A Risk-Based Analysis and Stress Test of General Fund Reserve Requirements for the City of Providence, Rhode Island

October 2021

Produced by:

The Government Finance Officers Association

Table of Contents

Section 1 - Executive Summary

A local government's "reserves" are the portion of fund balance which serves as a hedge against risk. The City of Providence, Rhode Island ("the City" or "Providence") has asked the questions: "what is the right amount of general fund reserves for us?" and "how resillient would any potential reserve target be to losses?" The Government Finance Officers Association (GFOA) has helped the City answer this question by examining the risks that it is subject to.

GFOA's methodology is intended to evaluate potential risks and their cost to the City's general fund. Our methodology is not intended to predict Providence's future. The GFOA Risk Model provides the option for Providence to adjust variables when future conditions change. Our model and this report also describe the assumptions behind our analysis and recommendations.

First, we identified the risks that posed the most clear and present danger to the City. The major risks are:[1]

- Hurricane
- Heavy snow
- Riverine flooding and dam inundation
- High winds
- Infectious disease
- Recessions

Next, for each risk we calculated the probability that the City would experience one of the aforementioned risks over a ten-year period and, if an event were to occur, what the magnitude of the loss would be for the City's general fund. To calculate the probability and magnitude of events, we did the following:

- **Analyzed Providence's own experience and the experiences of other municipalities.** For example, a recession would have similar impacts in other Rhode Island municipalities because the economic and legal environment would be similar (e.g., state aid would be impacted similarly).
- **Reviewed research produced by other agencies.** For instance, Aon, a global reinsurance company, provided data on hurricane frequency. The Federal Emergency Management Agency (FEMA) has data on costs that disasters have caused.
- **Drew from the expertise of City staff.** City staff work every day on preparing the City for the risks it faces. Staff provided their expertise to help us estimate risks. For example, City staff helped us understand the nuances of natural disaster risks and revenue instability risks in Providence. The City's Hazard Mitigation plan was also a valuable resource.

We modeled each risk individually and then combined each individual risk into a ten-year model of the City's reserves. The model is intended to answer the question: what amount of reserves will give the City of Providence sufficient confidence that it will be able to cover the losses from the risks GFOA has analyzed?

[1] The first four risks were taken from the City's Multi-Hazard Mitigation plan.

We combined all of the information described above to create at ten-year probabilistic model. The City's goal for this analysis was to find an amount that can give the City sufficient comfort that its reserves will cover its risks. The following pages present a series of graphics based on this model.

Exhibit 1.1 shows the chance that the City's current reserve will reach the critical threshold ($10.0 million) each year. GFOA has observed that most municipalities are comfortable with about 10% to 20% chance of reaching their critical threshold by the end of the analysis period. Providence has a higher chance than this – the percentages are in the mid-forties. It is important to note that, generally, the blue bars will always get higher the further in the future we look because more bad things can happen.

Exhibit 1.1 – Chance to Reach Critical Threshold Each Year

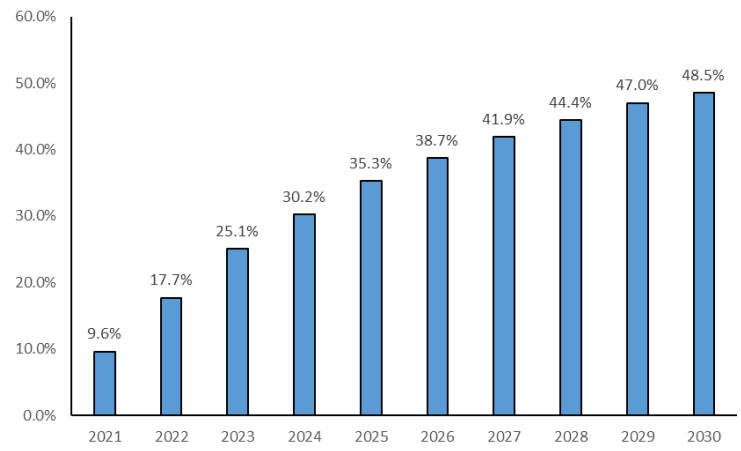
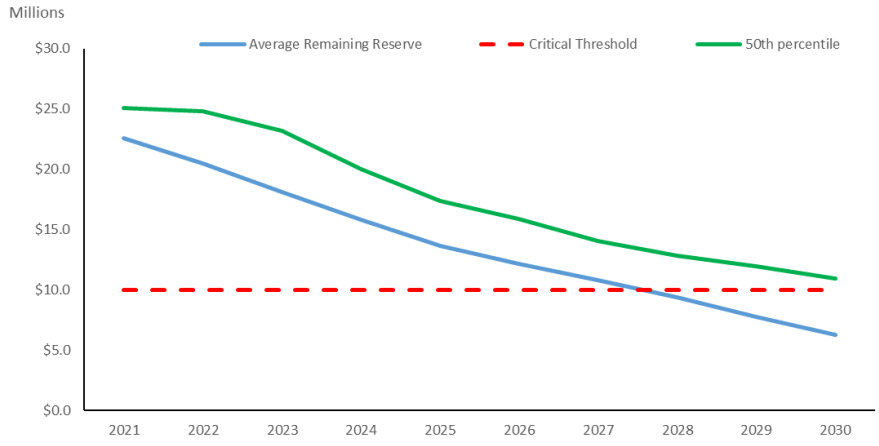


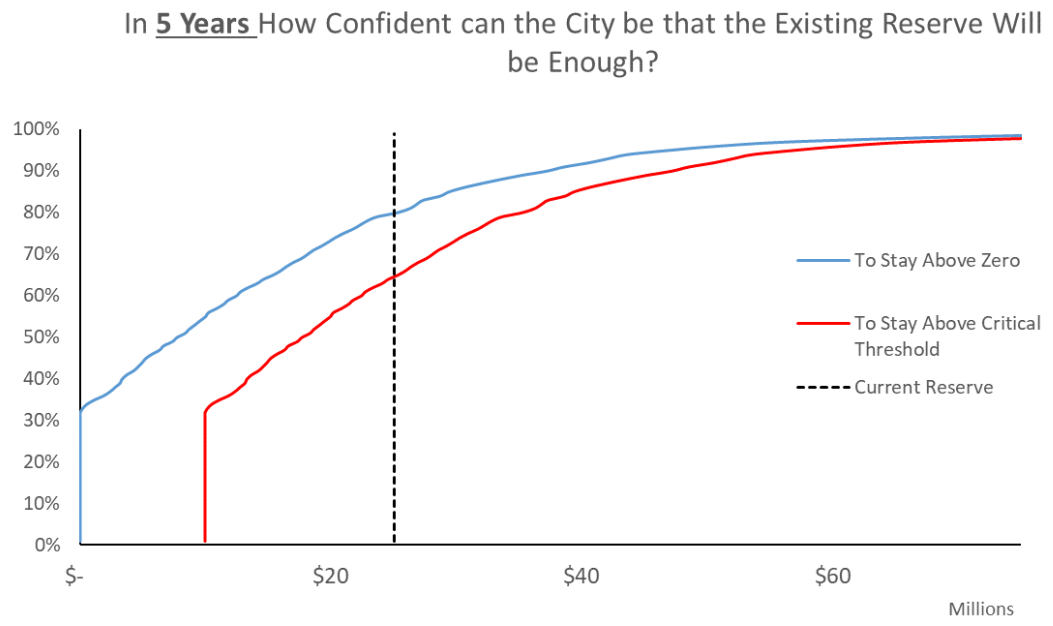
Exhibit 1.2 shows the average remaining reserve per year (blue line). We can see that the simulation shows the City's reserves are simulated to decline under "average" conditions. The chart also shows the 50th percentile (green line), which means the simulation shows reserves to be at or under the green line 50% of the time. This is another way to look at the "average". This illustrates the big impact such events can have.

Exhibit 1.2 – Simulated Remaining Reserve Per Year



Finally, Exhibit 1.3 is a cumulative probability chart. It shows the confidence available from varying levels of reserves. The horizontal axis is the amount of reserves and vertical axis is the confidence level. The chart shows that Providence's existing reserve intersects the red line about 65% confidence. The main take-away from this graphic is the reserves have a diminishing return at a certain point because the flatter the line gets, the less confidence an additional dollar of reserve "buys" you. This is because the further to the right you go on the graph, the more extreme the events are that must be covered by reserves. This graphic shows that it would the City would still get a good "bang for the buck" from higher reserves. This City would not be as well served by accumulating reserves pat the point where the line goes flat.

Exhibit 1.3 – Cumulative Probability Chart



The implication of the line going flat is that not all points on the line are equally cost effective. Let's examine Exhibit 1.3 to illustrate. First, please note that Exhibit 1.3 if a five-year outlook, so the numbers would be somewhat higher for a ten year outlook. According to the graph, to be 70% confident of staying above the critical threshold requires $28 million and 80% confident requires a reserve of $35 million, a difference of $7 million. To be 90% confident requires a reserve of $47 million, a difference of about $12 million from 80% confidence. This means that the City gets more "bang for the buck" before the curve gets flatter. The most cost-effective reserve for the risks described in this report appears to be at around 75% to 80% confidence. This translates to $31 million to $35 million if we consider a five year period and $38 million to $47 million if we consider a ten-year period.

However, City officials will need to think about other factors to order to finalize the reserve target range. This is because Exhibit 1.3 cannot account for every possible factor that should go into deciding how much Providence should keep in its reserve. The figures shown in the exhibit are what is needed to protect the City from just the risks described in this report. Usually, municipal governments have other concerns they expect their reserves to address. Here are three examples of such concerns:

- There are risks that are sometimes called "unknown unknowns." These are risks that are totally unanticipated.
- Our Risk Model is based largely on historical data, which, by definition, does not capture the potential future impacts of global climate change. Though the model has some accommodations for climate change (see discussion of floods and pandemics), it is impossible to say what the future impacts of climate change will be. This might suggest a more "risk averse" approach to reserves (i.e., maintaining more, rather than less).
- The City might wish to use reserves for purposes other than mitigating risks – for example, building a capital project using cash financing. The Risk Model gives the City the ability to estimate the cost of potential projects to see the financial impact on these reserves.[2]

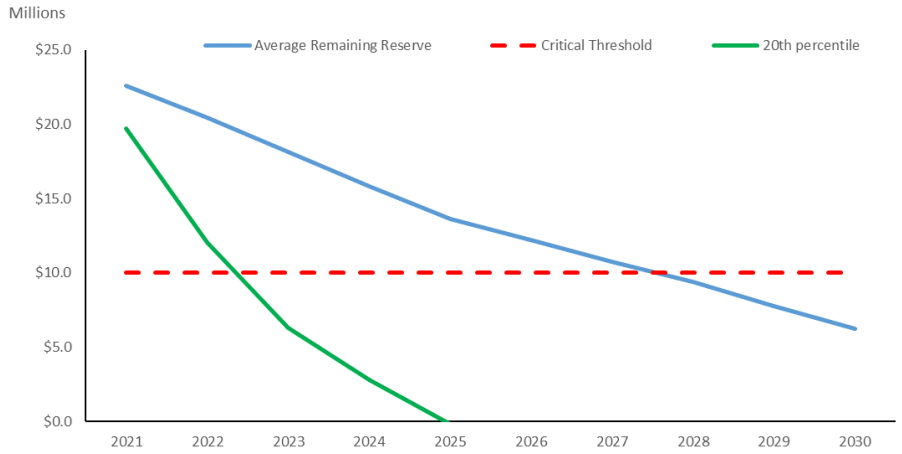
The GFOA Excel risk model allows the City to add these considerations to what we call "minimum acceptable reserves" or a "critical threshold." GFOA's discussions with the City staff suggest a critical threshold of $10.0 million is reasonable for cash flow given the City's recent experiences. This amount is shown in Exhibit 1.3 as the black dotted line. The City could choose to vary this critical threshold, which would then change the total amount of reserves the City would need to maintain in order to achieve a given degree of confidence that reserves would stay above the threshold.

