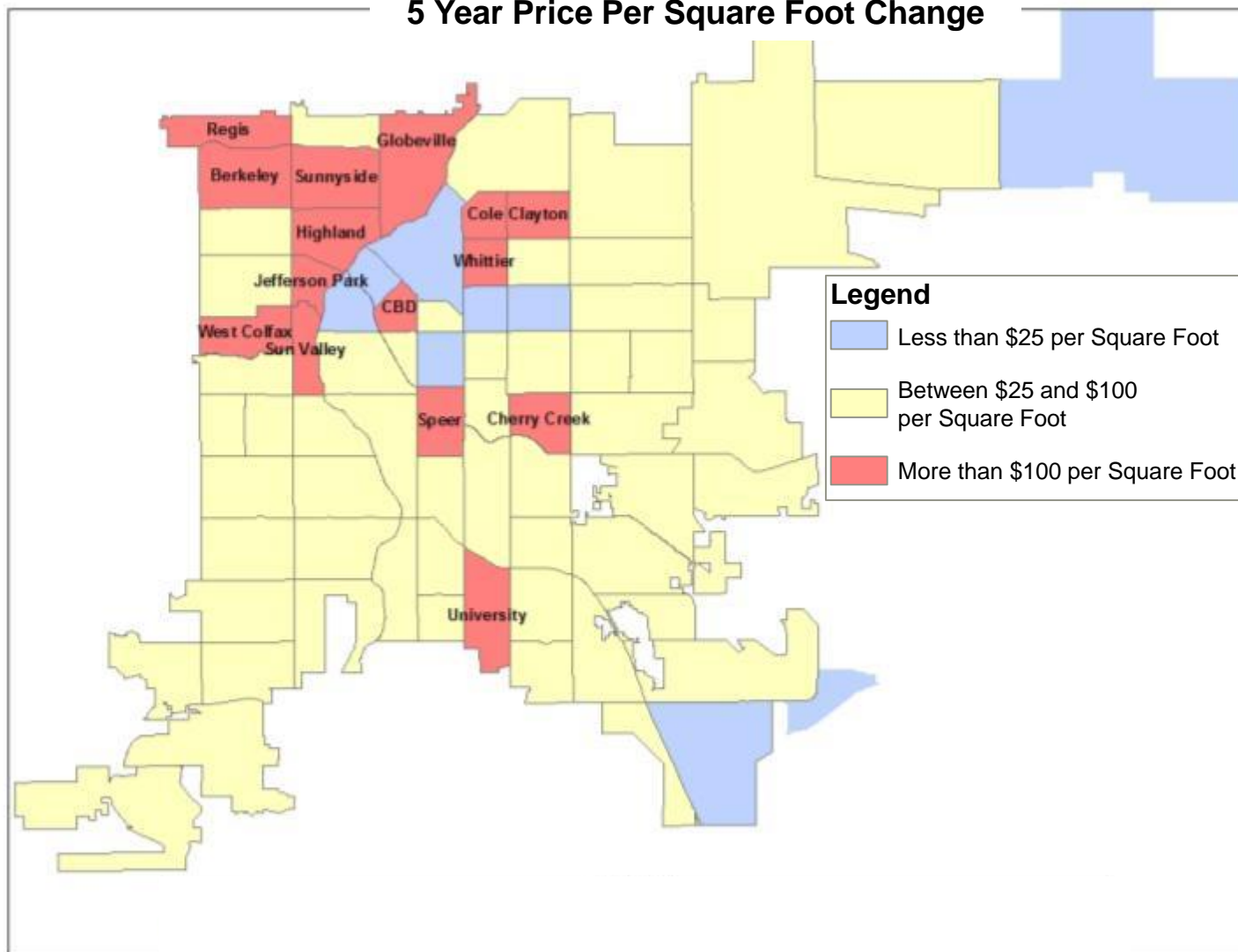


The mix of housing units in NW Denver has already occurred in parts of the Highlands and is currently happening around Sloan's Lake. The Blueprint Denver plan adopted in 2002 highlights zoning areas that may experience the same unit mix change, particularly near Tennyson and closer to the light rail station at Inca and 38<sup>th</sup> Street.

# Context Setting: Change in Home Prices

Source: City of Denver Assessor's Office 2010 and 2015

### 5 Year Price Per Square Foot Change



This map shows the 5 year price per square footage difference for all home types. The neighborhoods in red are gentrifying.

# Context Setting: Home Price Impact on Student Yield Rates

## Source: City of Denver; Geo-coded October Count

Over the last few years the City of Denver has seen several neighborhoods gentrify. One reliable data proxy of capturing the impact of gentrification is home prices. Between February 2014 and February 2015, Colorado's home prices increased 9.8%, the highest in the country. The average Denver home price in March 2015 was \$354,580, up from \$310,992 in March 2014.

