

Economic Impact on Delaware's Economy: The Development of Churchman's Crossing

by

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Executive Summary

The Center for Applied Demography & Survey Research at the University of Delaware conducted this study to measure the potential economic impact of developing the Churchman's Crossing area in Christiana, Delaware in conjunction with the SR-1 / I-95 interchange. The study was made possible by a grant from the Delaware Department of Transportation (DELDOT). The Center conducted the study independently and the authors are solely responsible for the design and execution of the study.

The Center employed the REMI PI+ model which is a dynamic economic simulation model. Since it is a structural model, it is capable of estimating causal relationships. It is a general equilibrium model with feedback. The REMI model is tailored to Delaware using data from the Bureau of Census, the Bureau of Economic Analysis, the Bureau of Labor Statistics and the Energy Information Administration among others.

Twenty-seven development projects are currently under consideration for the Churchman's Crossing area. The last of these projects is scheduled for completion by 2034. Overall, they have the potential to transform the area in two major ways. One transformation increases the operations at the Bank of America and J.P. Morgan headquarters. The other would transform the Christiana Mall and surrounding properties into an interstate hub of retail shopping. Other projects are also considered in the report, but their combined effect is relatively small.

The main findings of the impact study are outlined below.

- By 2034, these projects potentially could directly facilitate the creation of 10,200 jobs and indirectly create another 13,250 jobs.
- Spending on infrastructure could create up to 380 new jobs by 2012.
- GDP could potentially increase \$2.0 billion by 2025 and \$4.7 billion by 2034.¹ The cumulative impact on the state after twenty years is \$42.3 billion.

¹ All dollars are as of 2008, unless otherwise noted.

- Consumption could increase \$0.7 billion by 2025 and \$1.6 billion by 2034. The cumulative impact on the state after twenty years is \$13.9 billion.
- Annual state and local tax revenue could increase by as much as \$4.5 million by 2015, \$66 million by 2025, and \$156 million by 2034. Most of this revenue comes in the form of personal income tax. As much as \$1.4 billion in additional tax revenues could be generated over the next 20 years.
- Annual personal income could rise \$0.9 billion by 2025 and \$2.1 billion by 2034.

Other findings of the study are:

- State population could increase 8,100 people by 2025 and 19,400 by 2034.
- The timing of development will impact the magnitude of economic benefits. The earlier investment begins, the greater will be the accumulated benefits. Nearly \$14 billion in additional consumption could be generated over the next twenty years as a result of development.
- Most benefits in the construction sector are due to business development and the corresponding multiplier effect, not the initial investment spending. The construction sector alone could see as many as 1,450 new jobs by 2034.
- Each residential project is expected to generate approximately 67 temporary jobs and \$5.5 million in GDP each year it is under construction.
- Annual property taxes from residential projects could increase by \$686,000 (2008 \$) once the development is finished.
- Financial activity is an important element to development and creates substantially more benefits for the economy than the retail sector. Without such projects, the potential benefits for Churchman's Crossing could be reduced by as much as 75%.

Introduction

This report estimates the economic benefit of developing the Churchman's Crossing area in New Castle County, Delaware. Data used in this report comes from the Delaware Department of Labor (DOL), the New Castle County Department of Land Use (NCCDLU), and the Delaware Department of Transportation (DELDOT). The analysis relies on a regional economic simulation model, REMI's PI+, to predict what would happen if the current proposals to develop Churchman's Crossing take place.

As of August 2009, the NCCDLU lists four residential and twenty-seven nonresidential development projects for the area. The projects are scheduled for completion by 2034, and developers have committed to most of them. The four residential projects, listed in Table 1a, would build 247 workforce apartments, 218 townhomes, and 99 single family homes.

Table 1a - Descriptions of Current Residential Development Projects

Name	Description
Churchman's Meadows	247 Apartments
Patterson Lane	28 Townhouses
Traditions at Christiana	99 Active-Adult Single Family Houses
Hudson Village	190 Townhouse Condos

- Source: New Castle County Division of Land Use

Table 1b – Descriptions of Current Nonresidential Development Projects

Project Name	Description of Project	Existing Floor Space (sq ft)	Proposed Floor Space (sq ft)
Islamic Society of Delaware	Expands existing church footprint	7,400	6,600
Holiday Inn/Hampton Inn	Builds a new restaurant	122,300	8,000
Centurian Plaza / Catawba Property	Builds a new retail complex	84,300	12,000
Churchman Village / Metro Properties	Builds a new medical care center for nearby nursing homes.	135,800	16,700
Old Route 7 South	Expands warehouse and lumberyard	113,600	19,000
Christiana Medical Center / Faith City	Expands existing school facilities	65,200	21,200
Omega Professional Center Area	Expands the existing blood bank	253,300	27,300
Comfort Suites	Expands existing hotel capacity	32,000	33,400
Country Commerce Office Park	Builds new commercial office building	45,000	42,000
Christiana Corporate Center	Builds new commercial office building	278,000	43,200
Main Street Hotel	Builds new hotel	0	43,300
Sallie Mae/Nationwide/Provident Mutual	Builds a new wing on the existing commercial office building	159,000	50,000
Christiana Hospital	Builds new medical offices and miscellaneous buildings	2,150,900	80,900
Hotel/Restaurant Cluster	Builds a new hotel	134,600	89,200
Harmony Industrial Park	Builds a new light-Industrial / warehouse	1,170,800	90,600
Metro Business Park / SPCA	Builds new commercial office and warehouse buildings	12,800	175,900
Christiana Town Center (273 Mall)	Builds new retail stores	424,800	228,000
Industrial Rentals / Christiana Market Place	New commercial office, retail, and hotel buildings, & small restaurant	0	303,000
Christiana Mall*	Demolish and replace unused retail space and build new retail stores	1,182,900	327,200
Sears Eagle Run / Christiana Promenade*	Demolish existing warehouse / retail store and build new retail stores	286,500	446,900
J.P. Morgan Christiana Center	Expands commercial office space for a financial institution's corporate headquarters, and builds a new shopping center and daycare.	672,900	776,300
Bank of America /MBNA Christiana Center	New commercial office for a financial institution's corporate headquarters and some warehouse space	644,500	1,114,000
Christiana Fashion Center	Builds new retail stores	0	1,221,500
Total		7,976,600	5,176,200

* Existing floor space will decline as a result of demolishing current buildings.

- Source: New Castle County Division of Land Use

Table 1b provides a brief description of the nonresidential development projects. The third column lists the existing floor space for any existing buildings, and the fourth column lists the proposed expansion. Overall, 5 million additional square feet of floor space are planned for properties currently offering 8 million square feet. Approximately 90% of this additional space will be evenly divided between retail stores and commercial-office space. Light industry, warehouses, hotels, restaurants, medical offices, schools and churches make up the remaining 10% of additional floor space.

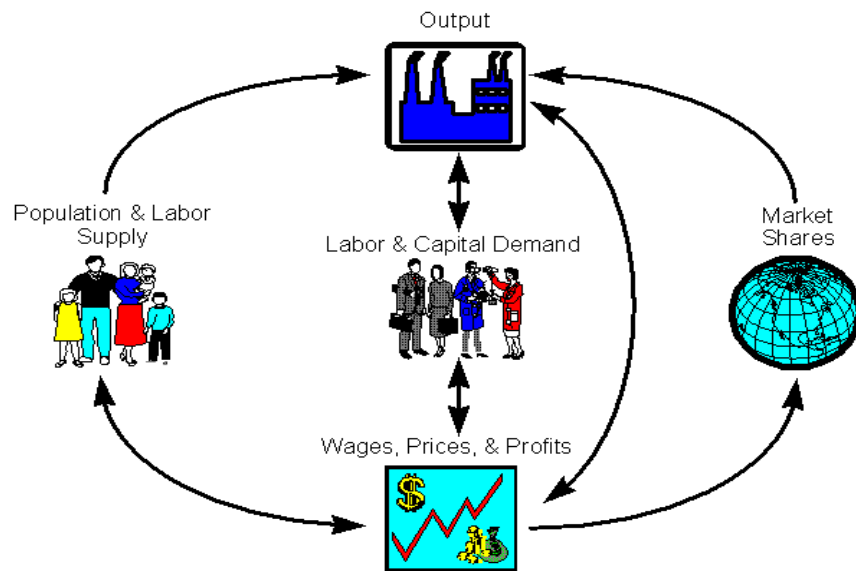
The report proceeds as follows. The first section presents an overview of the REMI model and how it will be used in this analysis. The economic impact of residential investment is analyzed in Section 2, and the nonresidential development is explored in Section 3. Section 4 addresses development's effect on state and local taxes. The final section summarizes the main findings of the report.

Overview of the REMI PI+ Model

REMI's PI+ software is a regional simulation of the Delaware economy. The model is tailored to Delaware using data from the Bureau of Census, the Bureau of Economic Analysis, the Bureau of Labor Statistics and the Energy Information Administration. The model is a regionalized version of a benchmarked national model. The region includes the three counties in Delaware, Cecil County MD, Delaware and Chester counties in PA combined, and the balance of the Delmarva Peninsula. Thus there are six sub-regions in the model. The economic impacts are listed for the entire state, though most of the activity takes place in New Castle County.

Each county in Delaware is modeled as an independent, fully functioning economy that interacts with every other sub-region in the area and with the nation in general. Each economy is founded on conventional assumptions, like households maximize utility and firms maximize profits. Hundreds of equations have been developed over the last 25 years to mathematically describe an economy's structure. These equations can be organized into five major components: Output and Demand, Labor and Capital Demand, Population and Labor Force, Wages-Prices-Costs, and Market Shares. Figure 1 illustrates REMI's main structure and components.

Figure 1 - Illustration of the REMI PI+ model



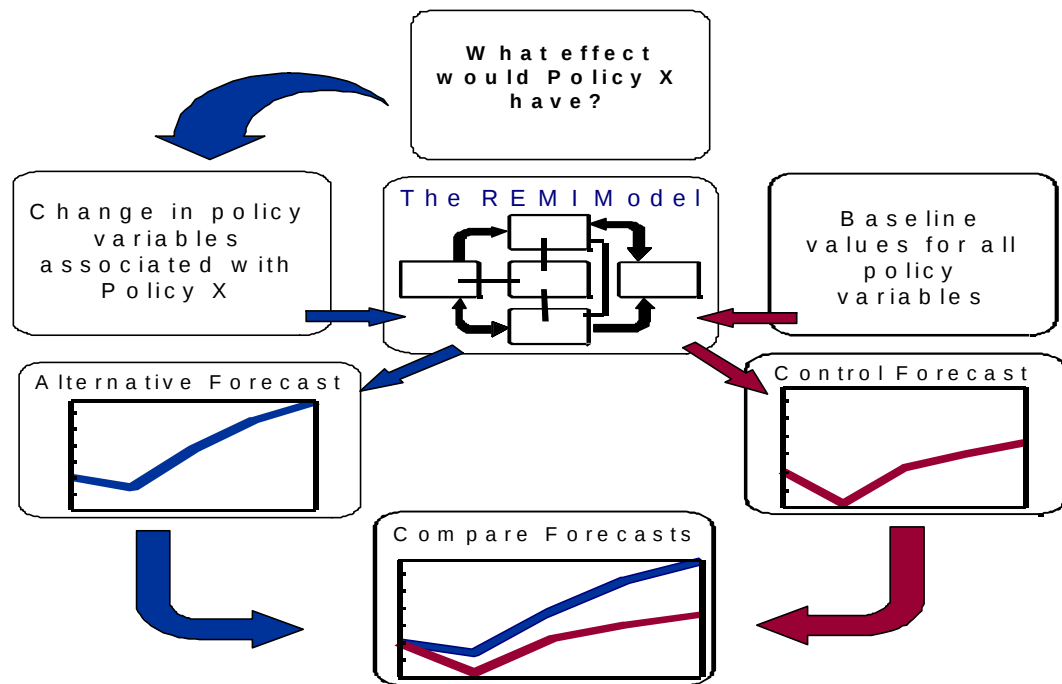
In the REMI model, businesses use labor, capital, and fuel as inputs in order to supply goods and services as output. Households and some businesses supply the inputs of production markets and also generate the demand for goods and services. Wages, prices, and profits adjust to form equilibriums in each market, but the process might take time. High market shares can generate cluster effects that influence factor productivity and input prices.

The REMI PI+ model is a general equilibrium model with feedback. This means that the model describes the entire economy as it changes over time. For example, changes in population, demographics, and wages each influence the labor supply at any moment in time, but are themselves influenced in the future by the changes in the labor supply. These adjustments happen gradually, so the economy does not statically jump from one equilibrium to another. This is one main advantage of using the REMI model versus other economic simulation models (RIMS II, IMPLAN).

A second advantage of using a general equilibrium approach is that the model can capture a multiplier effect from other parts of the economy. In a sense, the multiplier effect can be described as the cumulative effect of demand generating additional demand. For example, one dollar of retail sales is expected to generate 0.28¢ sales in construction, 0.30¢ in fabricated metal product manufacturing, 1.1¢ in utilities, etc. As will be shown, the indirect effects from the multiplier effect can be quite large.