Here are some other conclusions we can draw from the graphics presented on the previous pages:

- Providence's existing reserve provides a lower level of confidence than GFOA has observed most public officials are comfortable with. Most municipalities are comfortable with around 85% to 90% confidence of the reserve. That is does not mean that Providence must adopt the same attitude towards risk. Providence could have different goals and circumstances that make its officials willing to accept a lower degree of confidence.
- Our analysis of Providence's historical budget data shows that the City only has about a 50% chance of generating a budget surplus in any given year. This means that, on average, surpluses don't contribute to building the reserve. If the City could adopt budgeting practices that make it more likely to generate a surplus, this could have a considerable positive impact on its long-term risk profile. The Risk Model allows the user to change the chance or a surplus and observe the results.
- The City should remain mindful of the potential for extreme consequence events. To illustrate, Exhibit 1.4 below updates Exhibit 1.2 to change the 50th percentile to the 20th percentile (green line) to show the effect of more extreme events. The exhibit shows that 20% of the time the City reaches its critical threshold by 2026 and reserves even goes to zero by 2025. This suggests the City might consider alternatives to reserves to help manage extreme events, like insurance. We will discuss parametric insurance as one such option, later in this report.

[2] Note that the City has historically done some level of cash financing of projects. The model already accounts for "normal" spending that takes place in the City's annual budget, so this feature of the risk model would be used for larger projects that exceed what might be considered "typical."

Exhibit 1.4 – Simulated Remaining Reserve Per Year (showing 20th percentile)



- The figures we cited for the 75% to just over 80% confident range were $31 million to $35 million if we consider a five-year period and $38 million to $47 million if we consider a ten-year period. These fall short of the minimum standard established by GFOA's "Best Practice" recommended minimum (which would translate to $81 million[3]), but it does put the City in a favorable position compared its peer municipalities (the peer municipalities are examined in Section 6 of this report).
- Finally, the City can use this report and the Risk Model to find consensus on a reserve strategy all stakeholders are comfortable with. Meaning, are City officials willing to accumulate more reserves? Or, are they comfortable with current levels? This is a personal choice officials must make, but the Risk Model helps by showing the risk what different choices entail. GFOA suggests the City arrive at range of acceptable reserves and strive to keep reserves in that range. GFOA's experience with other municipalities suggests that the City's current reserve does not provide as a high degree of confidence as municipal officials often prefer.

To complement the reserve analysis, we offer the following additional recommendations:

The City should adopt a robust reserves policy. GFOA has conducted extensive research into what it takes for a local government to be financially sustainable. We call this body of work "Financial Foundations for Thriving Communities" (Financial Foundations). This research has shown that local governments require clear decision-making boundaries. A policy on the target level of reserves that the City should maintain and the acceptable use of those reserves provides clear decision-making boundaries for reserves. Furthermore, GFOA has found that a policy that identifies a floor and ceiling for reserves, rather than just a single target number, may provide more useful guidance. This is because a city government will rarely, if ever, have exactly the amount of reserves called for by its policy. Having a range defines the acceptable

[3] The "Best Practice" minimum is set at 16.7% of revenues or expenditures, but this is rule-of-thumb that does not take into account the risk profile an individual government.

tolerances the reserves should stay within. The City currently has a policy under consideration (see Appendix 1). Particularly noteworthy features include:

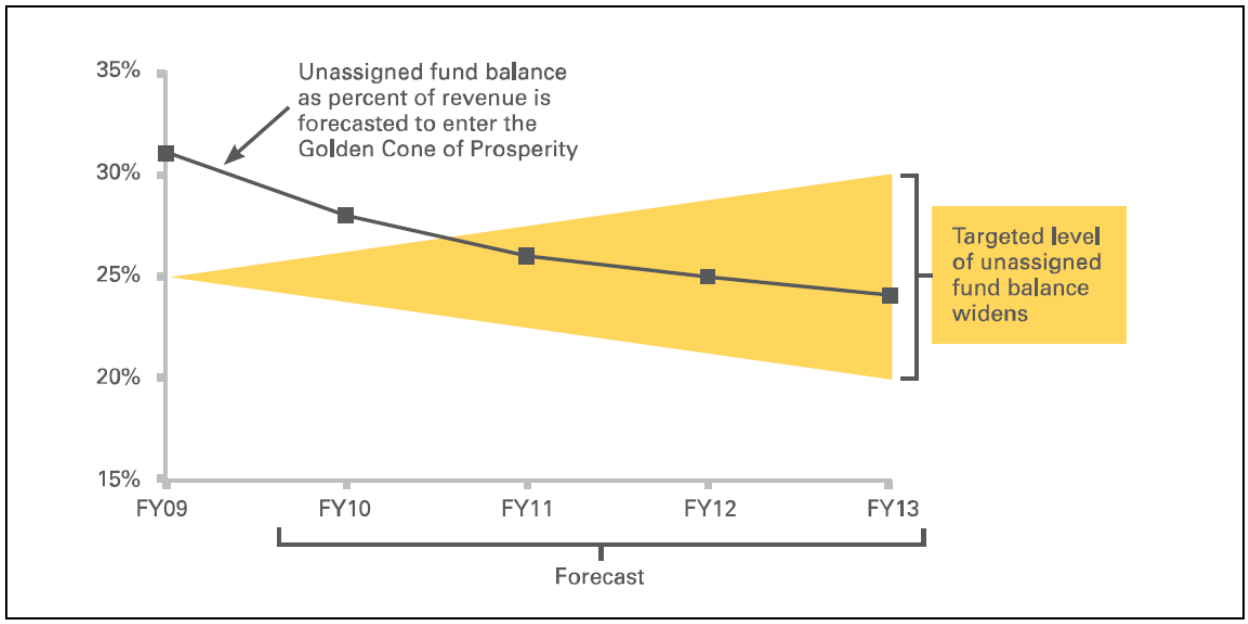
- The policy limits the use of the reserve to purposes that are sustainable over the long-term.
- The policy describes how the City's reserve will support the City's commitment to equity.
- The policy provides guidance on how the reserve will be replenished.
- The policy includes a range of acceptable reserves. We'll see why this is important in the next section.

The City should adopt a mechanism to monitor its own compliance with the policy. GFOA's Financial Foundations research suggests that boundaries (e.g., financial policies) must be monitored in order to be fully effective.

The City of Tempe, Arizona provides a good example of how a reserve policy can be monitored. Tempe's policy is to maintain the general fund reserve equal to between 20% and 30% of general fund revenues. The general fund reserve policy is combined with Tempe's five-year financial forecast, where the goal is to keep reserves within the 20% to 30% boundary during the five-year forecast period. This approach originated in 2009 when Tempe had a policy to maintain reserves equal to 25% of general fund revenues. However, Tempe had been maintaining fund balances above 30%, which was causing some to question why Tempe was not in alignment with the policy and whether Tempe had a fund balance that was too large. City Council and staff agreed to change the policy to set a goal for the reserves to be between 20% and 30% of revenues. This range would provide more discretion, but it would also create clear bounds for what Tempe would consider acceptable maximum and minimum reserves.

Tempe staff developed a presentation of Tempe's revenue forecast in the context of this new arrangement and informally called it the "Golden Cone of Prosperity." Exhibit 1.5 shows the presentation as it was in 2009, where the yellow cone representing the range of desired fund balance widens over the forecast horizon as the new policy is phased in and the black line representing actual fund balance gradually enters the cone.

Exhibit 1.5 —Tempe's Golden Cone of Prosperity in 2009



The meaning of the Golden Cone of Prosperity is straightforward, and its design and name give it a memorable character. As of 2020, Tempe staff still present the Golden Cone twice per year to help public officials to understand the big picture and to show whether Tempe is staying within agreed-upon boundaries. This is a testament to the communicative power of the Golden Cone. Providence could develop a similar presentation to help make sure the City stays within its agreed upon financial boundaries.

The City could consider a robust internal borrowing policy. There will always be some chance that Providence could find that it needs access to more financial resources than are available in its reserves. GFOA's research suggests that interfund borrowing could be a practical tool in emergency circumstances. Some other funds might be able to make short-term loans to the general fund in the case of an emergency. The City could develop policies to provide the flexibility to use these borrowing tools while also providing the necessary guidelines and limitations to ensure that borrowing occurs in a fiscally prudent manner.

Providence might consider if a policy could recognize internal borrowing's role as a supplementary risk management tool. A policy could address the following points:

- The rationale for using internal borrowing (reserves may not be able to handle every possible contingency);
- When internal borrowing may be used (if reserves are ever exhausted by an extreme event);
- Differentiate between short-term (to be paid back within the same fiscal year) and long-term borrowing;
- How the interest on the borrowing will be calculated (can have multiple alternatives to be determined on a case-by-case basis); and
- General repayment terms (interest only, fully amortized, duration, etc.).

Consider "parametric" insurance in addition to traditional indemnity insurance. Indemnity insurance is the type of insurance that most governments have traditionally purchased, where the insurance corresponds to the value of the assets being insured and reimbursement is paid out after a certain deductible has been met. The advantage of traditional indemnity insurance is that there is a known damage threshold past which the City is covered.