	Yield (#)		Northwest	Study Area
Run for assessed value, compare chart on right to other regions Henry and Hill, clarify 0 and affordable, call out scraps and renovation				
Less than \$200,000	0.50	4,260	unit)	
\$200,000 to \$349,999	0.21	7,442	Affordable	0
\$350,000 to \$499,999	0.15	4,857	Apartments	1,033
\$500,000 to \$649,999	0.23	2,281	Condominiums	4
\$650,000 to \$799,999	0.27	942	Townhomes	293
Greater than \$800,000	0.28	1,178	Single Family Detached	0

As home prices move up the student yield drops by half. The bounce back in the \$500,000 and above is due to Stapleton, which has a large share of homes sold at these price points and have the highest yields in the metro area.

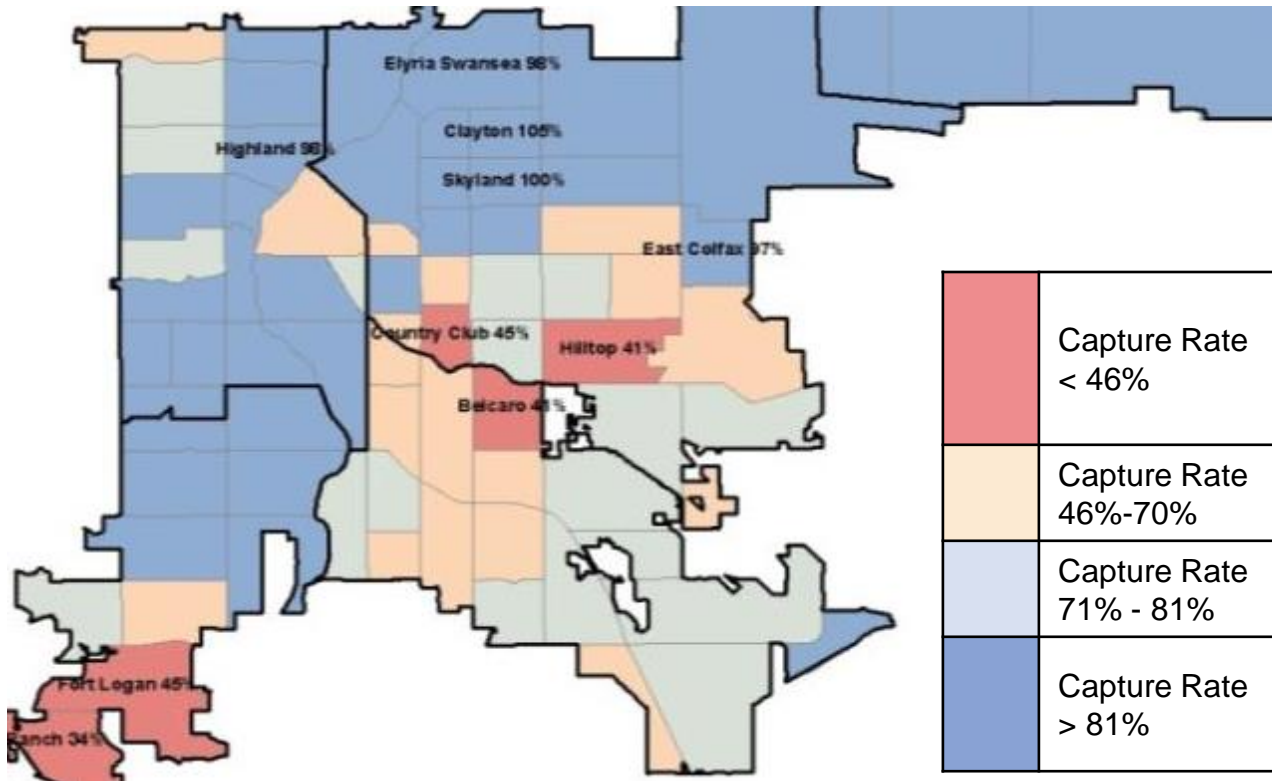
# Context Setting: Capture Rates

## Source: 2000 and 2010 US Census; October Count Enrollment

**Capture Rate:** Percentage of student-age population residing by block group that attends DPS versus other options, such as private school, neighboring districts, or home schooling. For example, if 100 people age 5-17 reside in a given census block group and 75 attend DPS, the capture rate is 75%.

While capture rates in the western portion of NW were below 80% in 2010, they are believed to already be closer to a ceiling as a result of improved performance of MS options in the NW. Note that rate calculations are less accurate in between census years.