Figure 2 illustrates how REMI estimates the effects of a policy. First, the REMI model is calibrated and standard future scenario is predicted. This future scenario is called the control forecast. A policy is then proposed that will impact the economy. A modeler adapts this policy into REMI by changing appropriate input variables. A simulation is run on these new parameters, which creates an alternative forecast. The alternative forecast is compared to the control forecast and differences between the two are attributed to the policy. In the next section, REMI will be used to estimate the effects of residential development.

Figure 2 – Illustration of a Policy Forecast in REMI



The Impact of Residential Development

As indicated in Table 1a, the residential projects in this area will create 247 apartments, 218 townhomes, and 99 single family homes. Before estimating their effects, a brief discussion will describe how these projects fit into the REMI framework.

The REMI model classifies houses and apartments as residential capital. Money spent on residential capital is considered an investment and generally creates the need for construction and professional services (i.e. engineers, architects, etc). In turn, these businesses require intermediate goods from other businesses, such as lumber and metal. Higher compensation for workers raises their consumption and stimulates sales in retail and other sectors. When the money eventually stops recycling through the economy, the total effect is collectively referred to as the multiplier effect.

Residential capital investment affects the model in other ways. For example, increasing the supply of residential capital will drive down housing prices, which in turn lowers inflation. Lower inflation reduces the demand for labor, capital, and fuel as real prices edge upwards and affect the rest of the economy. Many other complicated relationships are captured in the REMI model.

The policy proposed here increases the level of residential capital investment over time. REMI requires that the size of this investment enter as an input variable during the years that investment occurs. Unfortunately, this information is not available and must be estimated.²

Investment expenditures for the Traditions at Christiana, Patterson Lane, and Hudson Village subdivisions are assumed to be 90% of the properties' 2008 market value.³ This assumption is based on a 2005 report from the National Association of Home Builders that found the industry's average profit margins to be 10%. The market value of each property is created using data from New Castle County's tax assessment records.

The Traditions at Christiana is a subdivision of 99 active-adult single family homes. Only 20 lots remained unsold at the end of FY 2008. A linear regression and data from previous sales in this development predicted the 2008 market value for every home.⁴ The total 2008 market value was estimated at \$31,456,600. Assuming investment costs are approximately 90% of this figure, expenditure would be \$28.3 million.

The Hudson Village and Patterson Lane projects have not yet begun construction, so their market value was assumed to be the county average. The average value of a townhouse selling in 2008 was found to be \$192,600.⁵ Therefore, the market values for Hudson Village and Patterson Lane projects are forecasted to be \$36,594,000 and \$5,392,800 respectively. Investment expenditure is projected to be \$37.8 million.

² Clearly, the developer's cost estimates would be more accurate than anything derived in this report, but unfortunately that information is not available. On the other hand, even if that data were available, there would always be great uncertainty using those estimates.

³ <http://www.nbnnews.com/NBN/issues/2005-11-21/Coast+to+Coast/index.html>

⁴ A linear regression predicted the sales price given the total assessed value and quarter in which the property sold. Unsold properties were assumed to have the average sales price, de-trended for 2008.

⁵ An assessment to sales ratio was generated for every townhome sale in the county. Outliers with assessment to sales ratios greater than five and less than one were removed. The average assessment value and average assessment to sales ratio was created for each quarter. Finally, the average assessed value of all townhomes selling since 2004 was multiplied by the average 2008 assessment to sales ratio.

The Churchman's Meadows apartment complex is the last residential property. It is difficult to ascribe a market value to apartments, so a different approach was used to estimate investment costs.⁶ Diagrams from a similar apartment complex in Newark were used to estimate the total square feet for a 277 apartment complex.⁷ The RSMeans CostWorks' *Conceptual Estimator* was utilized to estimate construction costs of building each apartment building. The website estimated that apartments would cost approximately \$48.6 million.

Finally the timing of each investment project is discussed. Three of the four projects actually will be developed in the future. Because each one likely takes four years to complete, it would be wrong to spread the investment expenses out over the entire twenty year timeframe. Therefore, the residential projects will be viewed separately. That way, the benefit of each project may be viewed independently or with others in a group.

⁶ Apartment complexes are rarely bought and sold as a single unit. In addition, data is not readily available for the number of apartments within a complex.

⁷ Each apartment is assumed to be 1060 sq. ft and 64 apartments can likely fit in a four level, 81,500 square foot apartment building.

Table 2 - Estimated Annual Impact of Residential Investment on Delaware's Economy, figures above REMI baseline

Delaware's Total Economy								Construction Sector		
	Year	Employment	Pop.	GDP, mil. (2008 \$)	GDP, pct	Disp. Pers. Income, mil. (nominal \$)	Consumption, mil. (2008 \$)	Employment	Output, mil. (2008 \$)	Wages and Salaries, mil. (nominal \$)
Churchman's Meadows	1	126	24	\$10.3	0.03%	\$4.62	\$3.81	75	\$9.3	\$3.5
	2	119	43	\$9.9	0.03%	\$4.98	\$3.80	71	\$9.0	\$3.6
	3	108	56	\$9.1	0.02%	\$5.07	\$3.69	66	\$8.4	\$3.5
	4	97	65	\$8.1	0.02%	\$4.97	\$3.50	59	\$7.7	\$3.3
Patterson Lane	1	14	3	\$1.1	0.00%	\$0.51	\$0.42	8	\$1.0	\$0.4
	2	13	5	\$1.1	0.00%	\$0.55	\$0.42	8	\$1.0	\$0.4
	3	12	6	\$1.0	0.00%	\$0.56	\$0.40	7	\$0.9	\$0.4
	4	11	7	\$0.9	0.00%	\$0.55	\$0.38	7	\$0.8	\$0.4
Traditions at Christiana	1	73	14	\$6.0	0.02%	\$2.68	\$2.21	43	\$5.4	\$2.1
	2	69	25	\$5.7	0.01%	\$2.90	\$2.21	42	\$5.3	\$2.1
	3	63	33	\$5.3	0.01%	\$2.95	\$2.15	38	\$4.9	\$2.0
	4	56	38	\$4.7	0.01%	\$2.89	\$2.03	35	\$4.5	\$2.0
Hudson Village	1	85	16	\$7.0	0.02%	\$3.12	\$2.57	51	\$6.3	\$2.4
	2	81	29	\$6.7	0.02%	\$3.38	\$2.57	48	\$6.1	\$2.4
	3	73	38	\$6.1	0.02%	\$3.43	\$2.50	45	\$5.7	\$2.4
	4	65	44	\$5.5	0.01%	\$3.37	\$2.37	40	\$5.2	\$2.3
Avg. Annual Impact per Project		67	28	\$5.5		\$2.91	\$2.19	40	\$5.1	\$2.1

- Source: Center for Applied Demography and Survey Research

Table 2 reports the economic impact of increasing residential capital investment by the estimated amounts. The Churchman's Meadows apartment complex had the highest capital investments, so it affected the economy more than the other projects. Each year that the apartment complex is under construction, annual employment could increase by up to 126 jobs. Patterson Lane has the smallest investment, and is expected to create between 11 and 14 jobs each year. Overall, REMI predicts that approximately 6 out of every 10 new jobs will be in construction.

The last row in Table 2 takes the average annual impact over each project. This row gives the expected impact of a policy maker randomly choosing one project to develop in a given year. On average, a random project generates 67 additional jobs and \$5.5 million (2008 \$) more in GDP each year. Similarly, consumption would rise by \$2.2 million and the population would increase by 28 people. Wages and salaries in the construction sector would increase by \$2.1 million.

Other than the benefit of having a larger stock of residential capital, most benefits from residential investment will be temporary. This should make intuitive sense, because once a house is built, no more significant economic activity takes place other than the maintenance. For this and other reasons, the estimated economic benefits from residential development are quite small compared to the potential impact of the nonresidential development.

The Impact of Nonresidential Development

In this section, the economic impact of nonresidential development is estimated. There are two ways to view development, one way is driven by increases in supply and the other, by increases in both supply and demand. Either way can be modeled in REMI. To understand the difference, consider the following two scenarios.

In the first scenario, developers build retail stores and office buildings in anticipation of a demand that never materializes.⁸ In the short term, the construction workers, engineers, architects and others who build these buildings receive payment, and multiplier effect similar to residential investment is generated. Without the increase in demand, however, there would be no more economic gains once the investment money has finished cycling through the system. Instead, Churchman's Crossing would be left with too much nonresidential capital, reflected by falling commercial property prices, unused floor space, and increased deterioration.

In the second scenario, developers build retail stores and office buildings in anticipation of a demand that materializes. In other words, Christiana grows into a regional retail hub and the financial activity continues to expand in the region. As new businesses occupy the buildings, they generate jobs and additional output for the economy. A much larger multiplier effect occurs due mostly to the new business activity. The multiplier effect could even be large enough to generate more development.

⁸Of course, most development would likely stop once developers realized they had misjudged demand. This point is ignored for the purposes of the analysis.

The difference between the two outcomes comes down to whether demand increases. REMI can analyze each scenario, but different input variables are used for each. The first situation is most appropriately modeled as an increase in nonresidential capital investment. REMI requires that the size of that investment enter as a policy variable. The second situation models increased demand through the businesses that occupy the buildings. REMI requires that the type of business and number of employees enter as policy variables.

Both approaches will be adopted in this report. The main advantage of using the first approach is that investments are modeled explicitly. Therefore the impact of infrastructure and nonresidential capital investment can be isolated from the larger effects of business growth. The main advantage of using the second approach is that it captures the entire potential benefit of developing the area.⁹

⁹ Investment does not enter explicitly into the policy variables when demand increases, because the multiplier effect includes, among other things, spending in construction and nonresidential capital.

The Timing of Nonresidential Development

As mentioned earlier, the nonresidential projects are expected to occur sometime between 2015 and 2034. However, the impact also depends on when the projects occur within this time period. The report uses two possible timelines for development. The first timeline assumes a constant, uniform growth rate and the second timeline assumes nonlinear growth that peaks in the middle of the time period.

Figure 3a illustrates both timelines by showing the flow of annual investment expenditures if total project investment is \$700 million. Investment spending is \$35 million each year in the timeline with constant growth. Under nonlinear growth, investment is relatively low early on at \$23 million a year. As development reaches its peak in 2025, expenditures rise to \$47 million. By the end of the timeline, development activity falls and the investment reverts back to \$23 million a year. In the event that investment spending is not \$700 million, either timelines can be scaled up or down.

Figure 3b shows how the two timeline assumptions affect the stock of new jobs (as a percent of potential employment). Under constant growth, employment increases uniformly until it is at full potential in 2034. Under nonlinear growth, the stock of new employment builds slowly at first. Low growth early on makes the employment stock in the nonlinear timeline lower than the employment stock in the constant timeline.

Figure 3a – Timeline Assumptions for the Annual Flow of Nonresidential Investment Spending

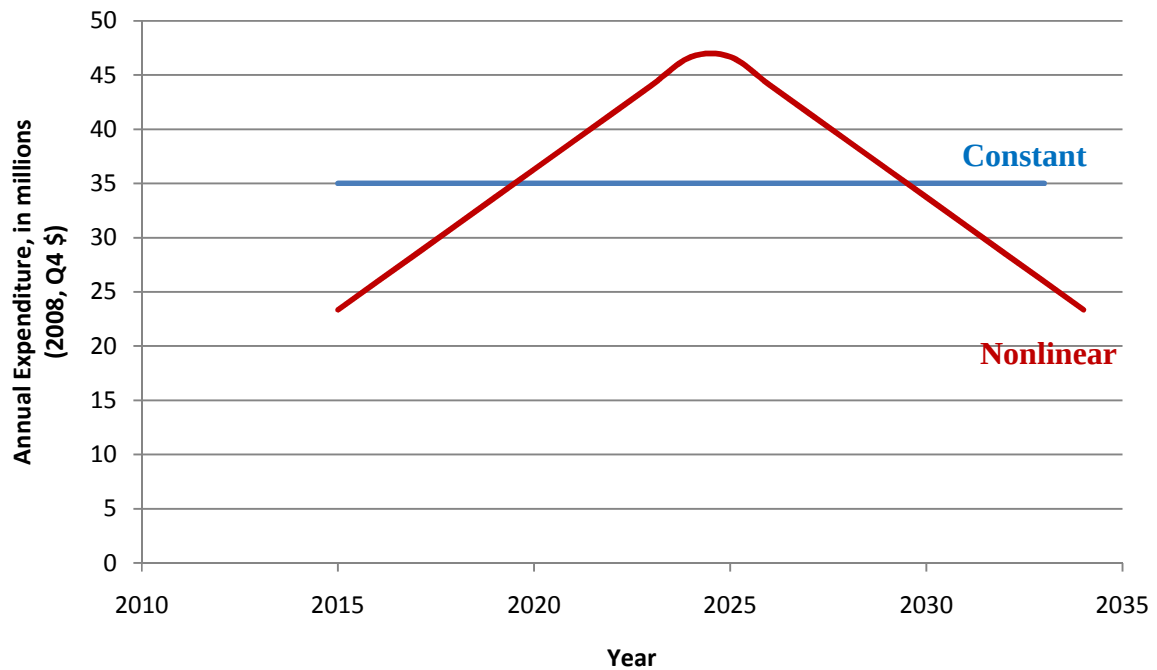
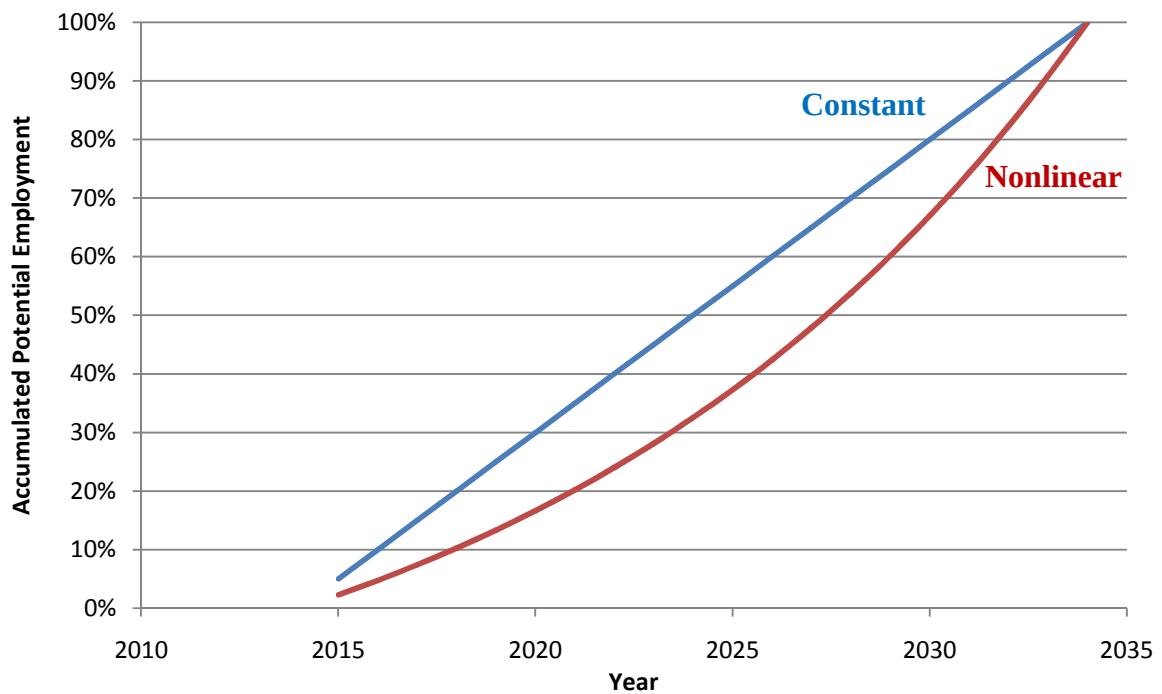