Parametric insurance is a newer type of insurance for providing coverage for extreme events, having increased in popularity in the last 15 years or so in the public sector but has been in use in the private sector for decades. Parametric coverage provides the policyholder (the City) with a payment amount that is defined ahead of time, should a defined event come to pass (a hurricane of a certain magnitude). Parametric insurance could be more useful for providing an injection of liquidity because the holder of the policy receives the defined payment immediately upon verification by a third-party that the given event occurred, which usually would be within a matter of days. As a simple illustration, a parametric policy might provide the City of Providence with $5 million upon the occurrence of a hurricane of some given wind speed, after speed is verified by a third-party. This feature of parametric insurance also eliminates much of the administrative hassle that would be associated with a traditional indemnity policy (e.g., working with claims adjusters). A final advantage is that the proceeds from the policy payout are completely fungible – the City could use them to fund whatever service it deems necessary or to counteract revenue loss from tax base impairment, whereas indemnity policies might require the policyholder to use the funds to repair or replace the asset that was insured. Parametric policies are not without their drawbacks, though, and are not a substitute for traditional insurance. The City can learn more about parametric policies in the publicly available GFOA research report "Parametric Insurance: An Emerging Tool for Financial Risk Management."[4]

A robust insurance strategy could make use of both traditional indemnity and parametric insurance. For example, traditional indemnity insurance could be used to protect against loss of the City's assets, while parametric insurance could be used to compensate the City for the losses in tax revenue it would experience from an impaired tax base, for instance.

The City should update its reserve policy if the school systems comes under City control. As of the time of this report it is not clear if, when, or under what terms the schools will join the City of Providence government. At the point where this happens, the City should updated its reserve policy to recognize its new risk profile that reflects the addition of the schools. Generally, the schools should lower the City's risk profile. This is because the schools don't have the same public safety responsibilities as the City government to respond to extreme events and the school may have a more stable revenue portfolio (state aid may be more stable). The GFOA risk model can be updated to reflect the changes to the City's risk profile.

GFOA's analysis has its limits. It is impossible for any risk analysis to be completely comprehensive of all considerations facing the City. Appendix 2 to this report lists the important limitations of this analysis.

[4] Available at: https://www.gfoa.org/parametric-insurance/.

Section 2 - Introduction

"Reserves" are the portion of a local government's fund balance that are available to respond to the unexpected. Reserves are the cornerstone of financial flexibility. Reserves provide a government with options to respond to emergencies and provide a buffer against shocks and other forms of risk. Managing reserves, though, can be a challenge. Foremost is the question of how much money to maintain in a general fund reserve. How much is enough and when does a reserve become too much? This can be a sensitive question because money held in reserve is money taken from constituents, and the argument could be made that excessive reserves should be returned to residents in the form of lower taxes/fees or enhanced services.

The City of Providence has been considering this question recently, given its vulnerability to economic stressors and natural disasters, such as hurricanes. The City engaged the GFOA through the Bloomberg Philanthropy's City Budgeting for Equity and Recovery (CBER) program in order to produce a recommendation to help it decide the appropriate reserve level for the general fund, given these risks. GFOA is a non-profit association of more than 20,000 state and local government finance professionals and elected officials from across North America. A key part of GFOA's mission is to promote best practices in public finance, including reserve policies.

GFOA's approach to reserves does not suppose "one-size-fits-all." Ideally, a local government's reserve strategy will be customized to the risk that the local government faces. For example, GFOA's "Best Practice" on general fund reserves recommends that general-purpose governments maintain reserves of no less than two months of regular operating revenues or regular operating expenditures (i.e., reserves equal to about 16.7 percent of revenues or expenditures), but that local governments should determine a reserve target that is most appropriate for their circumstances.[5] Therefore, GFOA worked with the City to conduct an analysis of the risks influencing the need for reserves as a hedge against uncertainty and loss.

A "risk" is defined as the probability and magnitude of a loss, disaster, or other undesirable event.[6] The GFOA's framework of risk assessment is based on the risk management cycle: identify risk; assess risk; identify risk mitigation approaches; assess expected risk reduction; and select and implement mitigation methods. Our analysis focuses primarily on risk retention, or using reserves, to manage risk. However, our analysis also encourages the City to think about how other risk management methods might alleviate the need to hold larger reserves. In other words, can the City manage its risks in some other way besides holding reserves? For example, could insurance or borrowing strategies complement the City's reserve strategy? A thorough examination of the risk factors should lead to a range of desired reserves and improve the City's understanding of its overall risk profile. A risk-aware analysis helps the City *stress test* its reserve strategy.

[5] GFOA Best Practice. "Appropriate Level of Unrestricted Fund Balance in the General Fund." GFOA. 2009.
[6] Definition of risk taken from: Douglas W. Hubbard. *The Failure of Risk Management: Why It's Broken and How to Fix It.* John Wiley and Sons, Inc. Hoboken, New Jersey. 2009.

As a first step to this project, GFOA conducted a review of the risk factors influencing the amount of reserves a municipal government should hold.[7] This review identified the risks on Exhibit 2.1 as the most salient risks to Providence's general fund reserve.

Exhibit 2.1 – Primary Risk Factors that Influence Reserve Levels for Providence
Revenue source stability, particularly as it relates to the potential for revenue decline from an economic downturn
Vulnerability to extreme events and public safety concerns, with emphasis on: • Hurricanes and coastal storms • Heavy snow • Riverine flooding and dam inundation • High winds • Pandemics / Infectious disease

The next section gives an overview of how we analyze these risks and what you can expect to see in the rest of this report.

[7] The risk factors and basic review method were developed and published in the GFOA publication: Shayne C. Kavanagh. *Financial Policies*. (Government Finance Officers Association: Chicago, IL) 2012.

Section 3 - The Approach to Uncertainty

The accomplished forecasting scientist, Spyros Makridakis, suggests a "Triple-A" approach for dealing with highly uncertain phenomena.[8]

1. **Accept.** First, we must accept that we are subject to uncertainty. For example, the severity and timing of a flood is unpredictable. Providence could go years without experiencing a serious flood or one could occur next month!
2. **Assess.** Next, we must assess the potential impact of the uncertainty, with history providing a useful reference point. The experiences of other local governments are also a good reference point. For example, we used the historical experiences of Providence and other relevant municipalities to estimate the potential impact future extreme events.
3. **Augment.** The range of uncertainty we face will almost always be greater than what we initially assess it to be. Therefore, we must augment our understanding of risk beyond what our historical experiences show us. For example, very few people saw the 2008 Great Recession coming or thought it could be as bad as it was. They were unprepared for this historically unprecedented recession. We can augment our understanding of risk using a technique called "Probability Management."[9] Probability Management is an application of modern information processing technology that allows us to simulate thousands of potential events (e.g., floods, recessions, etc.) so that we can observe the probability of events of various magnitudes coming to pass. The statistical technique that Probability Management is based on is called "Monte Carlo analysis." This technique was established in the late 1940s, but until very recently required special computers and software to use. Modern information technology has made Monte Carlo analysis accessible to anyone with a personal computer.

In order to use Probability Management, we express any given type of extreme event as a range of possibilities that the City might experience. This range is called a "distribution." A distribution is a shape that signifies how frequently the City might expect to experience a certain type of event and/or how severe the event might be.

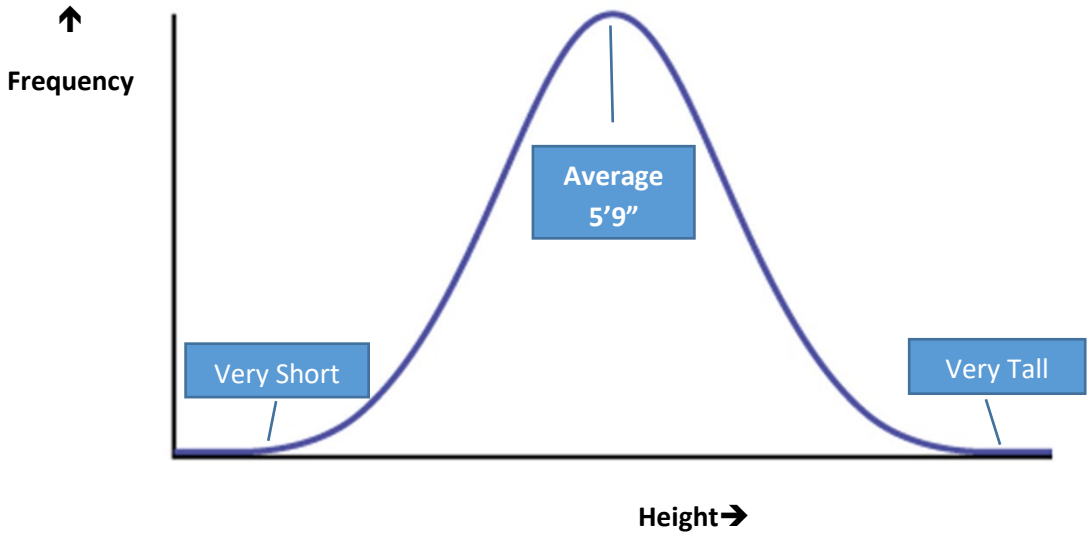
The most common type of distribution is called the "normal distribution," more popularly known as the "bell curve." Many phenomena fit a bell curve. To help us understand how to read a distribution, we can start with an example that is related to everyday life: the height of American men.

[8] See: Spyros Makridakis, Robin Hogarth, and Anil Gaba. *Dance with Chance: Making Luck Work for You*. (Oneworld Publications: Oxford, England). 2009.

[9] The discipline of "Probability Management" was developed by Dr. Sam Savage, author of *The Flaw of Averages*. You can learn more about Probability Management at probabilitymanagement.org.

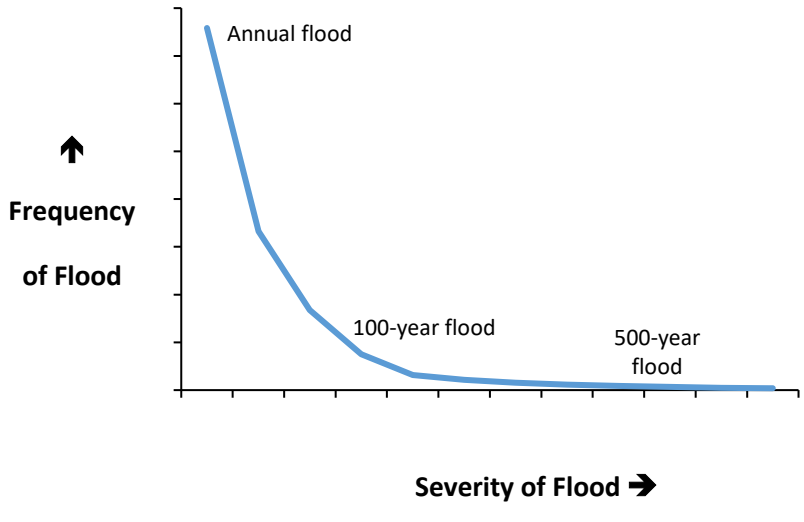
Exhibit 3.1 shows a bell curve for the height of American men. The horizontal axis of Exhibit 3.1 represents height. The vertical axis represents frequency. The most common height is 5'9", so it is shown at the top of the curve. Much taller men, like NBA centers, would be found on the right-hand side of the curve. Very short men would be found on the left.

Exhibit 3.1 – The Normal Distribution for American Men



The normal distribution can help analyze risk. To illustrate, the severity of an economic downturn is roughly normally distributed. A few downturns are slight, few are severe, but most are closer to average.