### 2010 K-12 Capture Rates

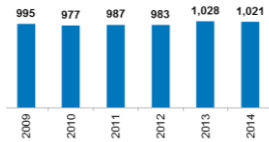


	Capture Rate < 46%	High rates of private school or neighboring district. Potential exists to recapture, though will be difficult.
	Capture Rate 46%-70%	Growth potential by recapturing from other options.
	Capture Rate 71% - 81%	Approaching the ceiling, but growth opportunities remain.
	Capture Rate > 81%	Capture rates approaching or at the ceiling. Minimal further growth is likely.

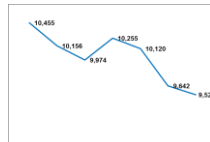


# Summary of Regional Impacts on Enrollment Forecast

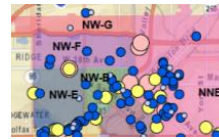
## Inputs: Major Data Points



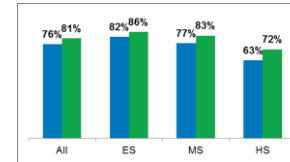
**Historical October Count Enrollment**



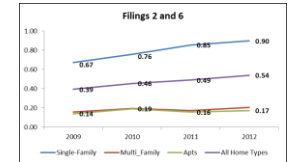
**Birth Rates**



**Residential Development**



**Capture Rates**



**Yield Rates**

Flat enrollment growth at both the ES and MS level point towards flat enrollment levels for MS through 2020

Declining birth rates across the city as well as in NW Denver point to elementary enrollment declines starting in 2014 with MS declines by 2020

Conversion of detached homes into attached has historically led to declining rates of students. City permitting shows more conversions are planned for NW.

Increased performance of DPS, including secondary schools has led to increasing rates of student-age population attending DPS

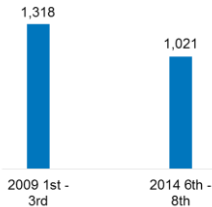
Increasing home prices are leading to lower yield rates. This is being partially off-set by empty nester families moving out of the area being replaced by younger families

### Overall

School performance is attracting more families to attend DPS, particularly due to secondary school strengthening. However, residential cost increases, shrinking birth rates, and conversion of housing to units with lower student yields is likely to result in minimal growth over the forecast horizon.

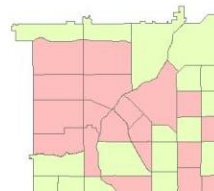
# Assumptions Used to Forecast Enrollment

## Data Points



**Cohort Comparison**

Is performance of one grade level improving vis-à-vis another? For instance, were families previously leaving the region for MS because of lower performance, but now are staying?



**Future Growth**

(Pulled in from the previous section)

Is elementary enrollment increasing, leading to larger future cohorts?