Figure 3b - Timeline Assumptions for the Accumulated Stock of of Potential Employment (in percent)



The Impact of Supply Driven Nonresidential Development

This section analyzes the effects of development without the demand of new businesses. Benefits found in this section are entirely attributed to infrastructure improvements and investment spending. Two policy variables in REMI capture these “supply-side” effects. Exogenous construction demand captures the effect of federal spending on infrastructure, and nonresidential capital investment captures the effects of developers building new stores and offices.

Spending on infrastructure has already been determined by DELDOT. DELDOT forecasts expenditures in Churchman's Crossing to be \$170 million (nominal). This money is projected to be spent with the following timeline.

- **2010:** \$6.9 million
- **2011:** \$31.6 million
- **2012:** \$45.3 million
- **2013:** \$45.3 million
- **2014:** \$40.9 million

Investment in nonresidential capital is not predetermined, so the project costs must be estimated. The *Conceptual Estimator* from the “Means Cost Works” website was utilized once again.¹⁰ Information on the type and size of each project was entered as inputs into the *Conceptual Estimator*, and it provided a cost estimate for each nonresidential structure.¹¹ Total costs per project are listed in Table 3.

¹⁰ <http://www.meanscostworks.com/MySquareFoot/MySFEstimate.aspx?InvokedFrom=MyEstimateHome>

¹¹ Using floor space, zoning information, and preliminary information about the type of buildings, cost estimates can be derived from the total floor area of each building. The estimates were obtained assuming 25% contractor fees, union labor, between 6-11% architectural fees, no user fees, and average input prices for Newark, Delaware as of the fourth quarter of 2008. These predictions are admittedly imprecise.

Table 3 – Estimated Nonresidential Construction Costs, (2008 \$)

Project Name	Expansion (sq. ft.)	Costs (per sq. ft.)	Total Costs
Islamic Society of Delaware	6,600	\$209.77	\$1,384,500
Holiday Inn/Hampton Inn	8,000	\$177.30	\$1,418,500
Centurian Plaza / Catawba Property	12,000	\$102.33	\$1,228,000
Churchman Village / Metro Properties	16,700	\$169.82	\$2,836,000
Old Route 7 South	19,000	\$96.15	\$1,827,000
Christiana Medical Center / Faith City	21,200	\$173.11	\$3,670,000
Omega Professional Center Area	27,300	\$183.66	\$5,014,000
Comfort Suites	33,400	\$189.98	\$6,345,500
County Commerce Office Park	42,000	\$170.68	\$7,168,500
Christiana Corporate Center	43,200	\$169.49	\$7,322,000
Main Street Hotel	43,300	\$185.79	\$8,044,500
Sallie Mae/Nationwide/Provident Mutual	50,000	\$169.54	\$8,477,000
Christiana Hospital	80,900	\$280.57	\$22,698,500
Hotel/Restaurant Cluster	89,200	\$168.81	\$15,058,000
Harmony Industrial Park	90,600	\$89.09	\$8,072,000
Metro Business Park / SPCA	175,900	\$114.21	\$20,091,000
Christiana Town Center (273 Mall)	228,000	\$111.89	\$25,510,000
Industrial Rentals / Market Place at Christiana	303,000	\$134.68	\$39,838,000
Christiana Mall	327,200	\$134.87	\$44,129,500
Sears Eagle Run / Christiana Promenade	446,900	\$120.30	\$53,762,000
Christiana Fashion Center	1,221,500	\$115.23	\$140,758,000
J.P. Morgan Christiana Center	776,300	\$148.58	\$110,970,500
Bank of America/MBNA Christiana Center	1,114,000	\$148.80	\$165,760,000
Total		\$136.59	\$701,383,000

- Source: "Means Cost Works" website and the New Castle County Division of Land Use

The estimated cost of the 23 projects is approximately \$700 million (2008 \$). Of course, the entire amount will not be spent in one year, but will be spread over time. Both constant and nonlinear growth timelines are analyzed. Spending on infrastructure is assumed to be \$170 million (nominal) spread over 2010 and 2014 as specified on the previous page.

Figure 4a plots the increase in state GDP that is directly attributable to investment spending. Figure 4b plots a similar graph for employment. The impact between 2010 and 2014 reflect the impact of DELDOT's expenditures. The figures reflect relatively large and immediate short term benefits. Between 2010 and 2014, infrastructure spending is forecasted to create up to 380 jobs each year and raise the state's GDP by a maximum of \$29 million.

Table 4 provides a better description of the economic impact. The initial five years give the expected impact of DELDOT's expenditures. The remaining rows show annual snapshots of the economy effects every five years. The state trends in Disposable Personal Income, consumption, and population are very similar to that of GDP and employment. Under constant growth these figures fall initially, but gradually rise or stay constant over time. Under nonlinear growth, these figures fall faster immediately after infrastructure spending is complete, but rise rather quickly by 2025. These "supply-side" investments would raise the state's GDP between 0.02% and 0.06% each year.

Figure 4a - Forecasted Difference in GDP (from baseline) Caused by Investment Spending (Supply Effects)

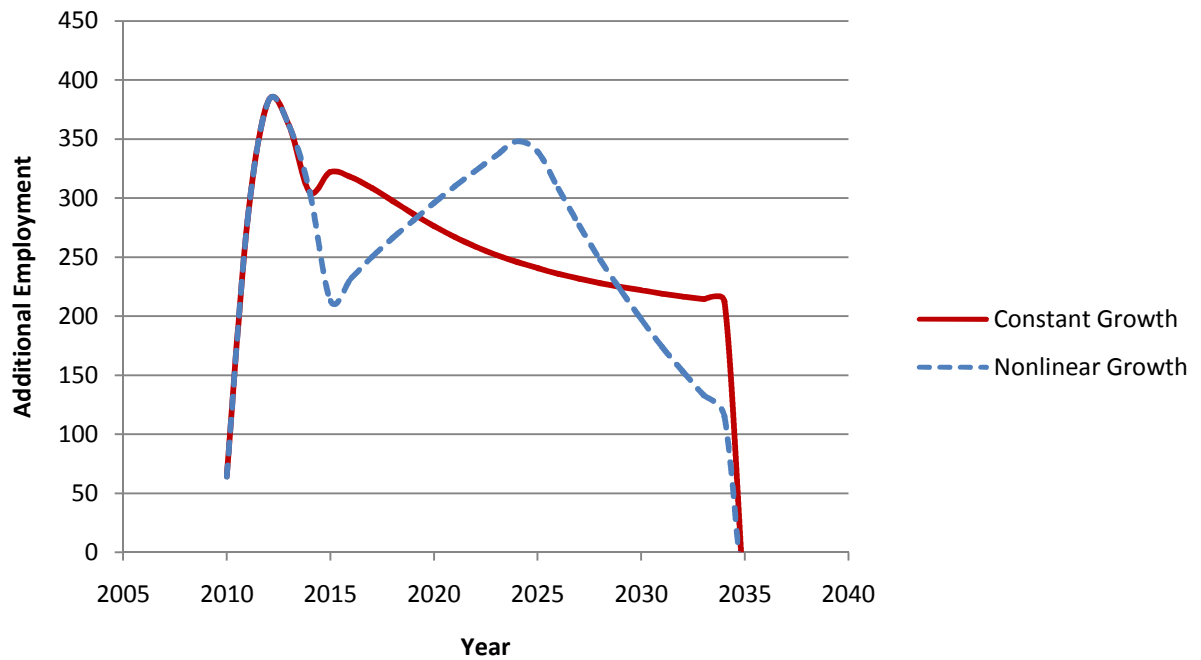


Figure 4b – Forecasted Difference in Employment (from baseline) Caused by Investment Spending (Supply Effects)

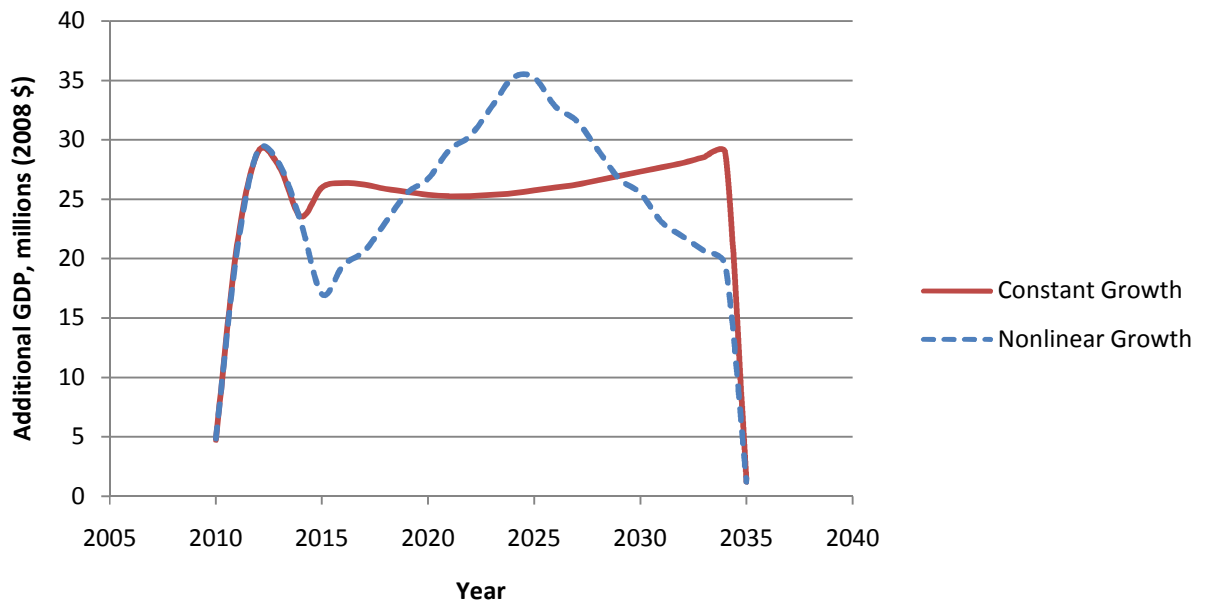


Table 4 - Estimated Impact due to DELDOT and Private Land Developers

Delaware's Total Economy							Construction Sector			
	Total	Population	GDP, mil.	GDP	Disposable	Consumption,		Wage and		
Units	Employment		(2008 \$)	(% of state)	Personal	mil. (2008 \$)	Employment	Salaries, mil.	Output, mil	
					Income			(nominal \$)	(2008 \$)	
					(nominal \$)					
Constant Development	2010	64	13	\$4.7	0.01%	\$2	\$1.9	41.4	\$5	\$1.9
	2011	281	65	\$21.1	0.04%	\$11	\$8.7	181.5	\$23	\$8.6
	2012	382	127	\$29.0	0.06%	\$16	\$12.5	248.5	\$31	\$12.4
	2013	361	174	\$27.7	0.05%	\$17	\$12.5	237.1	\$30	\$12.6
	2014	305	205	\$23.6	0.04%	\$16	\$11.3	203	\$26	\$11.4
	2015	322	234	\$26.0	0.05%	\$18	\$12.3	208.3	\$27	\$12.4
	2020	276	316	\$25.4	0.04%	\$21	\$13.0	146.9	\$21	\$11.5
	2025	241	329	\$25.7	0.03%	\$24	\$13.6	99.9	\$15	\$10.1
	2030	222	317	\$27.3	0.03%	\$29	\$14.7	72.8	\$11	\$9.6
	2034	213	299	\$28.9	0.03%	\$35	\$15.7	59.6	\$10	\$9.7
Nonlinear Development	2010	64	12	\$4.9	0.01%	\$2	\$2.4	41	\$5	\$2.0
	2011	281	65	\$20.6	0.04%	\$11	\$8.5	182	\$23	\$9.0
	2012	382	127	\$29.1	0.06%	\$16	\$12.1	249	\$32	\$12.0
	2013	361	174	\$27.9	0.05%	\$17	\$12.1	237	\$30	\$13.0
	2014	305	204	\$23.1	0.04%	\$16	\$10.9	203	\$27	\$11.0
	2015	213	214	\$17.0	0.03%	\$13	\$8.5	140	\$18	\$8.0
	2020	296	290	\$26.7	0.04%	\$22	\$13.4	163	\$23	\$13.0
	2025	339	369	\$35.2	0.05%	\$32	\$18.2	161	\$24	\$16.0
	2030	197	342	\$25.5	0.03%	\$26	\$13.4	54	\$8	\$7.0
	2034	115	272	\$19.4	0.02%	\$21	\$10.9	-2	\$0	\$0.0