Exhibit 3.2 – Sample Asymmetrical Distribution

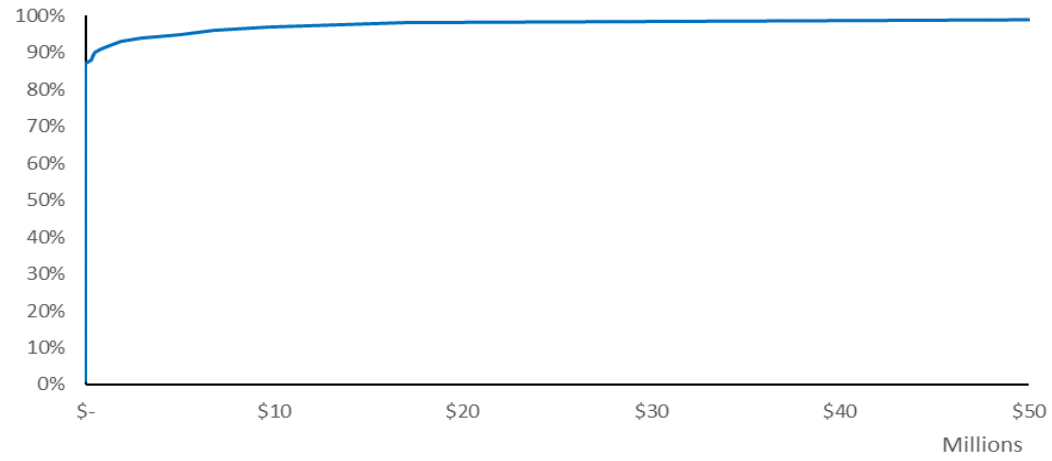


Another type of distribution we use in our analysis is an asymmetrical distribution, shown in Exhibit 3.2. Floods fit an asymmetrical distribution. Exhibit 3.2 shows that small floods are the most common type of flood. Large floods are relatively rare. The distribution is "asymmetrical" because the frequency with which we will experience these events are not evenly distributed around the middle of the distribution. Put another way, there are far more floods that are smaller than the "average" flood. Yet, there are far fewer floods that are larger than the average flood.

Expressing Providence's vulnerability as distributions allows us to calculate the probability that an event of a given magnitude will come to pass. When we associate a dollar amount with that event, we can estimate the probability or chance that Providence will need to have a given amount of money on-hand to respond.

Exhibit 3.3 is not a distribution but is a type of graphic we will use often in this report. It is called a "cumulative probability chart." It shows that increasing amounts of reserves are needed to gain more confidence that the City will have enough money to cover the extraordinary cost to the general fund arising from a hurricane in a given year. Because a hurricane is unlikely to occur in a given year, we can see that reserves aren't required about 85% of the time. For this reason, the curve starts at the 85% mark on the vertical axis, which means 85% of the time the required reserves for hurricanes will be zero. The curve then moves sharply to the right. This is because increasingly large amounts of money are needed to cover the costs from the most extreme hurricane.

Exhibit 3.3 – Annual Loss Curve for Providence from Hurricanes & Costal Storms



Most years (about 85%) no hurricane damage happens. This is because the blue line starts the 85% mark on the vertical axis. If a hurricane does happen there is about a 2/3 chance the damage will be less than $5 million. However, extreme damages are a possibility. This is the long tail on the blue line, which extends to the right.

It is important for the reader of this report to understand that **there is never one single, objectively best amount of reserves to hold**. The amount of reserves the City will want to hold will partially be a function of the City's willingness to take on risk. If City officials are willing to take on risk, they might opt for lower reserves and spending more money on current services. If officials are more risk averse, they might opt for higher reserves. GFOA's recommendations are informed by where reserves appear to provide the best value or "bang for the buck." For example, on Exhibit 3.3 we see that to go from 85% confidence to 95% confidence would require a significant amount of money. Conversely, to go an incremental 5% between 85% and 90% does not cost nearly as much. Hence, we could surmise that the best value of reserves occurs

between 85% and 90%. Other strategies for covering risk beyond these amounts may be more financially savvy (e.g., borrowing or insurance).

In Section 4, we cover revenue instability owing to economic downturns. In Section 5 of this report, we will review the City's primary risks posed by extreme events, including hurricanes and floods. Section 6 reviews secondary risk factors that have less weighty implications for the City's reserve strategy. We include Section 6 to highlight the full range of risks that were considered, even if some of them did not seem to present as clear and present a threat to the City's general fund reserve.

After we analyze the individual risks, in Section 7, we will consider the risks holistically. This section will:

- Consider the risks over a ten-year time period. This provides a more complete perspective on potential vulnerability and how to use reserves.
- Consider the potential occurrence any of the risks we analyzed to occur at the same time. Obviously, if they did occur at the same time, the stress on the City's reserves would be compounded.

Section 4 - General Fund Revenue Volatility

For purposes of our analysis, we divided the City's revenues into the following categories: property taxes, other local taxes (tangible property and excise taxes), payments from the state in lieu of taxes (state aid), and all other revenues. Property taxes are, by far, the most important source, as you can see in Exhibit 4.1. Immediately following Exhibit 4.1, we will analyze the risk the City faces in each category.

Exhibit 4.1 – Relative Importance of City Revenues, based on Average of 2018 through 2021 Data

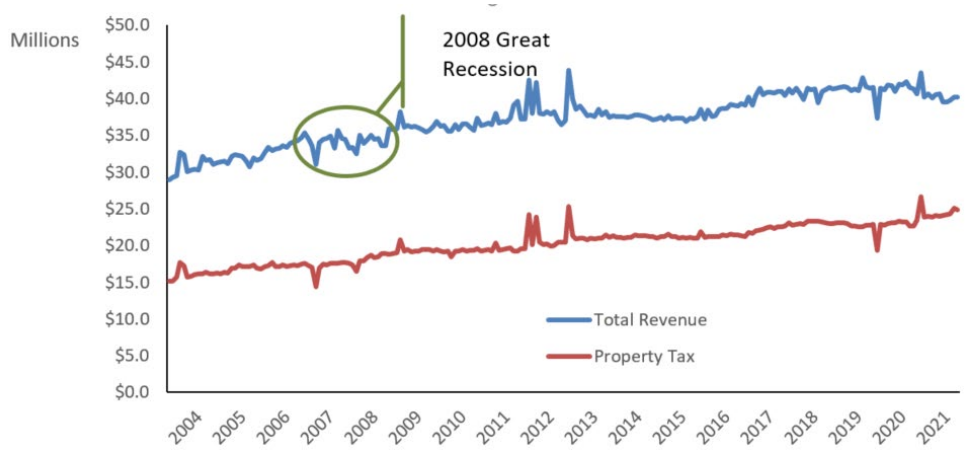
Revenue	Share of Total
Property Tax	58%
Tangible Property Tax	11%
Excise Tax	4%
State Aid	4%
All Other Revenues	22%

Property Taxes

Property taxes have been a very stable revenue source for the City. Exhibit 4.2 shows the very steady pace of property tax revenues since 2004. The data in the chart is presented as a "moving average" of monthly revenues, which means we have "averaged out" the normal month-to-month variation in revenues the City experiences. The blue line represents total revenue and red line represents property tax revenues.

One striking feature of the graph is how flat the red line is (there are a couple of spikes, but these are artifacts of the data rather than a notable characteristic of the tax itself). There have been no notable major declines or increases.

Exhibit 4.2 – Total Revenues and Property Tax Revenues, 2004 through 2021 (Monthly Moving Average)



In recent years, the City has not changed its tax rate much. However, during the housing boom and bust associated with the 2008 Great Recession, the City changed its taxes rates significantly in order to maintain a consistent levy. For example, the 2007 rate was about 25% less than 2006 (for residential and commercial) to offset a large rise in property values, but went up by about the same amount in 2010 to offset the reduction in property values. This shows that the City has adjusted its tax rate in the past to maintain consistent revenues. Hence, a risk might be the City's willingness or unwillingness to adjust its tax rate in the future to maintain consistent revenues during a recession.

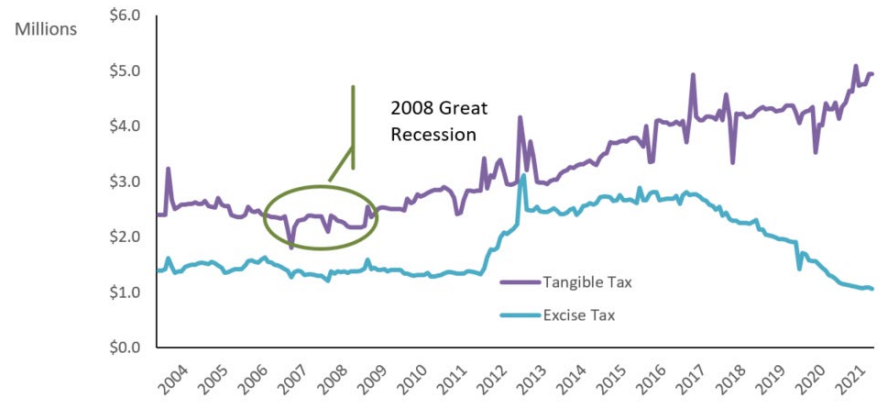
Another striking feature of Exhibit 4.2 is the comparison between the red line and the blue line during the 2008 Great Recession (the area circled in green). We can see a lot more volatility in the blue line and even noticeable decline compared to preceding and following months. The red line is comparatively flat and continuous. This shows that that the property tax is a stabilizing influence on City revenues.

Finally, it is worth noting that Providence does not have a material risk from concentration of the tax base in one or few taxpayers. An example of this risk would be if a small municipality has a large industrial property, where that property makes up a large portion of the tax base – if the factory were to close, then it would have a big impact on the tax base. Fortunately, Providence does not appear to have such a risk. The taxpayer with the highest assessed value is Narragansett Electric, whose property comprises about 3% of the City's assessed value. This is not insignificant, but utilities are stable businesses so even this portion of the tax base should not be at much risk. Dominion Energy is the second largest at about 2% of assessed value – again, utilities should be relatively stable.

Other Local Taxes (Tangible Property and Excise Taxes)

Other local taxes are tangible property tax and the excise tax. These appear to be a little more sensitive to recessions. Exhibit 4.3 shows a more noticeable dip on monthly revenues, compared to property taxes. Again, normal month-to-month variation has been averaged out. We do see that in recent years excise tax revenue has been declining. This is because the State of Rhode Island is phasing out the excise tax and shifting to state shared revenue. City staff expects this to be a positive development for the City, but also expects only a relatively minor increase in total revenue.