**Housing Impact**

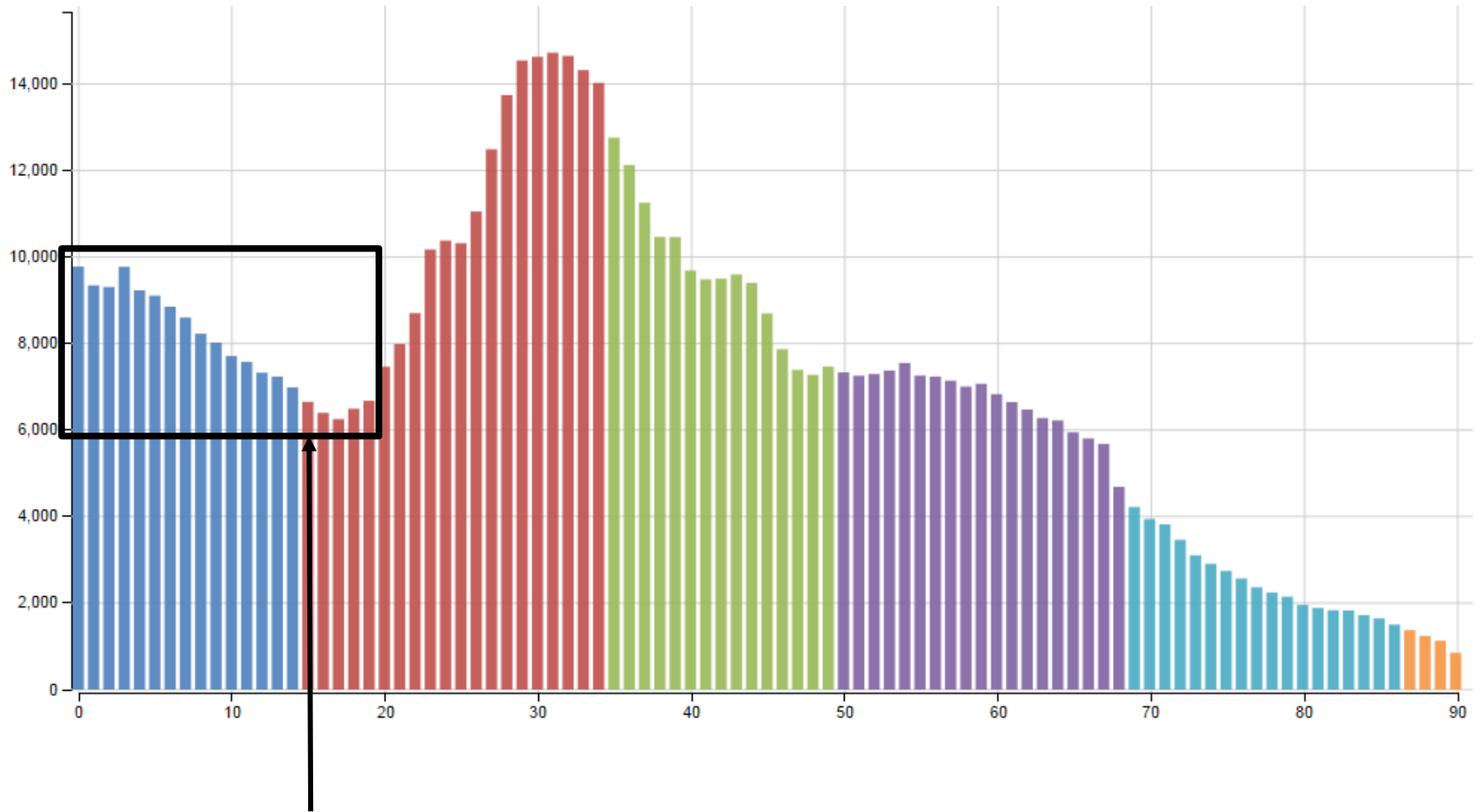
(Pulled in from the previous section)

Is the housing stock changing? Is housing more designed for younger families than older ones due to smaller square footage?

## Insights Guiding Assumptions

# Context Setting: Age of City & County of Denver Population City Wide

Source: 2014 Data from Colorado State Demographer's Office



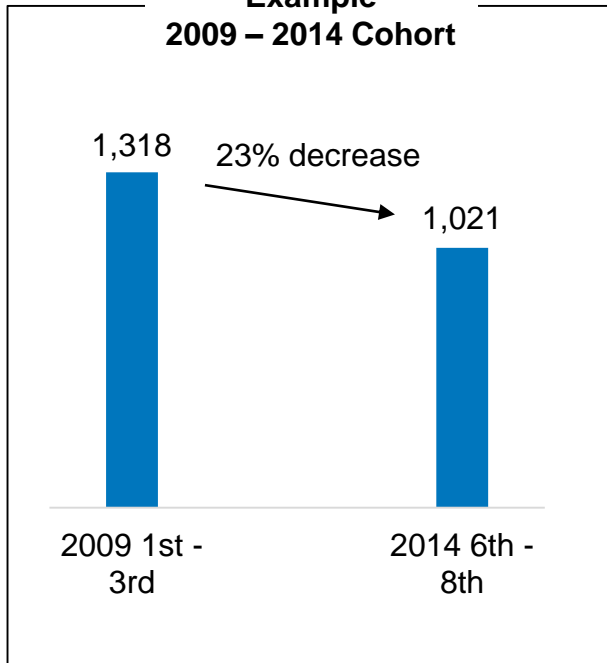
As data from the State of Colorado Demographer's Office shows, there are declines in the number of children residing in Denver as they age. Increases do not happen until students hit 18+ due to college and other post-K-12 opportunities.