- Source: Center for Applied Demography and Survey Research

The Impact of Demand Driven Nonresidential Development

In this section, the *total* potential benefits are calculated from the businesses that move to the area, not just the investment in new buildings and roadways. Although not explicitly modeled, this investment is implicitly contained in the multiplier effect. The multiplier effect also includes any resources used by businesses, so it is substantially higher than the multiplier effect in the previous section.

The relevant policy variables in the REMI model include the type and probable employment of each new business. The following general methodology will be conducted to create these input variables. First, nonresidential projects are assigned to one of nine classifications based on their building types. Businesses in the Churchman's Crossing area with the same building type are used to predict the likely employees per square foot of floor space. Each project is then scaled by the appropriate ratio to estimate the potential number of employees in each building. Finally, the employees are assigned into their probable industry sector.

The report analyzes development's upper range of potential of benefits. Though optimistic, it is not unrealistic. The NCCDLU has commitments and plans by the developers on 88.3% of the proposed square feet. Reaching a committed status requires a great deal of money, time, and effort, so the projects were not selected lightly.¹² They are the best estimates of what will be developed in the area. Of course, it is impossible to know with certainty when, or if, every project will develop. For the interested reader, the potential benefits from other future scenarios are discussed in an appendix.

¹² Larger projects require that architects design building blueprints, engineers assess the impact the building will have on the environment (and vice versa), traffic analysts forecast the load that each plan places on roadways, sewage designs are coordinated with utility companies, residents are given time to voice their concerns, and government officials must inspect and check off on a litany of compliances and regulations.

Table 5 - Employment per Square Foot of Floor Space in the Reference Set, by Business Type

Category	Reference Set	Avg. Employees per sq. ft.
Retail	Businesses in the Christiana Town Center and the anchor stores of the Christiana Mall, Concord Mall, and Prices Corner Shopping Center	0.0015382
Office Commercial (nonfinancial)	Businesses in the 273 Office Plaza and the Continental Executive Center	0.0023380
Office Commercial (financial & nonfinancial)	Businesses in the 273 Office Plaza, the Continental Executive Center and J.P. Morgan Christiana Center	0.0028252
Light Industry / Warehouse	Businesses in Harmony Industrial Park	0.0010706
Hotels	Comfort Suites and Red Roof Inn	0.0004561
Restaurants	Houlihans, Don Pablos, Bugaboo Creek, Michael's Restaurant, Cheeseburger in Paradise, Border Café, Applebees, Chilis, Bertuccis, and Famous Dave's BBQ	0.0121612
Medical Offices	Businesses in the Omega Medical Complex	0.0016484
Schools	Christiana High School, Kirk Middle School, and Smith Elementary School	0.0008676
Churches	Data not available for religious institutions	0

- Sources: Delaware Department of Labor and the Center for Applied Demography and Survey Research

The first column of Table 5 lists the nine different building classifications. The categories are: retail stores, commercial office space for nonfinancial organizations, commercial office space for financial and nonfinancial organizations, light industry/warehouse, hotels, restaurants, medical offices, schools and churches. The second column lists which companies from the area make up the reference set. The third column lists the average number of employees per square foot of floor space in the reference set.¹³

¹³ Floor area for the reference set was obtained by the New Castle County government's website. Employment information was obtained from the Delaware Department of Labor for the fourth quarter of 2008.

Employment per square foot varies considerably across building type. Restaurants generate the most employees per square foot of floor space, while hotels generate the fewest. Commercial office space was particularly sensitive to the type of business using the building.¹⁴ The employment density for commercial offices was nearly twice as large when the business was engaged in financial activities relative to other activities. Therefore, two density ratios for commercial office space were created. One ratio excludes financial activities from the reference set, and the other assumes that a third of all floor space is devoted to financial activities.¹⁵ The latter estimate is approximately 17% larger than the former.

Next, the appropriate employment ratio was multiplied by each project's proposed addition to floor space. Selecting this ratio was straightforward for some projects. For example, a project that only built retail stores could safely be assumed to create jobs in the retail sector. Some projects, such as the Market Place at Christiana, have multiple building types. The appropriate ratio for this type of project is a weighted average of the original ratios. The weights for each project are listed in the second column of Table 6.¹⁶ The third column lists the estimated employment that could be facilitated by the proposed floor plans.

¹⁴ Moreover, a blueprint of businesses in a professional office complex was not available, so the floor space of each business within a given building had to be estimated.

¹⁵ This assumption gives a conservative estimate for businesses in the financial sector.

¹⁶ Weights are based on each plan's proposed allocation of square footage.

Table 6 - Projections of Direct Business Employment

Project Name	Assumed Project Composition	Potential Employment
Islamic Society of Delaware	Church (100%)	0
Comfort Suites	Hotel (100%)	15
Centurian Plaza / Catawba Property	Retail (100%)	18
Christiana Medical Center / Faith City	School (100%)	18
Old Route 7 South	Light Industrial-Warehouse (100%)	20
Main Street Hotel	Hotel (100%)	20
Churchman Village / Metro Properties	Medical Office (100%)	28
Hotel/Restaurant Cluster	Hotel (100%)	41
Omega Professional Center Area	Medical Office (100%)	45
Holiday Inn/Hampton Inn	Restaurant (100%)	97
Harmony Industrial Park	Light Industrial-Warehouse (100%)	97
County Commerce Office Park	Office Commercial, nonfinancial (100%)	98
Christiana Corporate Center	Office Commercial, nonfinancial (100%)	101
Sallie Mae/Nationwide/Provident Mutual	Office Commercial, nonfinancial (100%)	117
Christiana Hospital	Medical Office (100%)	133
Metro Business Park / SPCA	Light Industrial-Warehouse (75%) / Office Commercial, nonfinancial (25%)	244
Christiana Town Center (273 Mall)	Retail (100%)	351
Industrial Rentals / Market Place at Christiana	Office Commercial, nonfinancial (5%) / Retail (72%) / Hotel (22%) / School (1%)	455
Christiana Mall	Retail (100%)	503
Sears Eagle Run / Christiana Promenade	Retail (100%)	687
Christiana Fashion Center	Retail (99%) / Restaurant (1%)	1,975
J.P. Morgan Christiana Center	Office Commercial, fin. & nonfin. (81%) / Retail (17%) / School (2%)	1,998
Bank of America/MBNA Christiana Center	Office Commercial, fin. & nonfan. (100%)	3,147
Total Employment		10,209

- Source: Center for Applied Demography and Survey Research

The REMI model requires that jobs generated by each project be classified by industry. For example, the employment generated by a new department store is likely associated with the retail trade sector. Unfortunately, this is not always so straightforward. Consider commercial office space and light industrial buildings. Many white collar sectors use commercial offices and many blue collar sectors use light industrial buildings. Table 7 lists the assumptions regarding industry classification and employment for the different building types.

Table 7 also lists the total expected employment that could be potentially sustained from the current projects. Most of the direct employment will either be in retail trade or financial services. However, a long tail of employment falls into other sectors as well, including restaurants, hospitals, and hotels. The stock of new jobs is assumed to accumulate gradually over time until the full potential is reached by 2034 (see Figure 3). For example, under the constant growth assumption, the REMI model assumes that half (5,104.5) of the potential jobs will be added to the economy by 2025.

Table 7 –Industry Classification for the Direct Potential Employment

Building Type	Industry	Financial Activities
Office Commercial, fin. purpose	Monetary authorities - central bank; Credit intermediation and related activities; Funds, trusts, & other financial vehicles	3716
Retail	Retail trade	3960
Hotels	Accommodation	107
Restaurants	Food services and drinking places	257
Schools	Educational services	31
Office Commercial, mult. purpose	Securities, commodity contracts, investments	1252
Office Commercial, mult. purpose	Insurance carriers and related activities	96
Office Commercial, gen. purpose	Real estate	65
Office Commercial, gen. purpose	Rental and leasing services; Lessors of nonfinancial intangible assets	65
Office Commercial, gen. purpose	Professional and technical services	65
Office Commercial, gen. purpose	Management of companies and enterprises	65
Office Commercial, gen. purpose	Administrative and support services	65
Light industry / Warehouse	Wood product manufacturing	20
Light industry / Warehouse	Computer and electronic product manufacturing	40
Light industry / Warehouse	Electrical equipment and appliance manufacturing	40
Light industry / Warehouse	Other transportation equipment manufacturing	40
Light industry / Warehouse	Furniture and related product manufacturing	40
Light industry / Warehouse	Miscellaneous manufacturing	40
Light industry / Warehouse	Warehousing and storage	40
Medical Offices	Ambulatory health care services	45
Medical Offices	Hospitals	133
Medical Offices	Nursing and residential care facilities	28
Total Employment		10,209

- Source: Center for Applied Demography and Survey Research

Table 8 summarizes REMI's forecast if development was constant during 2015 and 2034. The first column lists the total employment that could be created. In the first year of development, REMI estimates that 1,102 more jobs will be created. Over time, the number of new jobs increases by between 1,100 and 1,300 each year, so that approximately 23,500 jobs are created by 2034. REMI also predicts that population could increase as much as 19,400 by 2034.

Recall that the figures in Table 8 include any short run impact of nonresidential capital investment and road construction. REMI predicts that the construction sector will have 436 additional jobs after five years of development. This is already much higher than the “supply-driven” estimate in Table 4. Part of this difference can be attributed to the errors of implicitly modeling construction and investment spending. However, it seems more likely that the difference is due to the extra multiplier effect generated by new business activity.

REMI forecasts a substantial financial reward for developing the area. Gross domestic product (GDP) is expected to increase by \$144 million (2008 \$) in 2015, rising eventually to \$2.0 billion in 2025 and to \$4.7 billion by 2034. The latter number is a 4.8% increase from the baseline forecast. Consumption is also projected to increase; by \$42 million in 2015 and by \$662 million by 2025. Each of these figures applies to a single year and hides the overall impact of development.

The last two columns of Table 8 show the cumulative impact on GDP and consumption. REMI predicts that Delaware could see GDP rise by as much as \$42.3 billion more over 20 years, than it would without development. Similarly, total consumption could be \$13.9 billion more due to development. Of course, the cumulative impact of development is heavily influenced by the timing of development. This implies that on average, annual GDP and consumption could increase by \$2.1 billion and \$695 million respectively.

Development is assumed to be nonlinear in Table 9. In all but the final year, employment and GDP are lower under a nonlinear growth pattern than under a constant one. Similarly, population, disposable personal income, and consumption are substantially lower in the earlier phases of development than the latter. The impact of this timing assumption is most clearly seen in the cumulative effects. In the nonlinear situation, Delaware has “only” benefited by \$33.7 billion of additional GDP and \$11.0 billion of additional consumption after 20 years of development. This is approximately 20% less than what it could be achieved under constant growth.