Exhibit 4.3 – Other Local Taxes, 2004 through 2021 (Monthly Moving Average)



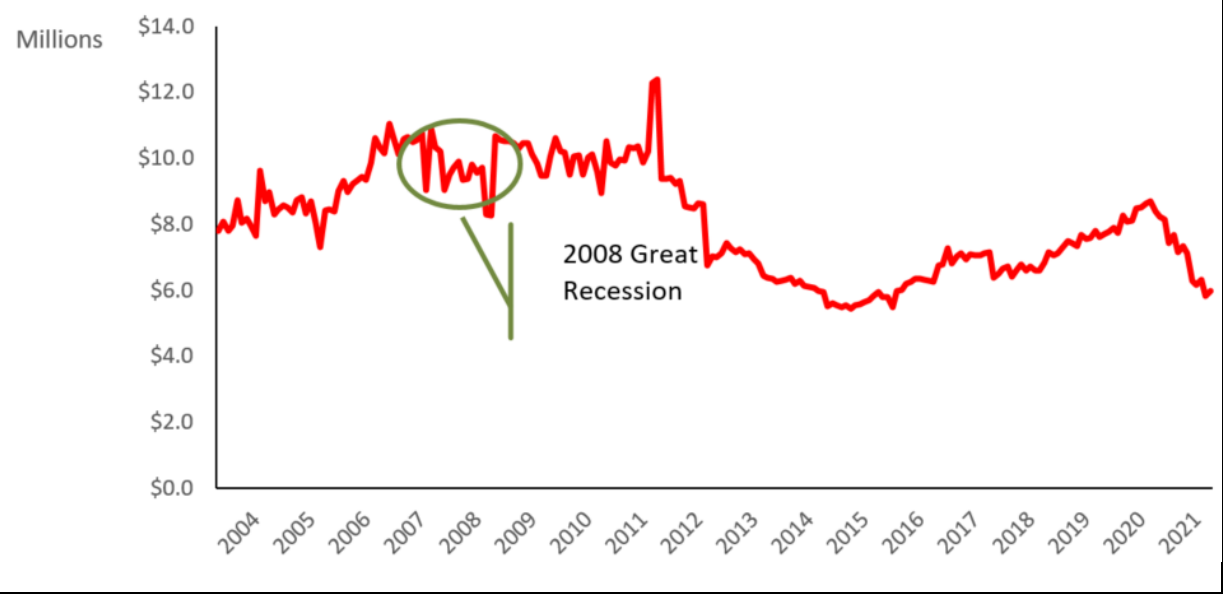
State Aid

State aid is the smallest of the individual sources of revenue we have chosen to highlight. At only 4% of City revenues it does not have much of an impact on City total revenue. An examination of the history shows that there was a sizable decline (20%) during the 2008 Great Recession.

Other Revenue

Other revenue comprises a variety of small revenue sources such as various permits and fees as well as school debt construction payments. In total there are about 200 other revenue sources, with school debt construction payments being the largest at 5% of total City revenue. All the remaining other revenue sources are 3% or less of total City revenue. Exhibit 4.4 shows some volatility in these revenue sources during the Great Recession (about a 20% drop during the worst part). It is also noticeable that there has been a drop off in other revenues after 2011. State excise taxes and federal grants became significantly less important to the City after 2011. Nevertheless, when all these sources are considered together, they are significant portion of the City's revenues. We can see that there was a drop in these revenues over the last year, presumably at least in part due to COVID. So, these revenues clearly have some vulnerability to economic slowdowns.

Exhibit 4.4 – Other Revenues, 2004 through 2021 (Monthly Moving Average)



Analyzing Revenue Risk

In order to analyze the risk that Providence is subject to we used the information presented above to inform our risk model. In addition to this information we also used the following information:

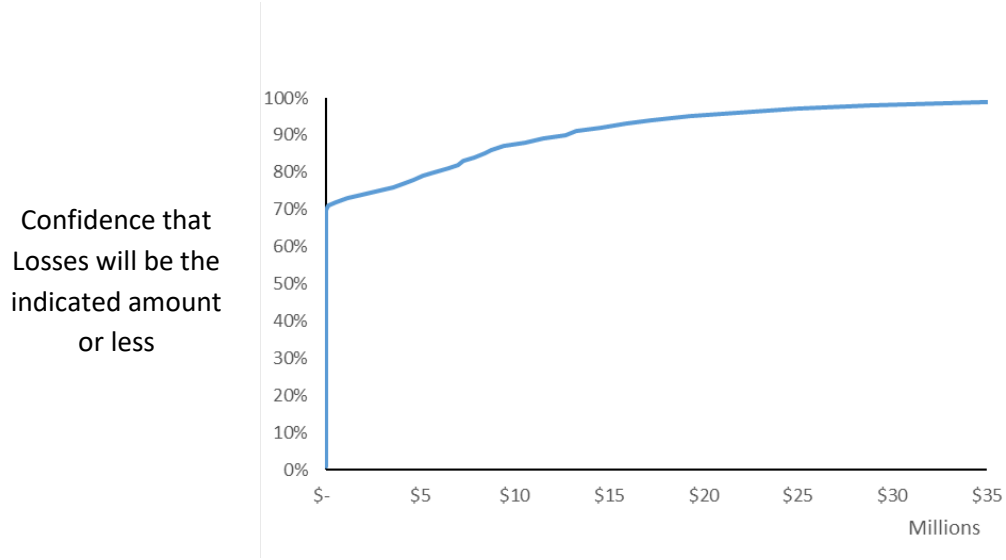
- Even though the City raised its tax rates during the 2008 Great Recession, in the risk model we don't want to assume that Providence will necessarily raise its tax rate to offset revenue losses

from a decline in property values. Hence, the model gives the user the opportunity to choose a tax increase as variable and define the size of the tax increase.

- Providence did not have data available on what happened during the 2001 recession. The 2001 time period is a very useful for our analysis because it gives a second data point to consider. In general the 2001 recession was a far less severe recession than 2008, so it shows us the impact of a recession of a lesser magnitude. GFOA recently worked with the Town of Charlestown, Rhode Island, to build a risk model and Charlestown had 2001 data available. Though Charlestown and Providence are very different in many ways, the two municipalities did at least face a similar macroeconomic and state policy environment. For example, both municipalities endured comparable declines in state shared revenues during the Great Recession, which suggests they probably endured similar declines in 2001. Both municipalities also suffer large declines in property valuations at around the same time in 2008. Hence, we might assume that property values in 2001 reacted similarly in both municipalities. We used the experiences of Charlestown in 2001 to help simulate what a less severe recession in Providence might look like.
- We assume that the losses from property taxes will be felt two years after the actual recession. This reflects that delay between when market forces act on real estate prices and when those impacts would show up in the City's tax revenue. This delay is consistent with what actually happened to the City during the Great Recession.
- We used data on how often recessions have occurred and how long those recessions have lasted from 1950 onwards to simulate the frequency and duration of future recessions.

Exhibit 4.5 below shows the cumulative probability curve for a single year loss, accounting for all the information described in this section, including how often recessions occur. About 70% of the time the City will not experience any loss at all. For 80% of the time, losses will be less than $5.6 million. Approximately 90% of losses will be less than $12.7 million and approximately 95% of the time the will be less than $18.5 million. The blue line does not reach 100%, but it does show that there is a small chance of losses significantly in excess of $18.5 million.

Exhibit 4.5 – Cumulative Probability Chart for Annual Recession Losses



Finally, note that Exhibit 4.5 does not account for any willingness on the part of the City to cut its spending in response to recession. That will be addressed in Section 7 of the report.

Checkpoints

- ✓ Property tax is the City's most important revenue source, by far, and has been a strong stabilizing influence on City revenues.
- ✓ An important part of the stabilizing influence of the property tax is that the City can adjust its tax rate. The City's willingness to raise its rates is an important determinant in the risk to the City's reserves from recessions.
- ✓ The City's other revenues also have some important vulnerabilities to recessions as well.
- ✓ In a given year, there is about a 70% chance that there would be no impact at all from a recession. There is a 90% chance losses in a given year would be less than $12.7 million.
- ✓ The analysis presented in this section does not take account of any willingness on the part of the City to cut its budget. That is addressed in Section 7.

Section 5 - Extreme Events

Although Providence can receive reimbursement from insurance and public agencies for natural disasters and some man-made extreme events, having adequate reserves in place is important to quickly and decisively respond to extreme events. For example, FEMA reimbursement will not cover all the costs the City incurs and it could take months, if not years, to receive reimbursement. As the City's Hazard Plan notes, hurricanes, flooding (including dam inundation), high winds, snow storms, and pandemics are major natural disaster risks the City faces. In discussions with City staff, these disasters represent the greatest risk and will be the focus of this section of the analysis.

FEMA and Reserves

The U.S. Federal Emergency Management Agency (FEMA) reimburses local governments for monies spent in response to a federally-declared disaster. FEMA reimbursement is only partial (typically 75 percent) and is often not immediate. Therefore, local governments must have the financial capacity to respond quickly and decisively, independent of FEMA assistance.

The following sub-sections will explore the potential budgetary implications that these hazards have for the City government.[10] These sections will explain any notable features of the data sets we used and discuss the range of potential damage the City could experience, as suggested by the data we gathered.

A. Hurricanes and Coastal Storms

The most notable recent example of a hurricane or coastal storm to impact Providence is Hurricane Irene in 2011. In 2011 dollars, the financial impact on City government was $853,960. To model the potential impact of future storms, GFOA obtained a library of simulated storms from Aon. Aon is a global professional services firm that provides a range of commercial risk, reinsurance, and data and analytic services.[11] Aon has the capacity to develop custom simulations for natural catastrophes. Aon developed a hurricane and coastal storm simulation for Rhode Island and conveyed it to GFOA.[12]

The Aon library simulates the impact of hurricanes and large coastal storms for the entire State of Rhode Island for a year. It includes over 10,000 scenarios, ranging from no hurricane or storm activity for the year, all the way up to hurricanes of historically unprecedented ferocity. The library includes the total estimated cost to public entities in the state for each scenario. GFOA then used historical records of Irene to see what portion of total costs to public entities in Rhode Island was borne by Providence.[13] It is also important to note that Hurricane Sandy did not have a material impact on the City. Therefore, we must assume that, perhaps due to Providence's distance from the ocean (compared to many other Rhode Island municipalities), there is some chance that the City will not be materially impacted by at least some hurricanes that make landfall in Rhode Island. The City's hazard plan lists ten hurricanes that have

[10] Our analysis excludes damages to private property any anything else not the direct financial responsibility of City government.

[11] Description taken from Aon.com.