# Cohort Comparison Overview

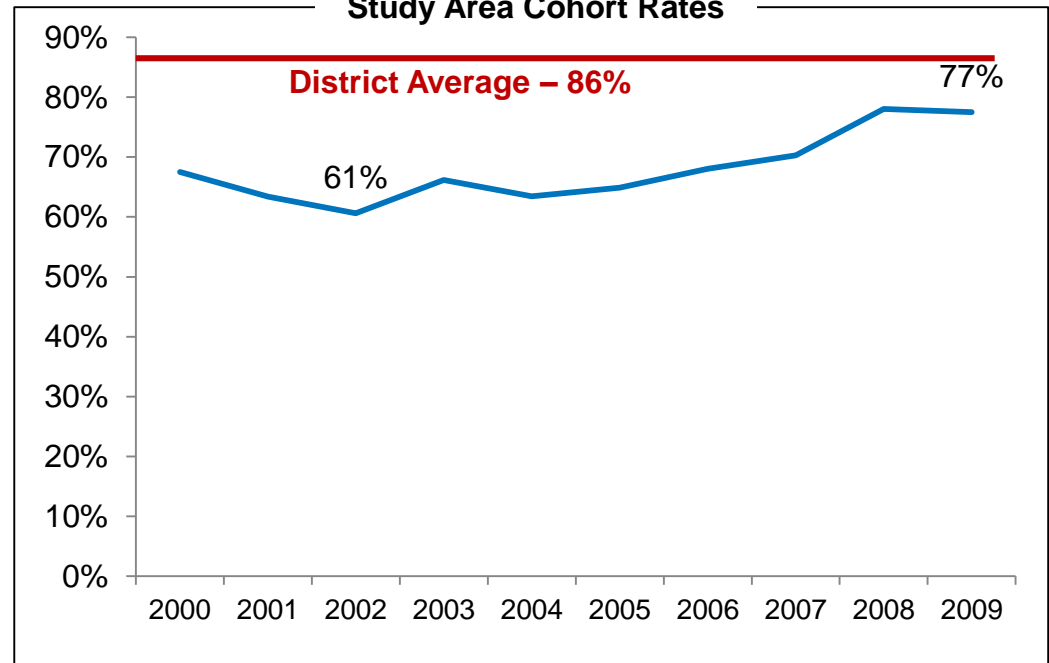
## Concept Overview: Cohort Comparison

What % of 1<sup>st</sup> through 3<sup>rd</sup> graders are enrolled somewhere in DPS 5 years later, when students are in grades 6- 8? Rates can also be compared to overall elementary vs. middle, etc.

Example  
2009 – 2014 Cohort



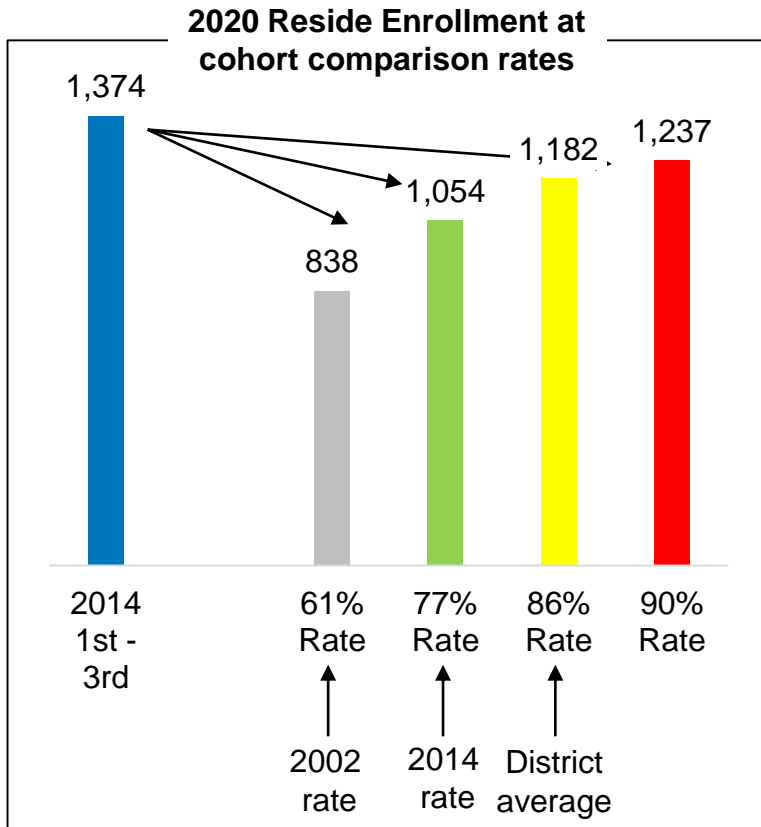
Study Area Cohort Rates



### Comments

- As a result of improved options in Northwest Denver, the percentage of elementary school-age students remaining with DPS for middle school has continued to increase.
- Overall in the district, each region has a decrease in the size of the cohort at middle school, which aligns with the data presented on the previous slide.