Table 8 - Total Potential Benefits to Delaware's Economy Assuming Constant Development Growth, figures above REMI baseline

Year	Annual Impact							Cumulative Impact	
	Total Employment	Jobs in Construction	Population	GDP, mil. (2008 \$)	GDP, %Δ	Disp. Pers. Income mil. (nom. \$)	Consumption mil. (2008 \$)	GDP mil. (2008 \$)	Consumption mil. (2008 \$)
2015	1,102	62	197	\$144	0.25%	\$60	\$42	\$144	\$42
2016	2,231	147	555	\$299	0.50%	\$133	\$90	\$443	\$132
2017	3,365	243	1,051	\$460	0.75%	\$217	\$138	\$903	\$271
2018	4,499	341	1,662	\$628	1.00%	\$311	\$192	\$1,531	\$463
2019	5,628	436	2,374	\$804	1.24%	\$416	\$249	\$2,335	\$711
2020	6,753	529	3,171	\$987	1.49%	\$531	\$308	\$3,322	\$1,020
2021	7,877	616	4,042	\$1,179	1.73%	\$658	\$371	\$4,500	\$1,391
2022	9,003	699	4,976	\$1,379	1.97%	\$798	\$438	\$5,879	\$1,829
2023	10,135	777	5,966	\$1,589	2.21%	\$950	\$509	\$7,469	\$2,338
2024	11,272	851	7,005	\$1,810	2.45%	\$1,118	\$583	\$9,279	\$2,921
2025	12,422	921	8,090	\$2,042	2.69%	\$1,301	\$662	\$11,321	\$3,583
2026	13,582	989	9,216	\$2,285	2.93%	\$1,501	\$744	\$13,605	\$4,327
2027	14,758	1,053	10,382	\$2,542	3.18%	\$1,720	\$833	\$16,147	\$5,160
2028	15,948	1,115	11,582	\$2,812	3.42%	\$1,961	\$925	\$18,959	\$6,085
2029	17,155	1,174	12,814	\$3,094	3.66%	\$2,224	\$1,025	\$22,054	\$7,109
2030	18,381	1,233	14,078	\$3,393	3.90%	\$2,511	\$1,129	\$25,447	\$8,238
2031	19,624	1,289	15,368	\$3,705	4.14%	\$2,826	\$1,238	\$29,152	\$9,476
2032	20,884	1,345	16,684	\$4,034	4.38%	\$3,169	\$1,355	\$33,186	\$10,831
2033	22,166	1,400	18,024	\$4,379	4.62%	\$3,545	\$1,477	\$37,565	\$12,309
2034	23,464	1,454	19,386	\$4,741	4.86%	\$3,954	\$1,606	\$42,305	\$13,915

- Source: Center for Applied Demography and Survey Research

Table 9 - Total Potential Benefits to Delaware's Economy Assuming Nonlinear Development Growth, figures above REMI baseline

Year	Annual Impact							Cumulative Impact	
	Total Employment	Jobs in Construction	Population	GDP, mil. (2008 \$)	GDP, %Δ	Disp. Pers. Income mil. (nom. \$)	Consumption mil. (2008 \$)	GDP mil. (2008 \$)	Consumption mil. (2008 \$)
2015	505	28	91	\$67	0.11%	\$28	\$19	\$67	\$19
2016	1,061	70	262	\$142	0.24%	\$63	\$42	\$209	\$62
2017	1,661	119	509	\$227	0.37%	\$107	\$68	\$436	\$130
2018	2,307	173	828	\$322	0.51%	\$159	\$98	\$758	\$228
2019	3,000	230	1,217	\$429	0.66%	\$221	\$132	\$1,186	\$361
2020	3,744	289	1,675	\$548	0.82%	\$293	\$170	\$1,734	\$531
2021	4,546	352	2,201	\$680	1.00%	\$377	\$212	\$2,413	\$743
2022	5,410	416	2,797	\$829	1.18%	\$476	\$261	\$3,243	\$1,004
2023	6,345	484	3,462	\$995	1.38%	\$590	\$316	\$4,238	\$1,320
2024	7,354	555	4,200	\$1,181	1.60%	\$723	\$376	\$5,419	\$1,696
2025	8,449	630	5,017	\$1,389	1.83%	\$877	\$446	\$6,808	\$2,141
2026	9,632	709	5,913	\$1,621	2.08%	\$1,055	\$521	\$8,429	\$2,662
2027	10,916	793	6,896	\$1,879	2.35%	\$1,261	\$607	\$10,308	\$3,269
2028	12,309	882	7,970	\$2,169	2.64%	\$1,499	\$704	\$12,477	\$3,973
2029	13,817	977	9,140	\$2,492	2.94%	\$1,774	\$811	\$14,970	\$4,784
2030	15,456	1,079	10,414	\$2,852	3.28%	\$2,091	\$932	\$17,822	\$5,717
2031	17,230	1,187	11,798	\$3,252	3.63%	\$2,456	\$1,067	\$21,074	\$6,784
2032	19,154	1,304	13,299	\$3,699	4.01%	\$2,877	\$1,218	\$24,773	\$8,001
2033	21,242	1,429	14,927	\$4,197	4.42%	\$3,362	\$1,386	\$28,970	\$9,388
2034	23,505	1,563	16,692	\$4,749	4.86%	\$3,919	\$1,573	\$33,719	\$10,961

- Source: Center for Applied Demography and Survey Research

Effects on State and Local Tax Revenue

In this section, the impact on state and county taxes is addressed. Three taxes are estimated, the corporate income tax, the personal income tax, and the property tax. Delaware's corporate income tax rate is 8.7%, its personal income rate varies between 2.2% and 5.95%, and for the Christiana area, property owners must pay \$2.409 for every \$100 of assessment value (assessed values as of 1983), of which 63% goes to public education.¹⁷

The BEA estimated that corporate profits are approximately 10.3% of GDP in 2008.¹⁸ If Delaware is similar, the increase in corporate income tax revenue for Delaware is simply $8.7\% \times 10.3\% \times \Delta \text{GDP}$. Similarly, Delaware's marginal tax rates usually imply an average tax rate of 4.8%. Given the changes in personal income, an estimate for personal income tax revenue is $4.8\% \times \Delta \text{Personal Income}$. The estimate for property taxes is more complex.

The 2008 assessment to sales ratio for the Churchman's Marsh area is 0.2032 for businesses and 0.2629 for residences. Therefore for every \$100 of assessed value, the expected business property is worth \$492 and residence is worth \$380. Because all properties must pay \$2.409 per \$100 of assessed value, the property tax for businesses is implicitly a 0.49% tax on market value. Residential property tax is implicitly 0.63% of market value. REMI's estimates for residential and nonresidential capital are used to derive property taxes. Tables 10 and 11 report the estimated annual tax revenues for residential and nonresidential development.

¹⁷ <http://www2.nccde.org/redevelopment/Pages/Tax%20Information.aspx>
http://dedo.delaware.gov/pdfs/main_root/publications/2008-2009_Property_Tax_Report.pdf

¹⁸ Corporate profits are highly variable over time.

Table 10 - Annual Tax Revenues from Residential Development

		Delaware's Total Economy, millions of 2008 \$				Annual Tax Revenues, thousands of 2008 \$				
	Year Of Constr.	GDP	Personal Income	Residential Capital Stock	Nonresidential Capital Stock	Corporate Income	Personal Income	Property	School	Total
Churchman's Meadows	1	\$10.29	\$5.31	\$12.43	\$0.23	\$92.3	\$254.6	\$79.4	\$50.0	\$426.3
	2	\$9.87	\$5.32	\$24.27	\$0.57	\$88.4	\$255.2	\$155.7	\$98.1	\$499.4
	3	\$9.06	\$5.22	\$35.15	\$0.93	\$81.2	\$250.6	\$226.0	\$142.4	\$557.7
	4	\$8.13	\$4.92	\$44.93	\$1.27	\$72.9	\$236.0	\$289.3	\$182.3	\$598.2
Patterson Lane	1	\$1.14	\$0.58	\$1.38	\$0.02	\$10.2	\$28.0	\$8.8	\$5.5	\$47.0
	2	\$1.09	\$0.59	\$2.70	\$0.06	\$9.8	\$28.6	\$17.3	\$10.9	\$55.6
	3	\$1.00	\$0.55	\$3.90	\$0.11	\$8.9	\$26.2	\$25.1	\$15.8	\$60.2
	4	\$0.89	\$0.51	\$4.98	\$0.15	\$7.9	\$24.5	\$32.1	\$20.2	\$64.5
Traditions at Christiana	1	\$6.00	\$3.07	\$7.25	\$0.13	\$53.7	\$147.4	\$46.3	\$29.2	\$247.5
	2	\$5.74	\$3.07	\$14.13	\$0.33	\$51.5	\$147.4	\$90.6	\$57.1	\$289.5
	3	\$5.28	\$3.01	\$20.46	\$0.55	\$47.3	\$144.5	\$131.5	\$82.9	\$323.4
	4	\$4.73	\$2.82	\$26.16	\$0.74	\$42.4	\$135.2	\$168.4	\$106.1	\$346.1
Hudson Village	1	\$6.98	\$3.57	\$8.43	\$0.16	\$62.6	\$171.3	\$53.9	\$34.0	\$287.7
	2	\$6.69	\$3.59	\$16.44	\$0.39	\$59.9	\$172.5	\$105.5	\$66.5	\$337.9
	3	\$6.13	\$3.53	\$23.82	\$0.63	\$54.9	\$169.6	\$153.2	\$96.5	\$377.7
	4	\$5.51	\$3.30	\$30.45	\$0.86	\$49.4	\$158.5	\$196.0	\$123.5	\$403.9
Avg. Annual Impact per Project		\$5.53	\$3.06	\$17.30	\$0.45	\$49.6	\$146.9	\$111.2	\$70.1	\$307.7

- Source: Center for Applied Demography and Survey Research

Table 11 - Annual Tax Revenues from Nonresidential Development Assuming Constant Growth

Year	Delaware's Total Economy, millions of 2008 \$				Annual Tax Revenues, millions of 2008 \$					
	GDP, mil.	Personal Income	Residential Capital	Nonresidential Capital	Corporate Profit	Personal Income	Property	School Tax Rev.	Total Tax Rev.	Cum. Total Tax Rev.
2015	\$144	\$59	\$4	\$6	\$1.29	\$2.86	\$0.05	\$0.03	\$4.20	\$4.2
2016	\$299	\$124	\$12	\$19	\$2.68	\$5.94	\$0.17	\$0.11	\$8.79	\$13.0
2017	\$460	\$194	\$27	\$44	\$4.12	\$9.32	\$0.38	\$0.24	\$13.83	\$26.8
2018	\$628	\$270	\$47	\$76	\$5.62	\$12.94	\$0.67	\$0.42	\$19.23	\$46.1
2019	\$804	\$347	\$74	\$119	\$7.20	\$16.67	\$1.05	\$0.66	\$24.92	\$71.0
2020	\$987	\$430	\$107	\$170	\$8.84	\$20.63	\$1.51	\$0.95	\$30.98	\$102.0
2021	\$1,179	\$516	\$146	\$229	\$10.56	\$24.77	\$2.05	\$1.29	\$37.37	\$139.3
2022	\$1,379	\$606	\$189	\$297	\$12.36	\$29.08	\$2.66	\$1.67	\$44.09	\$183.4
2023	\$1,589	\$699	\$238	\$373	\$14.24	\$33.56	\$3.33	\$2.10	\$51.14	\$234.6
2024	\$1,810	\$798	\$291	\$454	\$16.22	\$38.28	\$4.07	\$2.56	\$58.57	\$293.1
2025	\$2,042	\$901	\$350	\$541	\$18.30	\$43.24	\$4.86	\$3.06	\$66.40	\$359.5
2026	\$2,285	\$1,008	\$412	\$635	\$20.47	\$48.37	\$5.71	\$3.60	\$74.55	\$434.1
2027	\$2,542	\$1,121	\$478	\$733	\$22.78	\$53.79	\$6.62	\$4.17	\$83.18	\$517.3
2028	\$2,812	\$1,239	\$548	\$836	\$25.19	\$59.50	\$7.56	\$4.76	\$92.25	\$609.5
2029	\$3,094	\$1,363	\$622	\$943	\$27.73	\$65.44	\$8.55	\$5.39	\$101.72	\$711.3
2030	\$3,393	\$1,493	\$698	\$1,054	\$30.41	\$71.67	\$9.58	\$6.03	\$111.66	\$822.9
2031	\$3,705	\$1,629	\$779	\$1,168	\$33.20	\$78.20	\$10.65	\$6.71	\$122.06	\$945.0
2032	\$4,034	\$1,772	\$863	\$1,284	\$36.15	\$85.08	\$11.75	\$7.40	\$132.98	\$1,077.9
2033	\$4,379	\$1,923	\$951	\$1,405	\$39.24	\$92.30	\$12.90	\$8.12	\$144.44	\$1,222.4
2034	\$4,741	\$2,081	\$1,040	\$1,526	\$42.48	\$99.88	\$14.06	\$8.85	\$156.42	\$1,378.8

- Source: Center for Applied Demography and Survey Research

Table 12 - Annual Tax Revenues from Nonresidential Development Assuming Nonlinear Growth