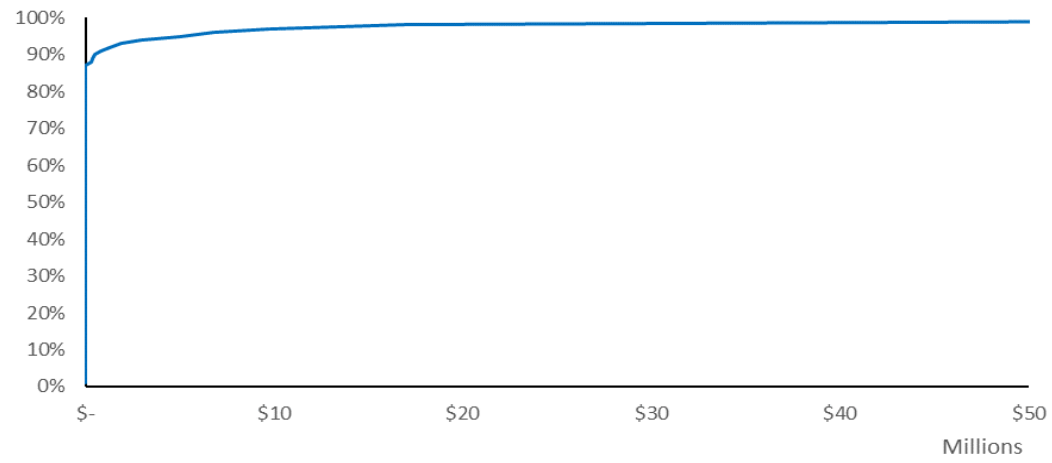
[12] GFOA and Aon are developing a relationship to allow GFOA to purchase simulations from Aon for natural catastrophes.

[13] According to FEMA records, the City of Providence accounted for about 10% of total assistance given to Rhode Island entities that received FEMA reimbursement for 2011's Hurricane Irene.

impacted Rhode Island. Two of them, Sandy (2012) and Edna (1954), appear to have had only minor impact on Providence. Hence, we might assume that there is a 2 in 10 or 1 in 5 chance that a given hurricane that impacts Rhode Island will not have a material impact on Providence. The model adjusts this probability for smaller or weaker storms and for stronger storms (stronger storms are assumed to be more likely to impact Providence than weaker storms).

The assumptions from the Aon dataset were then applied to the simulated storms. The result is a loss curve for any given year, as shown in Exhibit 5.A.1. The graph shows that it is likely (about 85% likely) that nothing at all will happen in a given year. The graph also shows that if an event does occur, there are a range of potential costs. If an event occurs, there is about 1/3 chance of the event costing the City less than $1 million, and 1/3 chance of costing between $1 million and $5 million and a 1/3 chance of costing more than $5 million. Finally, Exhibit 5.A.1 shows that the simulation includes the possibility of very extreme events. However, such an event is highly unlikely, of course. This results in the "sharp right turn" shape of the graph. This shape is an almost universal characteristic of loss curves for other extreme natural disasters like hurricanes and earthquakes.

Exhibit 5.A.1 – Annual Loss Curve for Providence from Hurricanes & Costal Storms



Most years (about 85%) no hurricane damage happens. If a hurricane does happen, then there is about a 2/3 chance the damage will be less than $5 million. However, extreme damages are a possibility. This is the long tail on the blue line, which extends to the right.

Of course, FEMA can be expected to offer assistance to Providence if an event occurs. The model accounts for FEMA assistance by adding reimbursements back to the general fund reserve two years after the event occurs. This assumes that FEMA reimbursement will not be instantaneous. The City can adjust this assumption in the GFOA model.

Finally, we should note the simulation above does not account for the potential impacts of global climate change because it is based on historical data. The potential impact of climate change might call for the City to be more risk averse with respect to hurricanes than the simulation suggests.

Checkpoints

- ✓ Hurricanes and coastal storms are rare events with potentially extreme consequences.
- ✓ Our simulation shows about an 85% chance of no events in a given year.
- ✓ If a hurricane does happen, there is about a 2/3 chance the damage will be less than $5 million. However, extreme damages are a possibility.

B. Riverine Flooding and Dam Inundation

The City's Multi-Hazard Mitigation Plan describes riverine flooding a major risk (apart from floods from heavy rains, for example). Riverine flooding occurs after heavy rain, particularly in areas with high water tables. Frozen ground conditions can also contribute to low rainfall infiltration and high runoff events that can result in river flooding.

First, let's look at the frequency of riverine flooding. According to the City's Hazard Plan, Providence has experienced around 30 riverine events since 1996 (the vast majority of which did not cause large damages). For the purposes of our analysis, we are interested in floods that caused substantial damages. The Hazard Plan and GFOA research identified two such floods: October 2005 and March 2010. Our research suggests that both were considered "100-year floods," which means there is about a 1% chance of such a flood occurring in a given year.

Now, let's move on to the magnitude of potential damages. The damage per significant event can be quite severe. For example, according the Hazard Plan, the damages to the City government from the March 2010 flood was about $650,000 in 2021 dollars. The records are not as clear about the October 2005 flood, but GFOA's research suggests that the damages as comparable.

However, we must recognize that we only have two historical events to draw upon. When working with a small data set we invoke the "Triple-A" rule from Section 3, which advises us to widen the range by doubling it. Doubling the range is a rule of thumb to obtain a 95% confidence interval. This gives us a 95% confidence interval that ranges from $650,000 to $1.3 million.[14] However, we must also account for the fact that the City could experience a more severe flood than a 100-year flood. In flood management, it is standard practice to consider 500-year floods as the next level up of severity (e.g., a flood that has a 0.2% chance of occurring in a given year). To gauge the potential damage of a 500-year flood we worked with the City's GIS staff to find out how many additional properties were in the geographic zone designated as at-risk during a 500-year flood. We found that there was about 75% more properties (as measured by assessed value) than in the 100-year flood zone. We therefore increase the range of a potential damages for a 500-year flood by 75% over a 100 year flood: $1.1 million to $2.3 million.

[14] The two floods the City experienced were $650,000 each. Doubling that gives us $1.3 million.

Exhibit 5.B.1 shows a simulated damages for varying levels of confidence probability chart of potential damages for a given 100-year and 500-year flood. We see that floods can be quite costly, but the mostly costly floods should be rare. For example, 60% of floods are simulated to be less than $2.5 million in damages, while only 10% of floods are more than $5 million. These figures do not include FEMA reimbursement. FEMA reimbursement is factored into the 10-year risk outlook in Section 7 of this report. FEMA is assumed to reimburse 75% of the cost of a flood. Any FEMA reimbursement is assumed to arrive two years after the event.

Exhibit 5.B.1 – Chance that a Given Flood of the Indicated Frequency would be *Less Than* the Indicated Amount

Chance	500-Year Flood	100-Year Flood
50%	$ 1,455,442	$ 848,296
60%	$ 1,534,509	$ 905,641
70%	$ 1,647,893	$ 959,336
80%	$ 1,761,213	$ 1,013,659
90%	$ 1,906,657	$ 1,099,996

An important caveat to what we have discussed so far is climate chance. One could argue that climate change could make severe floods more likely. The GFOA Risk Model gives the user to increase the chances of severe floods and observe the results.

Finally, our analysis considered the possibility of dam inundation: the risk that a dam has a critical failure that results in flooding. The City's Hazard Plan identified two dams that present a notable risk: Canada Pond and Conliff Pond. By consulting information on the dam's vulnerability (gathered from Rhode Island state agencies) and working with the City's GIS staff, we determined that the properties at risk from the Conliff Pond dam were outside of the City of Providence. This leaves Canada Pond. Working with the GIS staff, we determined that the additional value of properties at risk was about 7% more if the Canada Pond dam fails during a flood, compared to if it does not fail. We also considered the chance that the dam would fail. We learned from Rhode Island state agencies that there is no record of a dam failing in the entire state in the data they had available. Though data was not comprehensive of the state's entire history (it only covered more recent history), it does suggest that catastrophic dam failures are extremely rare events. This led us to make two assumptions. First, we assumed that the risk of catastrophic failure is limited to major flood events when the dam would be experiencing much more stress. Second, we assumed that the chance of failure during a 100-year flood was 1% and the chance of failure during a 500-year flood was 5% (five times greater). The reasoning is that the dams are regularly inspected and their structure assessed, plus there is no record of a dam failing. However, we did not want to assume the chance is zero, so we consulted with the City's emergency management staff to arrive at the 1% and 5% assumptions.

Checkpoints

- ✓ The City is vulnerable to riverine flooding and the damages have the potential to be severe.
- ✓ Highly damaging events are rare, compared to the frequency of riverine flooding generally.
- ✓ If a highly damaging event does occur, FEMA assistance will offset much of the costs. However, 25% of the costs will have to be shouldered by the City and the reimbursement will not arrive immediately.

- ✓ The risk of addition flooding from dam inundation is a possibility, but the risk is small compared to the overall risk from riverine flooding.

C. Extreme Snowfall

A heavy snow season can cause the City to incur higher than expected snow removal costs. To simulate this risk, we first gathered snowfall records from local weather stations in Providence. We then compared total snowfall since 2008 to the City's actual snow removal costs. We found a strong relationship between the snowfall figures and snow removal cost.

We then simulated future snowfall based on snowfall records since 2001.[15] The GFOA Risk Model simulates ten years into the future. Each of the ten years has a simulated amount of snow. We then simulated the cost to remove the snow based on the past relationship between the amount of snow and snow removal cost.[16] The simulated snow removal cost is then compared to the City's budget for snow removal. Any excess costs over the budget are assumed to impact the City's reserves.

The City could receive FEMA assistance to offset extreme snow removal costs. In fact, the City appears to have received FEMA assistance four times since 2003 for snowstorms. FEMA assistance is typically based on the magnitude of a particular storm event, not the totality of an entire snow season. Of course, a bad event would contribute to a bad snow season. However, a bad snow season does not necessarily mean there was a bad snow event. For example, 2009 and 2011 saw total snowfalls comparable to two of the years in which FEMA assistance was received and 2009 and 2011 had total snow removal costs greater than any year in which FEMA assistance was received - yet no events in 2009 or 2011 were eligible for FEMA reimbursement. The model simulates the chance of FEMA assistance occurring in the future, based on how frequently the City has received FEMA assistance in the past.[17] The amount of FEMA reimbursement is also simulated based on past reimbursement rates: federal assistance has been sufficient to cover between 15% and 40% of total annual snow removal costs.[18] The ten-year model assumes a two-year delay in receiving the federal reimbursement, but the length of the delay is user-definable. The FEMA reimbursement is added back to the City's reserves, once it is received.

Our simulation shows the distribution of annual snow fall costs in Exhibit 5.C.1. The blue line shows cost before any FEMA reimbursement. The red line shows costs with FEMA reimbursement.[19] The black line shows the City's annual snow removal budget (about $2.2 million). We can see that, after accounting for FEMA reimbursement, about 75% of the time there will be no excess costs because the black dotted line

[15] Data from 1996 to 2001 was missing from the weather station data, which was sourced from the National Centers for Environmental Information, a part of the National Oceanic and Atmospheric Administration. We gathered data from 1983 to 1995, but decided not to incorporate it based on doubts about its validity.

[16] The model makes allowances for the fact that there is uncertainty inherent in predicting snow removal costs.