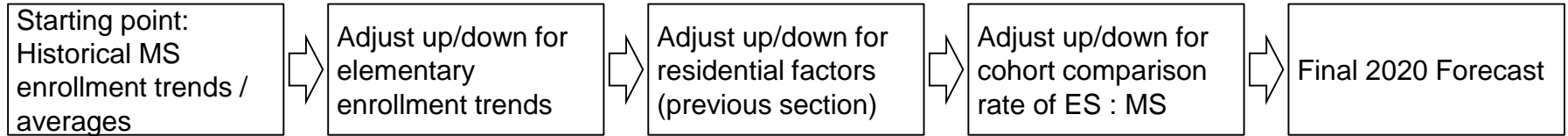
# Enrollment Impact of Various Cohort Comparison Rates



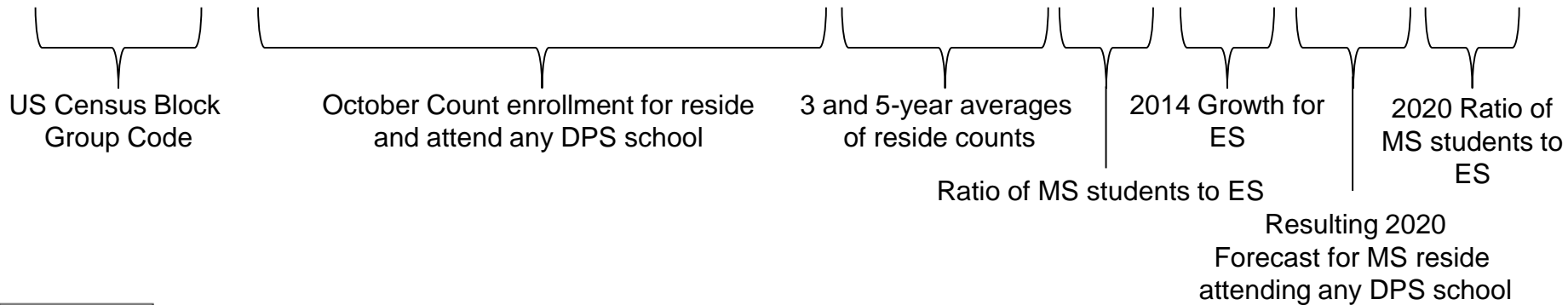
Boundary	Comparison Rate
Denver Green	74%
Lake Zone	76%
Trevista	77%
Merrill	78%
Skinner	78%
Grant Ranch	81%
Whittier	83%
Morey	83%
Hill	84%
Hamilton	85%
<b>District Average</b>	<b>86%</b>
Bruce Randolph	86%
West MS Zone	88%
Grant Beacon	90%
Kepner	95%
Henry MS	96%

- Grade 6-8 cohort comparison rates have increased from 61% to 77% versus grade 1-3 enrollment 5 years prior. A primary driver of an increased number of elementary students remaining with DPS for middle school is due to the improved MS offerings in the area including Skinner, Strive, and Bryant Webster.
- DPS Planning believes that looking forward to 2020, NW MS cohort comparison rate is likely to be between the current rate on the lower end and the district average on the higher end.

# Guide to Forecast Calculation Process and Worksheet

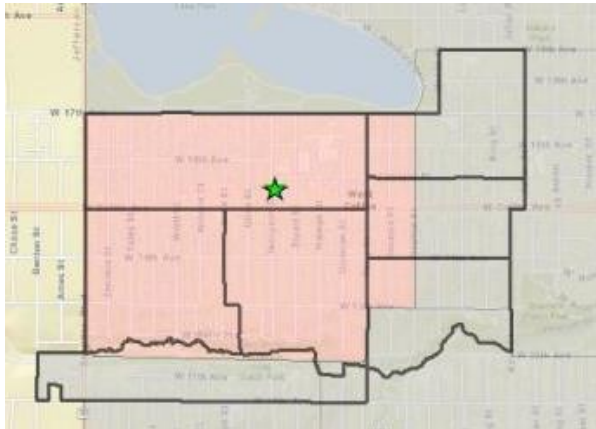


Census Block	# of MS Students Residing						Average Reside		MS : ES Ratio	2014 ES Growth	2020 MS Forecast	2020 MS :ES Ratio
	2000	2010	2011	2012	2013	2014	5-Year	3-Year				
080310154003	16	10	14	16	17	17	15	17	31%	21	19	38%
080310005011	17	17	15	10	9	13	13	11	10%	5	18	20%
080310005024	42	31	41	38	44	38	38	40	97%	4	34	97%
080310154001	7	19	18	16	13	12	16	14	35%	14	15	31%
080310003021	11	5	10	10	13	10	10	11	22%	-4	11	23%
080310003024	7	11	6	6	8	9	8	8	35%	-3	8	30%