Year	<i>Delaware's Total Economy, millions of 2008 \$</i>				<i>Annual Tax Revenues, millions of 2008 \$</i>					
	GDP, mil.	Personal Income	Residential Capital	Nonresidential Capital	Corporate Profit	Personal Income	Property	School Tax Rev.	Total Tax Rev.	Cum. Total Tax Rev.
2015	\$67	\$27	\$1	\$2	\$0.60	\$1.28	\$0.02	\$0.01	\$1.9	\$1.9
2016	\$142	\$59	\$6	\$10	\$1.27	\$2.86	\$0.09	\$0.05	\$4.2	\$6.1
2017	\$227	\$96	\$12	\$21	\$2.03	\$4.60	\$0.18	\$0.11	\$6.8	\$12.9
2018	\$322	\$137	\$23	\$38	\$2.88	\$6.58	\$0.33	\$0.21	\$9.8	\$22.7
2019	\$429	\$185	\$38	\$59	\$3.84	\$8.86	\$0.53	\$0.33	\$13.2	\$36.0
2020	\$548	\$237	\$56	\$87	\$4.91	\$11.36	\$0.78	\$0.49	\$17.1	\$53.0
2021	\$680	\$296	\$78	\$123	\$6.09	\$14.22	\$1.09	\$0.69	\$21.4	\$74.4
2022	\$829	\$362	\$103	\$163	\$7.43	\$17.37	\$1.45	\$0.91	\$26.2	\$100.7
2023	\$995	\$435	\$134	\$210	\$8.92	\$20.86	\$1.87	\$1.18	\$31.7	\$132.3
2024	\$1,181	\$516	\$169	\$263	\$10.58	\$24.77	\$2.36	\$1.48	\$37.7	\$170.0
2025	\$1,389	\$607	\$209	\$324	\$12.45	\$29.14	\$2.91	\$1.83	\$44.5	\$214.5
2026	\$1,621	\$709	\$255	\$392	\$14.52	\$34.03	\$3.53	\$2.23	\$52.1	\$266.6
2027	\$1,879	\$822	\$306	\$467	\$16.84	\$39.45	\$4.23	\$2.66	\$60.5	\$327.1
2028	\$2,169	\$947	\$362	\$551	\$19.44	\$45.45	\$4.99	\$3.14	\$69.9	\$397.0
2029	\$2,492	\$1,087	\$425	\$643	\$22.33	\$52.15	\$5.84	\$3.68	\$80.3	\$477.3
2030	\$2,852	\$1,242	\$495	\$744	\$25.55	\$59.61	\$6.78	\$4.27	\$91.9	\$569.3
2031	\$3,252	\$1,416	\$573	\$853	\$29.14	\$67.95	\$7.81	\$4.92	\$104.9	\$674.2
2032	\$3,699	\$1,607	\$658	\$974	\$33.15	\$77.15	\$8.93	\$5.63	\$119.2	\$793.4
2033	\$4,197	\$1,821	\$751	\$1,104	\$37.61	\$87.41	\$10.16	\$6.40	\$135.2	\$928.6
2034	\$4,749	\$2,058	\$855	\$1,244	\$42.56	\$98.77	\$11.50	\$7.24	\$152.8	\$1,081.4

- Source: Center for Applied Demography and Survey Research

The tax revenues stemming from the four residential projects will be substantially low relative to the total effect. The construction and investment spending creates most of the gains to personal income and corporate profit tax revenues. After construction is complete, only the property tax would remain. The long term tax receipts for residential projects are estimated to be \$686,000 each year.¹⁹

In Tables 11 and 12, tax revenues are estimated for constant growth and nonlinear growth, respectively. The best case scenario occurs with constant growth. In this case, Delaware tax revenues are \$4.2 million higher in 2015. They continue to rise each year with development, eventually reaching \$156 million by the end of the forecast. After 20 years of development, Delaware's schools and local government could receive nearly \$1.4 billion in revenue. In the worst case scenario, the first year's tax revenue is only \$1.9 million. By the time development peaks, tax revenues are forecasted to be \$44.5 million a year. By the end of the time frame, Delaware would receive \$1.1 billion in revenues. Schools could receive up to \$9 million a year, but this would not occur until the end of the forecast.

REMI consistently predicts that the personal income tax generates between 60 and 65% of tax revenue from the nonresidential investment. Of course, these estimates are based on current tax laws and economic conditions, which could change over time. In addition, the corporate profit tax receipts have been highly variable in the past and may change substantially in the future.

¹⁹ Property tax revenues at the end of the construction period are \$289,300+\$32,100+\$168,400+\$196,000 = \$685,800. Presumably the assessed values will reflect their market value.

Summary and Conclusions

In summary, this report utilized REMI PI+, a regional economic forecasting software, to predict the outcome of developing the Churchman's Crossing area. The potential benefits are substantial, but sensitive to future demand. In this regard, it should be noted that all serious projects on file at the Department of Land Use were included in these results. In this sense, the benefits reflected in this paper represent the upper possibilities of development. For illustrations of less optimistic scenarios, the interested reader may refer to the appendix.

In the best case scenario, direct employment is expected to increase by 10,200 workers by 2034, resulting in 13,250 more workers through the multiplier effect. This large multiplier effect includes any short run investment spending on buildings and roadways. In this future scenario, development attracts 19,400 additional people to the state, and GDP eventually rises by \$4.7 billion each year. The 20 year cumulative impact on GDP and consumption could be \$42.3 billion and \$13.9 billion respectively. In addition, state and local taxes increase every year from development, resulting in an additional \$1.4 billion over 20 years.

The results summarized above are long run effects that do not explicitly model short run construction spending. For example, DELDOT's \$170 million proposal is forecasted to generate 380 jobs and raise GDP \$29 million by 2012. In turn, this would create \$367,000 in personal income tax and \$109,000 in the corporate profit tax for the state that year. However, construction spending is relatively small compared to the total potential investment. The major economic benefits of infrastructure investment come from accommodating private development.

The four residential projects also generate economic benefits, though on a much smaller scale than the nonresidential projects. On average, each project generates 67 jobs each year it is under development. Similarly, state GDP rises by \$5.5 million and consumption rises by \$2.2 million on average each year. Nearly 60% of the economic benefits from residential investment will be in construction.

The following limitations should be considered while reviewing this report. First, this report focuses on specific economic indicators as the benefits of development. There are many other consequences of development, both benefits and costs. Policy makers should consider all factors when making their decision. Second, the projections in this report are imprecise given the extreme uncertainty inherent to any long term forecasts. Third, the analysis assumes development comes from an exogenous shock to demand. If the demand was internally created, the forecast could be different. Finally, if certain projects never materialize, the actual benefits will never realize their potential. The appendix contains a more thorough discussion of this limitation.

Appendix

The analysis contained in the report assumes that all of the projects are developed as planned. Therefore, the analysis provides the *potential* benefits of development. This section explores alternative forecasts if the largest projects are not developed as planned.

Both J.P. Morgan and Bank of America have plans to significantly expand their regional offices in Churchman's Crossing. Given the size of these projects and the average income of their employees, these projects greatly affect the estimates contained the report. However, the future of the financial sector is perhaps more uncertain than other sectors. If the projects do not develop as they are intended, the potential benefits reported in the main report are not realistic even as an upper limit.

To understand the sensitivity of the main results, the forecasts for multiple future outcomes are analyzed. In the first outcome (A), no development activity occurs for the two projects. The second outcome (B) assumes that the two projects develop, but are instead used as general commercial office space and medical offices. The third outcome (C), the proposals go through as originally intended.

Tables A.1 and A.2 show the amount (A.1) and type (A.2) of employment that is directly facilitated by nonresidential development in each outcome. Outcome A is the worst case scenario, facilitating a potential 5,064 jobs, most of which will be in the retail sector. In Outcome B, the projects would directly facilitate 8,590. More jobs remain in retail than in any other sector, though the three healthcare sectors collectively have 2,042 new jobs. Outcome C comes from the main report. Development facilitates 10,209 jobs mainly in the retail and financial sectors.

Table A.1 - Projections of Direct Business Employment, multiple outcomes

Project Name	Assumed Project Composition	Potential Employment
Islamic Society of Delaware	Church (100%)	0
Comfort Suites	Hotel (100%)	15
Centurian Plaza / Catawba Property	Retail (100%)	18
Christiana Medical Center / Faith City	School (100%)	18
Old Route 7 South	Light Industrial-Warehouse (100%)	20
Main Street Hotel	Hotel (100%)	20
Churchman Village / Metro Properties	Medical Office (100%)	28
Hotel/Restaurant Cluster	Hotel (100%)	41
Omega Professional Center Area	Medical Office (100%)	45
Holiday Inn/Hampton Inn	Restaurant (100%)	97
Harmony Industrial Park	Light Industrial-Warehouse (100%)	97
County Commerce Office Park	Office Commercial, nonfinancial (100%)	98
Christiana Corporate Center	Office Commercial, nonfinancial (100%)	101
Sallie Mae/Nationwide/Provident Mutual	Office Commercial, nonfinancial (100%)	117
Christiana Hospital	Medical Office (100%)	133
Metro Business Park / SPCA	Light Industrial-Warehouse (75%) / Office Commercial, nonfinancial (25%)	244
Christiana Town Center (273 Mall)	Retail (100%)	351
Industrial Rentals / Market Place at Christiana	Office Commercial, nonfinancial (5%) / Retail (72%) / Hotel (22%) / School (1%)	455
Christiana Mall	Retail (100%)	503
Sears Eagle Run / Christiana Promenade	Retail (100%)	687
Christiana Fashion Center	Retail (99%) / Restaurant (1%)	1,975
Outcome A: Total, w/o two major projects		5,064

J.P. Morgan Christiana Center	Office Commercial, nonfinancial (81%) / Retail (17%) / School (2%)	1,690
Bank of America/MBNA Christiana Center	Medical Offices (100%)	1,836
Outcome B: Total, with medical/nonfinancial use		8,590

J.P. Morgan Christiana Center	Office Commercial, fin. & nonfin. (81%) / Retail (17%) / School (2%)	1,998
Bank of America/MBNA Christiana Center	Office Commercial, fin. & nonfan. (100%)	3,147
Outcome C: Total, with financial sector use		10,209

- Source: Center for Applied Demography and Survey Research

Table A.2 –Industry Classification for the Direct Potential Employment, multiple outcomes

Building Type	Industry	Outcome A	Outcome B	Outcome C
Office Commercial, fin. purpose	Monetary authorities - central bank; Credit intermediation and related activities; Funds, trusts, & other financial vehicles	0	0	3716
Retail	Retail trade	3762	3960	3960
Hotels	Accommodation	107	107	107
Restaurants	Food services and drinking places	257	257	257
Schools	Educational services	18	31	31
Office Commercial, mult. purpose	Securities, commodity contracts, investments	65	276	1252
Office Commercial, mult. purpose	Insurance carriers and related activities	65	276	96
Office Commercial, gen. purpose	Real estate	65	276	65
Office Commercial, gen. purpose	Rental and leasing services; Lessors of nonfinancial intangible assets	65	276	65
Office Commercial, gen. purpose	Professional and technical services	65	276	65
Office Commercial, gen. purpose	Management of companies and enterprises	65	276	65
Office Commercial, gen. purpose	Administrative and support services	65	276	65
Light industry / Warehouse	Wood product manufacturing	20	20	20
Light industry / Warehouse	Computer and electronic product manufacturing	40	40	40
Light industry / Warehouse	Electrical equipment and appliance manufacturing	40	40	40
Light industry / Warehouse	Other transportation equipment manufacturing	40	40	40
Light industry / Warehouse	Furniture and related product manufacturing	40	40	40
Light industry / Warehouse	Miscellaneous manufacturing	40	40	40
Light industry / Warehouse	Warehousing and storage	40	40	40
Medical Offices	Ambulatory health care services	45	385	45
Medical Offices	Hospitals	133	1288	133
Medical Offices	Nursing and residential care facilities	28	369	28
Total		5,064	8,590	10,209

- Source: Center for Applied Demography and Survey Research

Tables A.3 and A.4 report the potential benefits of outcome A assuming constant and nonlinear development growth respectively. The number of jobs that could be potentially reached is now approximately 8,900. This is substantially lower than the reports forecast of 23,400 jobs. In addition, the increase in GDP is only expected to reach \$1.3 billion by 2034. The total cumulative impact on consumption is expected to be nearly \$10 billion less than the outcome C. Depending on the particular measure, outcome A's potential benefits are approximately 30% to 50% of outcome C's potential benefits.

Tables A.5 and A.6 report the potential benefits of outcome B. Recall that in this scenario, the two development projects are used for general commercial office and medical purposes. In this outcome, nearly 15,200 jobs are created as a result of development. GDP eventually reaches \$2.3 billion by 2034, increasing the state's cumulative addition to GDP by \$20.7 billion over 20 years. In general, overall benefits are between 50% and 66% of outcome C's potential benefits.

The importance of the financial sector can also be viewed by analyzing the size of the multiplier effect. If the two projects develop as expected, 10,209 direct jobs are facilitated by the projects, but 23,464 jobs are actually created. Thus, each potential direct job creates 1.3 indirect jobs. In both outcomes A and B, 0.76 indirect jobs are created. The difference between the multiplier effects reveals that business type is almost as important as the number of new jobs.