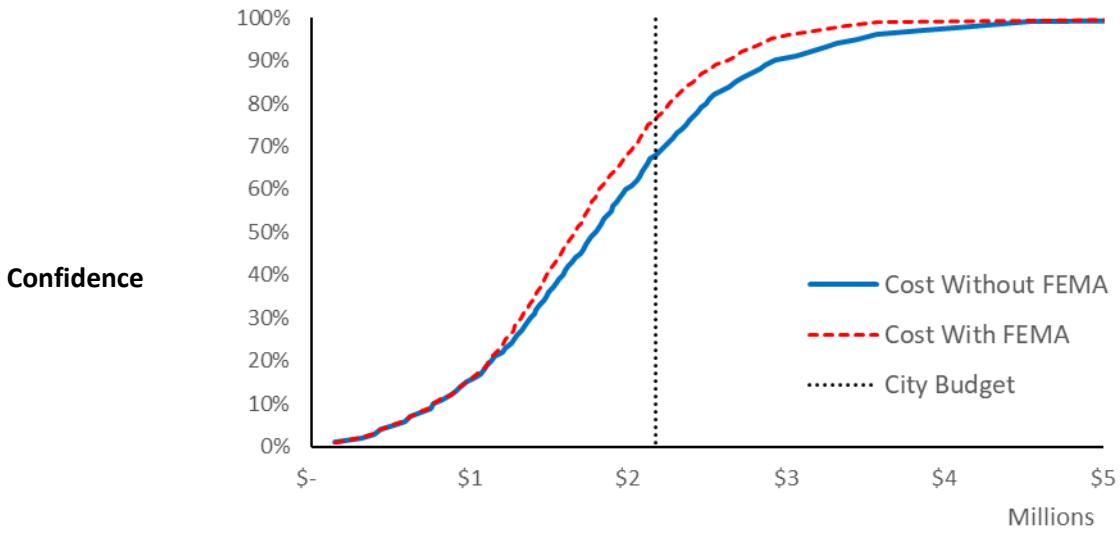
[17] The model assumes a material increase in the chances of receiving assistance for particularly bad snow seasons. This assumes that particular bad snow seasons are particularly likely to include a bad snow event.

[18] FEMA typically reimburses 75% of an event's cost, but remember that we are simulating the cost of an entire snow season, not just the cost of a given snow event. Hence, the FEMA reimbursement would necessarily cover less than 75% of the cost of the season as the season must cost more than the event.

[19] In this case, FEMA reimbursement is incorporated immediately, without the two-year delay that happens in the ten-year model.

crosses the red at the 75% confidence level (meaning 25% of the time costs are greater). Not accounting for FEMA reimbursement (the blue line), about 66% of the time there will be no excess costs. Also, as with many of the other risks the City is subject to, we see the potential for excess costs increases as we move further to the right. However, the lines eventually flatten out, which means that the most extreme cases become increasingly unlikely.

Exhibit 5.C.1 – Potential for Annual Snow Removal Costs in Excess of the City's Budget



The City can be about 75% confident that the annual snow removal budget will be sufficient to cover annual snow removal costs after accounting for the possibilty of FEMA reimbursement (66% confident without FEMA reimbursement).

Checkpoints

- ✓ The City could incur snow removal costs in excess of its budget. Based on records of historical snow removal costs, there is a about a 33% chance of this happening, before we take into account of FEMA reimbursement for particularly bad storms.
- ✓ For very large excess costs, there is some chance of FEMA assistance. The City has gotten assistance in the past for particularly bad storms.

D. High Winds

The City's Multi-Hazard Mitigation Plan describes high winds as a major risk, apart from hurricanes or tornados. Hurricanes and tornados are consider lesser risks by the City, so were not modeled. A high wind event is defined as an event that produces winds about 40 to 70 miles per hour.

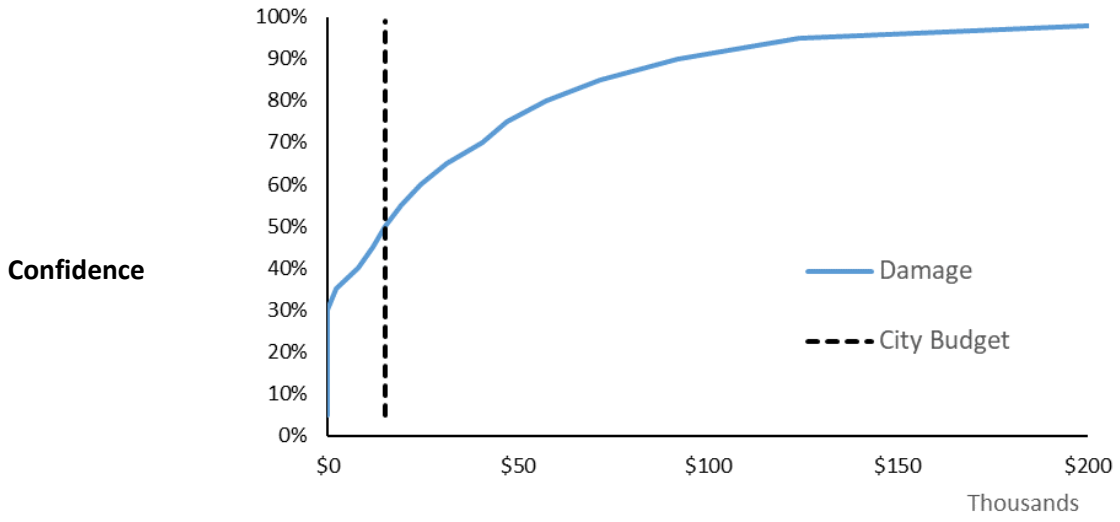
First, let's look at the frequency of high wind events. According to the City's hazard plan, Providence has experienced around 40 high wind events since 1996. If we look at the last 15 years, there were 16 wind events that caused damage to the City. This equates to a little over one event per year.

Now, let's move on to the magnitude of potential damages. According to the hazard plan, the damage per event is relatively minor. After adjusting for inflation, the average event costs just over $20,000 and the most expensive event was just under $70,000.

This means that the risk to the City from single event is relatively minor. However, there could be some risk if Providence experiences multiple events in one year, especially if each of those events causes above-average damages. The City does have some capacity to absorb the cost of high wind events in its regular budget, but this capacity could be overwhelmed.

Exhibit 5.D.1 shows a cumulative probability chart of potential damages for a given year. The black dotted line is the City budget's assumed capacity to absorb costs, which is set at $15,000. This is sufficient to cover 50% of potential annual strong wind damages. We do see from the chart that the possibility of large annual costs does exist. For example, there is a 10% chance that damages could be over $90,000. These losses are not that large compared to some of the other risks we are covering in this report, like riverine floods or hurricanes. However, unlike floods and hurricanes we must assume there will be no FEMA or other outside reimbursement because the City has not received any such reimbursement before.

Exhibit 5.D.1 – Potential for Annual High Wind Damages in Excess of the City's Budget



The City can be about 50% confident that its regular budget can absorb annual costs from high wind events.

Checkpoints

- ✓ The City frequently experiences high wind events, but the potential damage from any single event is largely manageable within the City's regular budget.
- ✓ The risk comes from the possibility of multiple events in one year, where each event is above average.
- ✓ Our simulation shows the City has a 50% chance of covering the annual cost of wind events through its budget. Anything additional would need to be covered by reserves.
- ✓ We assume that high wind damages would not be eligible for outside assistance (e.g., FEMA) because the City has never received outside assistance for high winds damages.

E. Pandemics / Infectious Disease

COVID-19 has made people more aware of the risks posed by pandemics. We included pandemics in the risk model. First, to simulate the frequency of pandemics we looked at the historical frequency of pandemics that have had a substantial impact on the United States: the 1918 flu and the 2020 COVID pandemic. This suggests pandemics might occur once every 100 years.[20] However, one could argue that pandemics will be more likely in the future. For example, easier travel means that infectious diseases could spread more easily. Global climate change could create environments that are more hospitable to disease carrying organisms. Therefore, the Risk Model gives the user the option to increase the assumed likelihood of pandemics and observe the results. We assumed a pandemic could last up to three years.

There are two types of financial losses the City could incur: increased costs and decreased revenue. We used the City's actual experience from COVID-19 as a starting point to estimate both types of losses. The City has two years of experience with COVID-19, but this is still a very small data set. Therefore, we apply the Triple-A rule we described in Section 3, which advises us to double our range of expectations. Exhibit 5.E.1 shows the ranges of losses we simulated.

Exhibit 5.E.1 – Simulated Range of Annual Losses from a Pandemic

	Additional Costs from a Pandemic	Lost Revenue from a Pandemic
High	$4.2 million	$27 million
Low	$500,000	$13 million

The risk model also takes into account the possibility of financial assistance from other levels of government. The model assumes FEMA reimbursement for costs at the customary level of 75%. Coverage of lost revenue is not as clear cut. First, we must simulate if there will be any revenue coverage at all. The experience of the COVID pandemic suggested that Democratic officials were more favorably disposed

[20] We did not think it was appropriate to account for disease outbreaks that did not impact the US as that would overstate the frequency of events that could impact Providence.

towards such financial assistance for local governments than Republican officials. Since we have a two-party system we assume there is an equal chance (50/50) one or the other will be in power and thus a 50/50 chance that federal/state officials will provide support. Assuming there is financial support, the next question is: how much will there be? The experience with COVID suggests that some local governments have used federal support to replace 100% of lost revenues, while others have replaced much less. Hence, the model simulates a range of possibilities from 50% to 100% replacement.

Checkpoints

- ✓ Pandemics are an extremely rare, but high consequence event.
- ✓ We used the experience with COVID-19 as a starting point to simulate what future pandemics might look like. This is only one data point, though. So, we great expanded our expectations for uncertainty beyond what we saw happen during COVID-19. That means the model simulates possibilities for pandemics that are much worse and much milder than COVID-19 (as well as pandemics of similar impact).

Section 6 - Secondary Risks and Comparable Analysis

Prior sections of this report reviewed the risks of the greatest financial consequence to Providence. In this section we briefly review some other potential risk factors that were considered but that did not appear to present as a pressing risk to Providence's general fund reserve as the other risk factors we examined. In some cases, this is because potential impact of the risk is not high. In other cases, it is because the event is highly unlikely to occur. The primary risks are risks that Providence stands a good chance of experiencing in the next ten years. This is not to say that Providence should not prepare for rarer, but potentially high consequence events or for more frequent, but lower impact risks like some of those described below. It is only to say that these events were not included in the scope of our analysis because of their very low probability of occurring. Also, in this section we examine how Providence compares to other cities on indebtedness and the amount of fund balance maintained.

A. Secondary Risks

The City of Providence's Multi-Hazard Mitigation Plan identifies a number of risks that are not major risks. These risks are not categorized as major risks because they are judged by the Hazard Plan to be of low probability, of low severity, or both. Some of the more notable risks are listed in the table below.