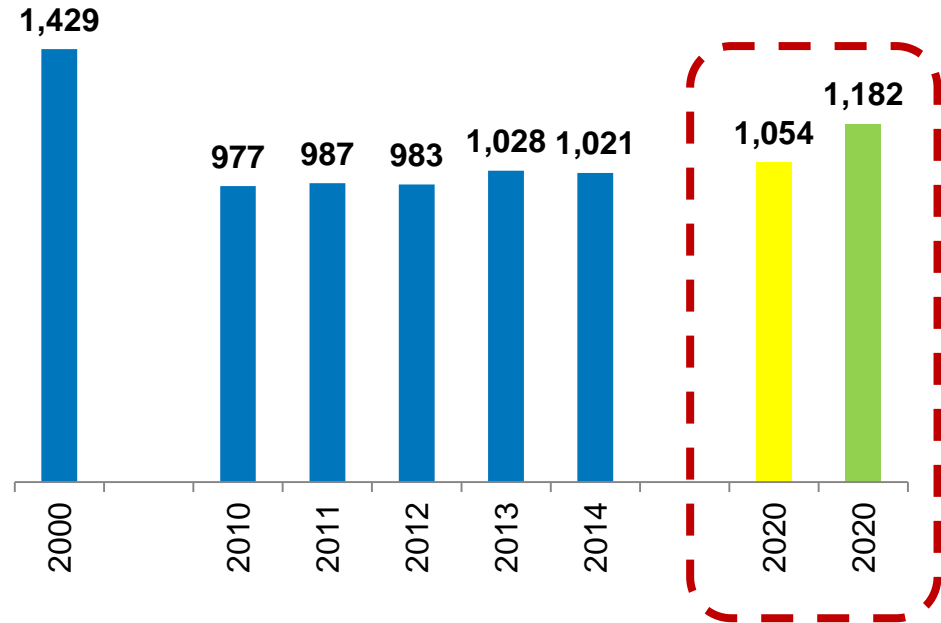
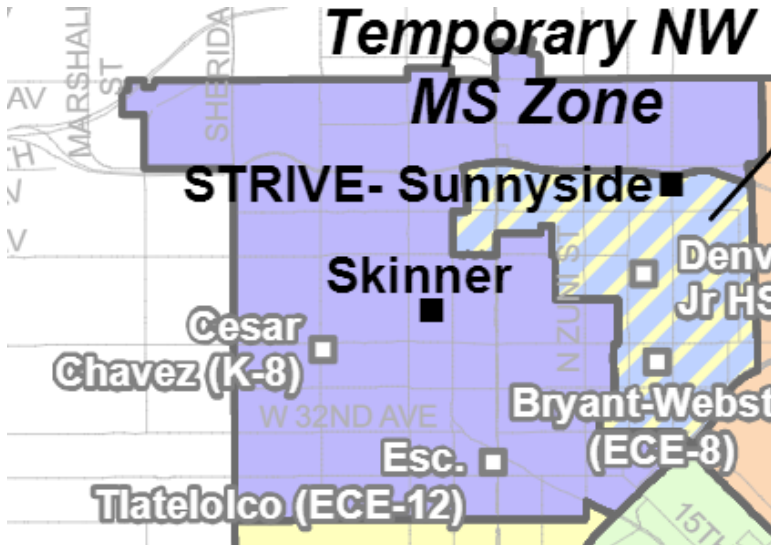
# Mapping Census Block Forecasts to School / Regional Levels

Census Block	DPS Planning Region	DPS Planning Sub-Region	ES Boundary	MS Boundary	HS Boundary
080310154003	NW	NW-G	Centennial	Skinner	North HS
080310005011	NW	NW-E	Brown	Skinner	North HS
080310005024	NW	NW-E	Brown	Skinner	North HS
080310154001	NW	NW-G	Centennial	Skinner	North HS
080310003021	NW	NW-E	Edison	Skinner	North HS
080310003024	NW	NW-E	Edison	Skinner	North HS



- Each of the 480 census block groups within the City and County of Denver are geocoded to one or more elementary schools, middle schools, and high schools.
- DPS Planning is able to combine the blocks based on the education level that is being forecasted

# Resulting 2020 NW Denver MS Enrollment Forecast



## Comments

- DPS Planning forecasts that MS reside enrollment in the study area will be between 1,054 and 1,182 which is 3% to 16% increase in students by 2020.**
- The low end of the range assumes that the current cohort comparison rate remains relatively flat while the high end of the range takes the study area in-line with the district average of 86%.
- Overall, the macro-regional factors point towards neutral growth outside of 5-year averages for reside enrollment, which itself shows minimal growth over the last 5 years. Additionally, elementary enrollment is also relatively flat since 2010, which is then captured and projected forward to 2020 based on elementary reside rates.