Table A.3 - Total Potential Benefits to Delaware's Economy Assuming Constant Development Growth, figures above REMI baseline: Outcome A

Year	Annual Impact							Cumulative Impact	
	Total Employment	Jobs in Construction	Population	GDP, mil. (2008 \$)	GDP, %Δ	Disp. Pers. Income mil. (nom. \$)	Consumption mil. (2008 \$)	GDP mil. (2008 \$)	Consumption mil. (2008 \$)
2015	418	30	69	\$39	0.07%	\$16	\$11	\$39	\$11
2016	856	75	196	\$80	0.14%	\$37	\$24	\$119	\$35
2017	1,302	124	373	\$125	0.21%	\$62	\$39	\$244	\$74
2018	1,748	175	592	\$172	0.28%	\$90	\$55	\$416	\$129
2019	2,193	226	848	\$222	0.35%	\$121	\$70	\$639	\$199
2020	2,634	274	1,135	\$273	0.41%	\$156	\$87	\$912	\$287
2021	3,074	319	1,447	\$327	0.48%	\$194	\$106	\$1,238	\$392
2022	3,512	362	1,781	\$384	0.55%	\$235	\$125	\$1,622	\$517
2023	3,950	402	2,134	\$442	0.62%	\$280	\$146	\$2,064	\$663
2024	4,388	440	2,503	\$504	0.69%	\$329	\$168	\$2,568	\$830
2025	4,827	475	2,887	\$569	0.76%	\$383	\$191	\$3,137	\$1,021
2026	5,268	507	3,283	\$639	0.83%	\$442	\$215	\$3,776	\$1,236
2027	5,711	538	3,691	\$711	0.90%	\$506	\$240	\$4,487	\$1,476
2028	6,157	566	4,109	\$789	0.97%	\$576	\$267	\$5,276	\$1,743
2029	6,605	593	4,536	\$869	1.04%	\$653	\$295	\$6,145	\$2,038
2030	7,057	618	4,971	\$955	1.11%	\$736	\$325	\$7,101	\$2,364
2031	7,512	641	5,412	\$1,045	1.18%	\$827	\$357	\$8,146	\$2,721
2032	7,969	662	5,859	\$1,141	1.25%	\$925	\$390	\$9,287	\$3,110
2033	8,430	682	6,311	\$1,241	1.32%	\$1,033	\$425	\$10,528	\$3,535
2034	8,893	701	6,766	\$1,346	1.39%	\$1,150	\$461	\$11,874	\$3,996

- Source: Center for Applied Demography and Survey Research

Table A.4 - Total Potential Benefits to Delaware's Economy Assuming Nonlinear Development Growth, figures above REMI baseline: Outcome A

Year	Annual Impact							Cumulative Impact	
	Total Employment	Jobs in Construction	Population	GDP, mil. (2008 \$)	GDP, %Δ	Disp. Pers. Income mil. (nom. \$)	Consumption mil. (2008 \$)	GDP mil. (2008 \$)	Consumption mil. (2008 \$)
2015	191	14	32	\$17	0.03%	\$7	\$5	\$17	\$5
2016	407	35	92	\$39	0.06%	\$18	\$12	\$56	\$17
2017	642	61	181	\$62	0.10%	\$30	\$19	\$118	\$36
2018	896	89	295	\$89	0.14%	\$46	\$28	\$206	\$64
2019	1,168	118	435	\$118	0.18%	\$64	\$38	\$324	\$102
2020	1,460	150	599	\$152	0.23%	\$86	\$49	\$476	\$151
2021	1,773	182	788	\$188	0.28%	\$111	\$61	\$664	\$211
2022	2,109	215	1,001	\$231	0.33%	\$140	\$75	\$895	\$287
2023	2,472	250	1,239	\$277	0.39%	\$174	\$91	\$1,172	\$378
2024	2,862	286	1,501	\$329	0.45%	\$213	\$108	\$1,501	\$486
2025	3,283	324	1,791	\$388	0.52%	\$258	\$127	\$1,889	\$613
2026	3,737	363	2,108	\$454	0.59%	\$310	\$149	\$2,343	\$762
2027	4,227	404	2,454	\$528	0.67%	\$370	\$175	\$2,871	\$937
2028	4,756	447	2,831	\$609	0.75%	\$440	\$203	\$3,481	\$1,140
2029	5,327	492	3,240	\$702	0.84%	\$520	\$233	\$4,182	\$1,373
2030	5,944	540	3,683	\$805	0.93%	\$612	\$268	\$4,987	\$1,641
2031	6,609	590	4,162	\$920	1.04%	\$718	\$306	\$5,907	\$1,947
2032	7,327	642	4,679	\$1,049	1.15%	\$840	\$350	\$6,956	\$2,297
2033	8,101	698	5,238	\$1,192	1.27%	\$979	\$397	\$8,148	\$2,694
2034	8,935	756	5,840	\$1,352	1.40%	\$1,139	\$450	\$9,501	\$3,144

- Source: Center for Applied Demography and Survey Research

Table A.5 - Total Potential Benefits to Delaware's Economy Assuming Constant Development Growth, figures above REMI baseline: Outcome B

Year	Annual Impact							Cumulative Impact	
	Total Employment	Jobs in Construction	Population	GDP, mil. (2008 \$)	GDP, %Δ	Disp. Pers. Income mil. (nom. \$)	Consumption mil. (2008 \$)	GDP mil. (2008 \$)	Consumption mil. (2008 \$)
2015	738	43	125	\$73	0.06%	\$33	\$23	\$73	\$23
2016	1,503	105	354	\$152	0.12%	\$74	\$49	\$225	\$72
2017	2,255	173	668	\$232	0.19%	\$121	\$76	\$456	\$148
2018	3,021	243	1,057	\$317	0.26%	\$175	\$106	\$773	\$254
2019	3,780	312	1,509	\$405	0.33%	\$235	\$137	\$1,179	\$391
2020	4,534	378	2,016	\$497	0.42%	\$300	\$171	\$1,675	\$562
2021	5,285	441	2,567	\$591	0.50%	\$373	\$206	\$2,267	\$768
2022	6,032	500	3,157	\$688	0.59%	\$452	\$244	\$2,955	\$1,012
2023	6,761	554	3,776	\$789	0.69%	\$536	\$282	\$3,744	\$1,294
2024	7,511	605	4,425	\$896	0.79%	\$631	\$323	\$4,640	\$1,617
2025	8,259	653	5,100	\$1,008	0.91%	\$733	\$367	\$5,648	\$1,984
2026	9,012	698	5,797	\$1,125	1.03%	\$845	\$413	\$6,773	\$2,396
2027	9,768	741	6,515	\$1,248	1.15%	\$967	\$461	\$8,021	\$2,858
2028	10,517	780	7,249	\$1,374	1.29%	\$1,099	\$512	\$9,395	\$3,370
2029	11,285	817	7,999	\$1,509	1.44%	\$1,245	\$566	\$10,904	\$3,936
2030	12,057	852	8,763	\$1,651	1.60%	\$1,403	\$623	\$12,555	\$4,559
2031	12,841	886	9,541	\$1,799	1.77%	\$1,577	\$683	\$14,354	\$5,242
2032	13,623	917	10,328	\$1,955	1.95%	\$1,765	\$747	\$16,309	\$5,989
2033	14,415	947	11,125	\$2,117	2.15%	\$1,970	\$813	\$18,426	\$6,802
2034	15,198	975	11,927	\$2,286	2.36%	\$2,192	\$881	\$20,712	\$7,683

- Source: Center for Applied Demography and Survey Research

Table A.6 - Total Potential Benefits to Delaware's Economy Assuming Nonlinear Development Growth, figures above REMI baseline, Outcome B

Year	Annual Impact							Cumulative Impact	
	Total Employment	Jobs in Construction	Population	GDP, mil. (2008 \$)	GDP, %Δ	Disp. Pers. Income mil. (nom. \$)	Consumption mil. (2008 \$)	GDP mil. (2008 \$)	Consumption mil. (2008 \$)
2015	334	20	57	\$33	0.13%	\$15	\$11	\$33	\$11
2016	709	49	165	\$72	0.26%	\$35	\$23	\$104	\$34
2017	1,108	84	322	\$114	0.38%	\$59	\$38	\$219	\$72
2018	1,543	123	524	\$161	0.50%	\$89	\$55	\$380	\$126
2019	2,012	164	772	\$216	0.63%	\$124	\$73	\$596	\$199
2020	2,520	207	1,064	\$277	0.75%	\$166	\$95	\$873	\$294
2021	3,051	252	1,398	\$341	0.87%	\$213	\$119	\$1,214	\$413
2022	3,626	298	1,774	\$415	0.98%	\$269	\$146	\$1,629	\$558
2023	4,241	345	2,193	\$495	1.10%	\$333	\$175	\$2,125	\$733
2024	4,907	395	2,656	\$586	1.21%	\$408	\$209	\$2,711	\$942
2025	5,625	447	3,166	\$687	1.33%	\$494	\$246	\$3,398	\$1,189
2026	6,394	501	3,723	\$799	1.44%	\$593	\$289	\$4,197	\$1,477
2027	7,228	558	4,332	\$924	1.56%	\$708	\$336	\$5,121	\$1,814
2028	8,130	617	4,994	\$1,063	1.67%	\$840	\$388	\$6,184	\$2,202
2029	9,105	680	5,713	\$1,219	1.78%	\$993	\$448	\$7,403	\$2,650
2030	10,164	747	6,494	\$1,394	1.90%	\$1,170	\$515	\$8,797	\$3,165
2031	11,313	818	7,339	\$1,588	2.01%	\$1,373	\$589	\$10,385	\$3,754
2032	12,523	892	8,249	\$1,798	2.12%	\$1,603	\$670	\$12,182	\$4,424
2033	13,847	971	9,232	\$2,036	2.23%	\$1,869	\$761	\$14,218	\$5,185
2034	15,277	1,054	10,293	\$2,299	2.34%	\$2,175	\$863	\$16,518	\$6,048

- Source: Center for Applied Demography and Survey Research

Many plausible justifications could lead a reader to favor any outcome. For example, a reader may favor outcome A if he or she believed that the current economic situation will force financial companies to abandon development projects. A different reader might favor outcome C if he or she thought that Delaware's geographic position and comparatively low wages would attract businesses forced to cut costs. A third reader may look at Delaware's aging population and cluster of healthcare and white collar businesses in the area and conclude that outcome B is more likely.

Ideally, probabilities could be assigned to each outcome based on the respective merits of their justification and an expected value of future benefits could be derived. However, such probabilities are impossible to calculate (even with error), because the future is too complex to ascribe it with a probability distribution.²⁰ Ultimately, beliefs (and their continued updating) guide us through uncertainty by *implicitly* attaching higher probabilities to those outcomes we believe, for whatever reasons, are more likely to happen. Of course, any probability distribution derived from beliefs is completely subjective.

A moderate belief that imposes no preference among the three scenarios might assign equal probabilities (33%) to each. A set of relatively pessimistic beliefs might assign outcome A with a 50% probability of occurring, while giving outcomes B and C each a 25% probability. An optimistic set of beliefs might implicitly have a 25% / 25% / 50% probability distribution for outcomes A, B, and C respectively. Figures A.1 through A.4 plot the "expected" value of employment and GDP for each of these beliefs for constant and nonlinear development growth. The reader is encouraged to apply his or her own set of beliefs to the estimates contained in this report.

²⁰ At the heart of this problem is the fundamental distinction between risk and uncertainty.

Figure A.1 – Potential Employment Gains for Multiple Future Scenarios and Beliefs, Constant Development Growth

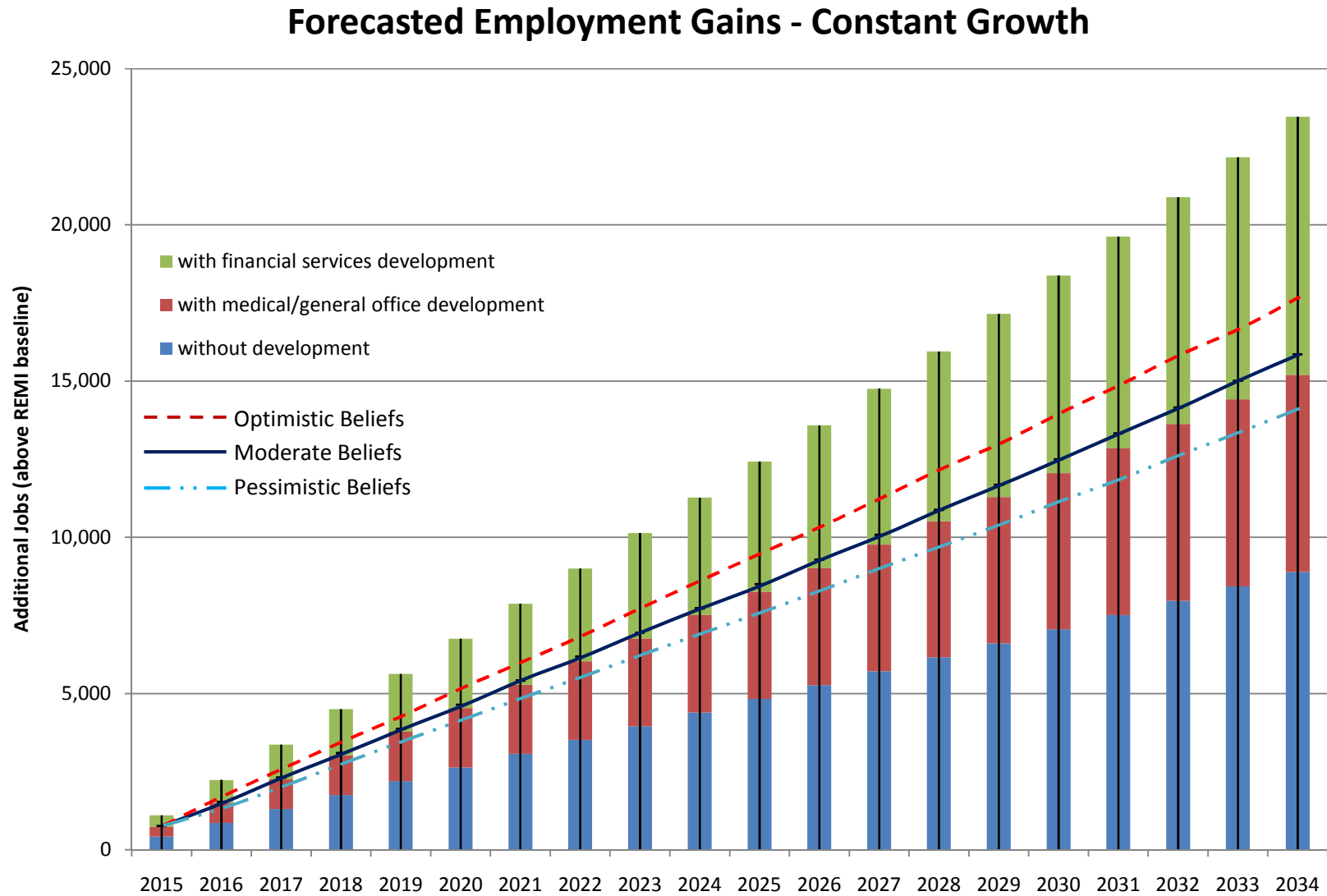


Figure A.2 – Potential Employment Gains for Multiple Future Scenarios and Beliefs, Nonlinear Development Growth