# Appendix

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## 2014 Enrollment: Top Attend Locations by Boundary

### Skinner Boundary

School	# Attending
Skinner	333
Strive Sunnyside	100
DCIS	57
Cesar Chavez	34
DSA	27
Bryant Webster	25
All Other DPS Choices	21
<b>Total MS Residents</b>	<b>690</b>

- 52% of Skinner boundary families choiced-out to another DPS MS in 2014-15.
- In 2012 the choice-out rate was 69% for Skinner
- Roughly 75% of Skinner boundary families attend a NW Denver MS, while 25% leave the region

### Trevista Boundary

School	# Attending
Trevista	110
Strive Sunnyside	59
Bryant Webster	50
Skinner	47
Cesar Chavez	16
DCIS	11
All Other DPS Choices	38
<b>Total MS Residents</b>	<b>331</b>

- 67% of Trevista MS boundary families choiced-out to another DPS MS in 2014-15.
- Choice-out rates for Trevista K-8 have remained relatively flat around 70% for the past 5 years.
- 14% of families are leaving the NW for MS.

# 2015 Choice Preferences for NW Area Families

## Skinner Boundary

School	# Listing #1
Skinner	110
Strive Sunnyside	21
DCIS	16
DSA	11
DSST Byers	5
All Other DPS Choices	21
<b>Total Choice Applicants</b>	<b>184</b>

- 60% of Skinner boundary families who participated in Choice selected Skinner #1.
- An additional 66 families residing in the boundary did not submit a form, but are guaranteed a seat at Skinner

## Trevista Boundary

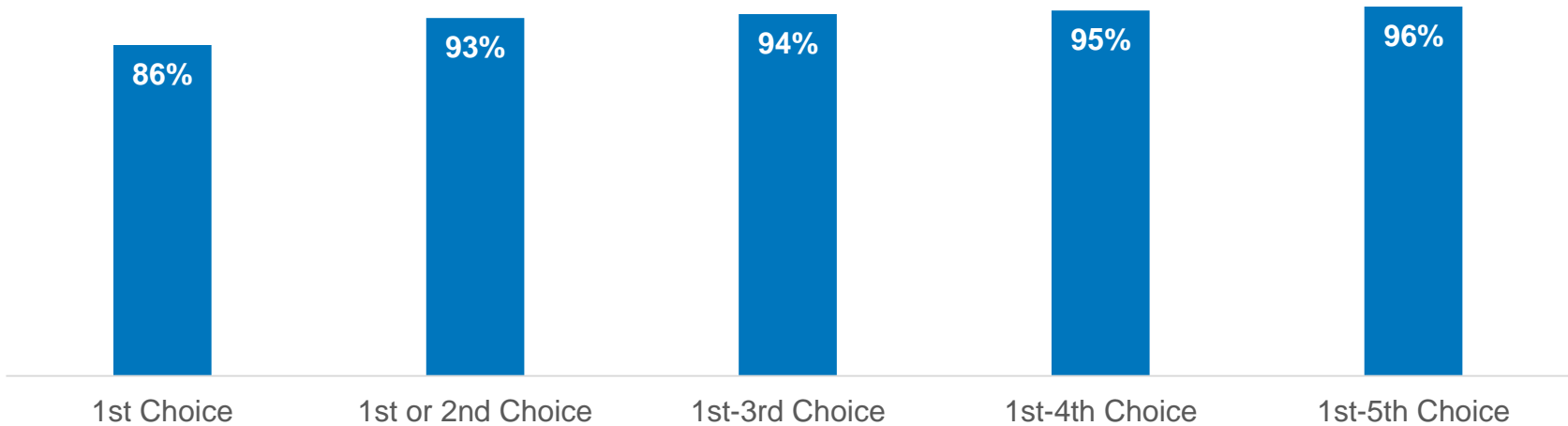
School	# Listing #1
Skinner	33
Strive Sunnyside	23
Bryant Webster	20
DCIS	5
GALS	5
All Other DPS Choices	20
<b>Total Choice Applicants</b>	<b>106</b>

- 72% of Trevista boundary families who participated in Choice selected Skinner, Strive, or Bryant Webster #1. These three schools encompassed the guaranteed options for Trevista families during the outreach efforts after Trevista MS was closed.

## 2015 Round 1 Choice Results:

### What percent of applicants received one of their preferred schools in NW?

Assignment by Preference for Northwest Participants



\* Transition grade levels only kinder, 6<sup>th</sup> and 9<sup>th</sup>

Grade Level	Preference Selections				
	1st	1st or 2nd	1st-3rd	1st-4th	1st-5th
Kinder	84%	91%	94%	94%	95%
6th	86%	93%	94%	96%	96%
9th	87%	94%	95%	96%	96%
<b>Total</b>	<b>86%</b>	<b>93%</b>	<b>94%</b>	<b>95%</b>	<b>96%</b>