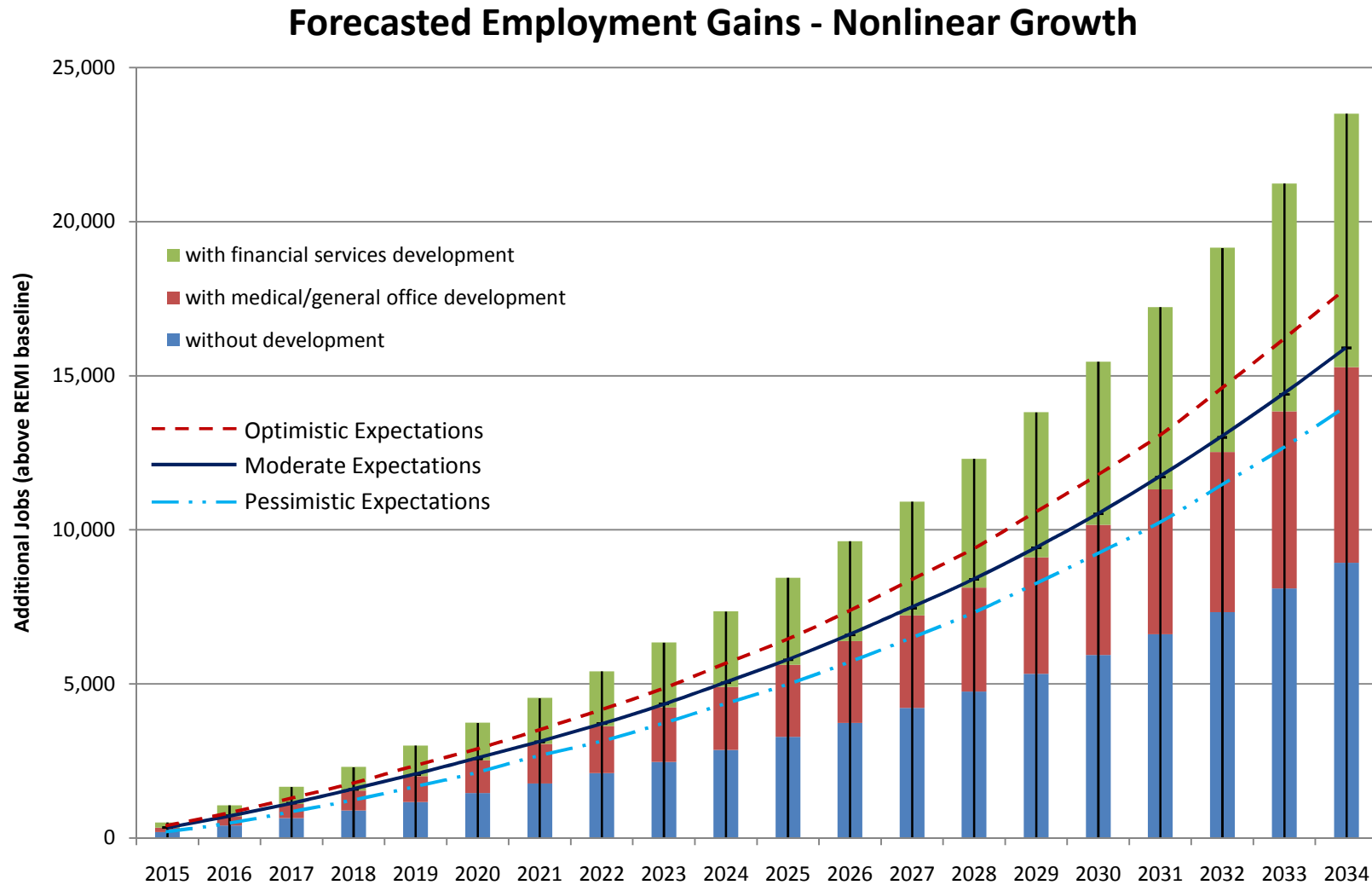


Figure A.3 – Potential GDP Gains for Multiple Future Scenarios and Beliefs, Constant Development Growth

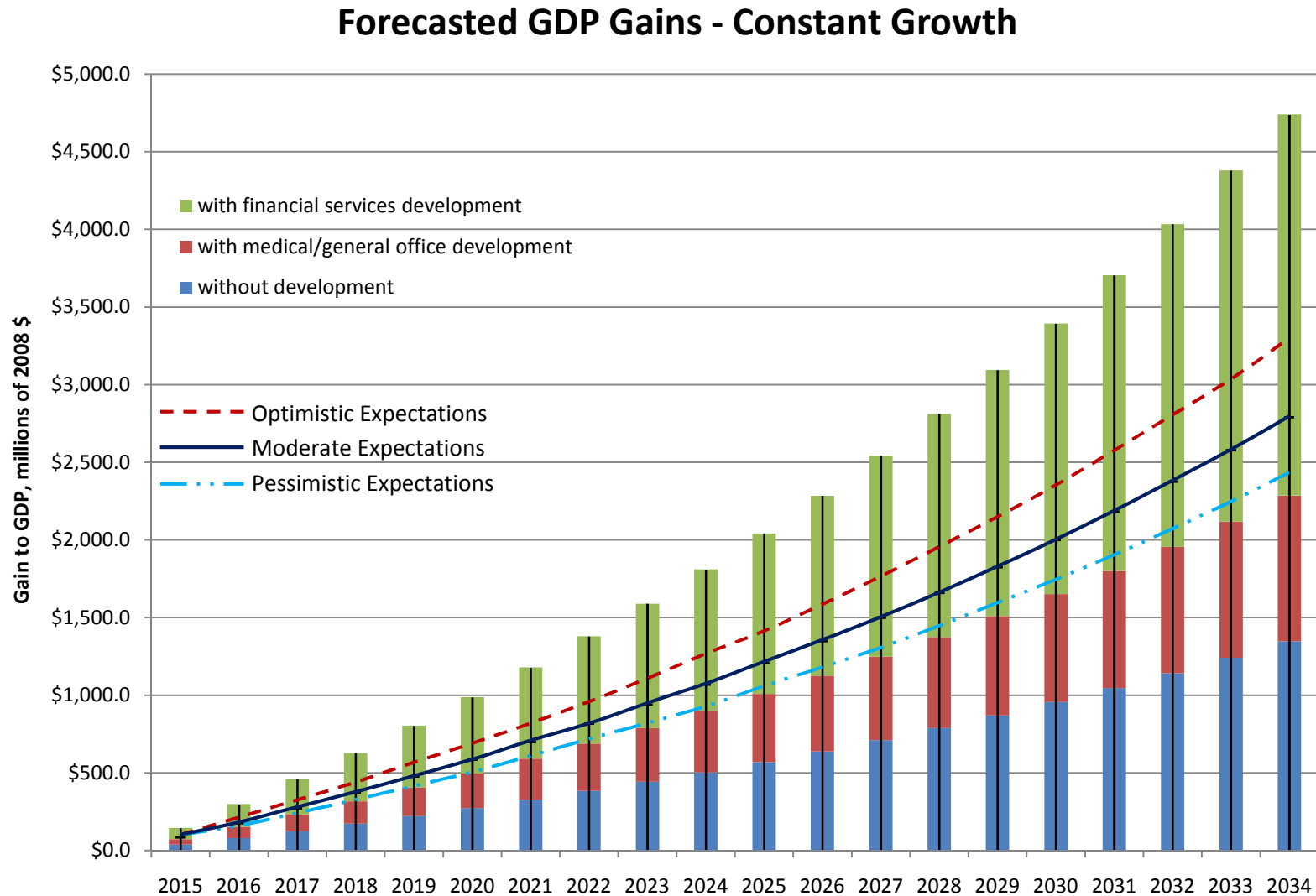


Figure A.4 – Potential GDP Gains for Multiple Future Scenarios and Beliefs, Nonlinear Development Growth

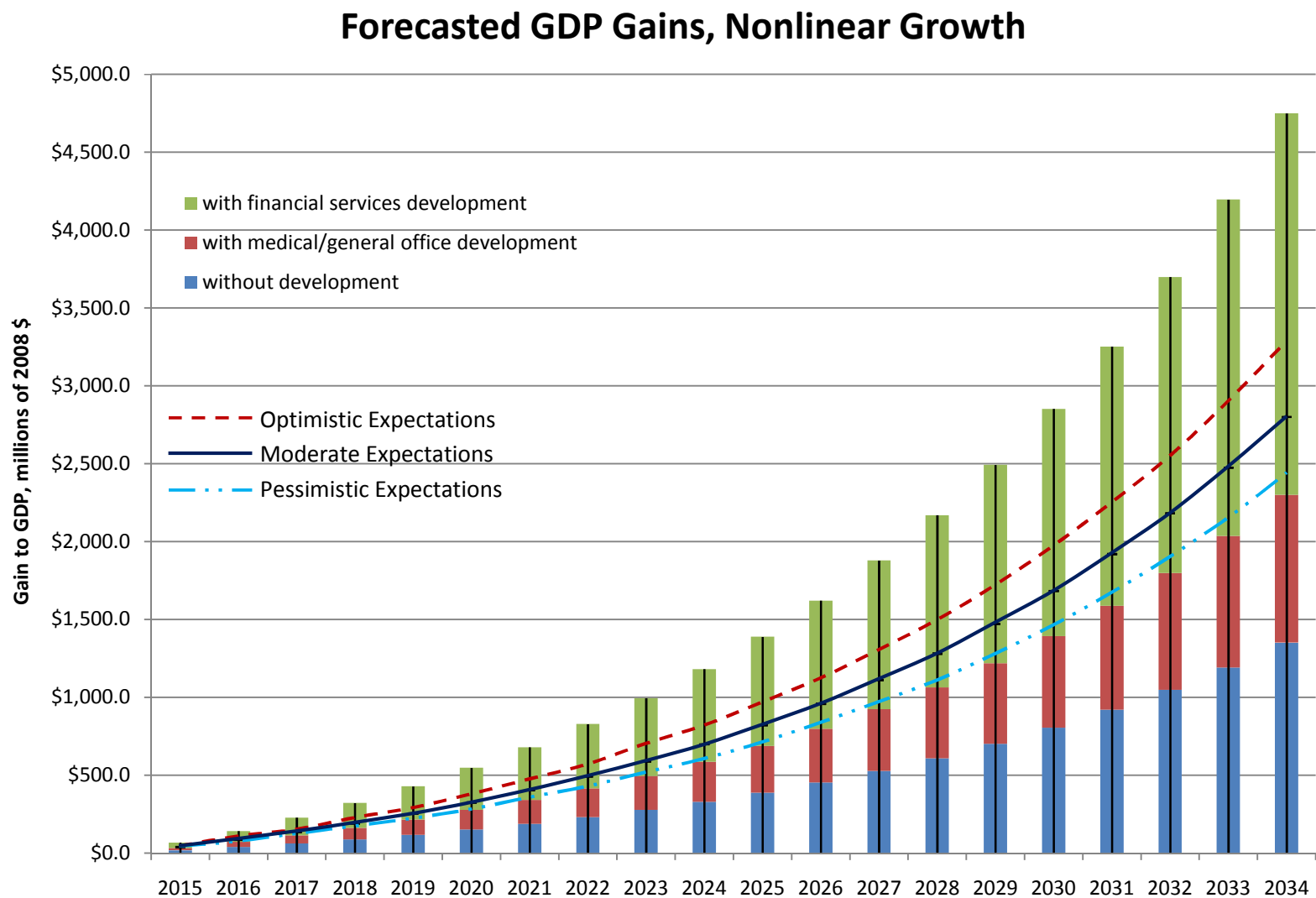


Figure A.5 – Map of Proposed Development in Churchman's Crossing