Risk	Probability	Severity
Tornados	Moderate	Low/Moderate
Extreme cold	High	Low (with high preparedness)
Urban fire	Moderate	Moderate (with high preparedness)
Extreme heat	Highly likely	Low
Infectious disease (not including pandemics)	Moderate	High human impact, low physical impact
Terrorism (excluding cyber-attacks)	Unlikely to potential	Varies according to the type of terrorism
Sea Level Rise	High	Low
Infrastructure failure	Potential	Limited to negligible

Because the City's Hazard Plan did not consider risks like those in table above to be major risks to the City, we did not quantitatively analyze them. However, that is not to say the City shouldn't be prepared for these risks in some way. For example, the City has high preparedness for urban fires and extreme cold. Also, as we will discuss more in Section 7, the GFOA risk model includes a "critical threshold" of reserves that the City would not want go below. We recommend that the critical threshold be set above zero because the GFOA Risk Model can't include every possible contingency. The critical threshold amount

could help protect the City against any significant financial losses that arise from the risks in the table above.

In addition to the risks described in the Hazard Plan we also examined a number of additional financial risks.

First is the potential for lawsuits. Providence's history with its self-insurance for lawsuits shows that it has routinely put more than enough aside for lawsuits. Hence, the risk that Providence will find itself short in any given year appears low. Also, the City could investigate purchasing commercial insurance to provide coverage for extreme losses.

Second is cash flow issues. For some local governments, reliance on property tax can create cash flow risk if revenues are only received at one or two points during the year. Fortunately, for Providence, it gets larger amounts of revenue every three months or so. However, though the intervening months does see minimal revenue income. If we assume that expenditures are relatively even throughout the entire year, then that means the City will need to cover the gap between the major points when revenue comes in. Over the last couple of years, the largest cumulative deficit was about $13 million. Three years ago there was a cumulative deficit of $28 million in one month. The City's reserves is not a representation of "cash in bank," but there is some relationship. The City monitors cash flow closely, including monthly cash flow reports that are shared with the City Council. The City also times its expenditure disbursements to match cash flow patterns, and is mindful of getting tax bills out in a timely fashion to facilitate revenue inflows. Currently, the City has an emergency cash component of its reserves, equal to $13 million.

Third is under-funded pension liabilities. According to the National Resource Network's "A Strategic Fiscal & Management Plan for the City of Providence" (2016), the City's unfunded pension liability is an important source of potential financial distress. This is relevant to our analysis because pension liabilities place more stress on the budget and reduce the City's financial flexibility. Reserves are a source financial flexibility. The City might take this in account when deciding on a final reserve target: it has less flexibility (due to pensions) to adjust its budget to respond to unexpected circumstances. Note that we do not suggest that the City create a reserve specifically for pensions. The "Strategic Fiscal & Management Plans" made a number of recommendations for how the City could address its pension liabilities and we assume those strategies would be superior to any strategy based on the City's reserves.

Fourth is unfunded infrastructure maintenance. This issue was also raised in the Strategic Fiscal & Management Plan. Unfunded infrastructure maintenance also reduces financial flexibility because it is a large cost the burden's the City's budget. Also, it could be that if the City's assets are not being kept up to acceptable standards, there is increased risk of catastrophic failure. This could cause large, unanticipated expenditures in order to respond. Similar to pensions, we do not suggest that the City develop a reserve strategy to deal with asset risk – rather, it should focus on the strategies that were part of the Strategic Fiscal & Management Plans.

Secondary Risk Checkpoints

- ✓ The City's Hazard Plan identifies a number of other risks to be insufficiently likely and/or potentially less severe to be categorized as a major risk. We did not quantitatively model these risks.
- ✓ The City should still prepare for these risks, though. When it comes to reserves, GFOA suggests that the City identify a "critical threshold" amount that it will strive to keep reserves above. This provides a buffer amount beyond the reserves called for by the analysis of the major risks. The critical threshold is discussed more later in this report.
- ✓ In addition to the risks described in the Hazard Plan, we identified a number of other financial risks, including: cash flow issues arising from unavoidable mismatches between revenue inflows and expenditure outflows, underfunded pension liabilities, and a backlog of unfunded asset maintenance. These risks constrain the City's financial flexibility, making reserves an even more important source of flexibility. This emphasizes the need to manage reserves well.

B. Comparable Analysis

This section compares Providence to other cities on indebtedness and the amount of fund balance they maintain. This information provides context for the City in selecting its own reserve levels. Debt and reserves are both determinants of financial flexibility. A high debt burden means less flexibility, which then would suggest that reserves are especially important for providing flexibility. A lower debt burden would mean the converse.

Debt

At the end of FY 2020, Providence had total debt outstanding of $553.5 million, of which all was direct debt. The City was rated as Baa1 by Moody's Investor Services for its general obligation debt. Exhibit 6.B.1 compares Providence with the medians of similarly-sized peers (population between 100,000 to 500,000) across different Moody's Investor Services' credit ratings. The top row shows the direct debt a city has relative to its full value or total assessed value. Here, Providence has a greater share at 4.06% than across all credit rating categories, including those also rated Baa (2.90%). The second row shows direct debt a city has relative to its total operating revenues. For this metric, Providence fairs much better with direct debt at 0.65 times its operating revenues, which is less than across all credit rating categories.

Exhibit 6.B.1 – Comparison of Providence's Financial Indicators to Cities with Population of 100,000 to 500,000

	Providence	**Aaa**	**Aa**	**A**	**Baa**	**Ba**
Direct Debt / Full Value (%)	*4.06%*	1.00%	1.20%	3.00%	2.90%	N/A
Direct Debt / Operating Revenues (x)	*0.65*	1.16	0.95	1.06	0.92	N/A

Source: Moody's Investors Service, "2018 US Local Government Medians Demonstrate Stability of Sector"

To further explore, we examined how Providence compares to a group of peer cities based on a combination of factors, including geography, population, and general fund revenue portfolio. Exhibit 6.B.2 provides summary statistics from each of the cities' FY 2020 annual financial report and includes four commonly used measures of indebtedness. The measures are categorized as measures of overall debt and measures of direct debt. Of note, the City of Worcester, MA does not separate its direct and overlapping debt measures in its annual financial report. As such, direct debt measures for Worcester are denoted as N/A in the exhibit.

Measures of overall debt captures the full burden placed on the public by debt issued by all local governments that overlap the city. Within this category, the first measure, overall debt per capita, shows the burden placed on citizens by municipal indebtedness inclusive of direct and overlapping debt. The second measure, overall debt burden, compares direct debt plus the debt of overlapping jurisdictions as a percent of the full assessed value of properties in the jurisdiction.

Measures of direct debt includes debt service (inclusive of principal and interest payments) as a percent of the city's expenditures. This measure gauges the pressure placed on the budget by debt payments. The second measure shows direct debt as a percent of the city's full value to show the debt burden relative to the City's tax base.

Exhibit 6.B.2 – Comparison of Providence's Debt Measures with Peer Cities

		Measures of Overall Debt		Measures of Direct Debt	
	Population	**Overall Debt per Capita**	**Overall Debt Burden (Overall Net Debt as % Full Value)**	**Debt Service as a % of Expenditures**	**Direct Net Debt as % of Full Value**
Providence, RI	*178,042*	*$3,109*	*4.06%*	*6.39%*	*4.06%*
Bridgeport, CT	144,229	$6,547	14.55%	8.93%	14.55%
Hartford, CT	122,587	$6,290	10.73%	6.55%	7.55%
Springfield, MA	155,472	$1,407	2.51%	2.91%	2.36%
Worcester, MA	185,428	$4,100	3.70%	N/A	N/A
Mean	157,152	$4,291	7.11%	6.19%	7.13%
Median	155,472	$4,100	4.06%	6.47%	5.81%

Sources: FY 2020 annual financial report of each city

Among its peers, Providence has the second lowest level of overall debt per capita at $3,109, below the mean and median across the peer group, both of which are over $4,000. With respect to overall debt burden, Providence falls in the middle of the group with overall net debt at 4.06% of full value. The two Massachusetts peers, Springfield and Worcester, have a smaller share of overall debt burden. Meanwhile, the two Connecticut peers, Bridgeport and Hartford, have significantly larger share of overall debt burden.

In examining direct debt measures, Providence trails the City of Springfield, MA in both debt service as a percent of expenditures and direct net debt as a percent of full value. Providence and the City of Hartford, CT are more comparable in terms of debt service as a percent of expenditures at 6.39% and 6.55%,

respectively. Providence does not have any overlapping debt, so its level of direct debt as a percentage of full value is 4.06%, which is behind the City of Springfield, MA at 2.36% and ahead of the City of Hartford, CT at 7.55%.

Providence issued an average amount of debt compared to its peers. This means Providence's financial flexibility should not be unusually constrained by debt burden. Hence, debt could play a role in the City's risk mitigation strategy.

Claims on Fund Balance

It is important to gain an understanding of existing claims on the City's general fund balance in order to fully see funds available to the City in case of a major, unforeseen expenditure or emergency.

To help the City consider the amount of reserves to maintain, Exhibit 6.B.3 provides a table of general fund balances as a percent of general fund revenues for peer cities. Several notes should be made about Exhibit 6.B.3 in order for the reader to fully understand its meaning. First, "fund balance" is an accounting term describing the difference between assets and liabilities in the general fund. "Reserves" (which are the main topic of GFOA's analysis for Providence) are the portion of fund balance set aside, by City policy, as a hedge against risk. Hence, not all "fund balance" is necessarily available as a reserve. The right-hand section of Exhibit 6.B.3 shows how much each city holds in fund balance as a percent of general fund revenue. Each of three columns on the right in this exhibit examines fund balances from a different perspective between its relationship to risk mitigation.

The first column shows "unrestricted" fund balance as a percentage of general fund operating revenue. This is an accounting term describing fund balances that do not have constraints placed on their use by an outside entity (e.g., a bond covenant might restrict the use of some portion of fund balance to debt service) and are spendable (e.g., do not represent inventory or other non-liquid assets). An "unrestricted" fund balance may still have constraints placed upon its use, but these constraints would be created by the city government itself. One common constraint is to dedicate some portion of fund balance to hedging against the types of risks described in this report. However, other constraints have nothing to do with risk mitigation - to illustrate: a common self-imposed constraint is setting aside fund balance to pay for a special capital project. While the City does not have such a constraint, if it did, such a constraint *could* be removed and made available for risk mitigation.

The second column shows the amount of fund balance available for risk mitigation after fund balances having self-imposed restrictions (not germane to risk mitigation) are removed from consideration. This leaves self-imposed restrictions that are germane to risk mitigation as well as unrestricted fund balance, which could easily be used for responding to emergency events if needed.

The third category includes only those fund balances that have been specifically identified by the city as intended for creating a risk mitigating reserve. It should be noted that since the analysis in Exhibit 6.B.3 is based only upon the information included in each city's FY 2020 annual financial report, so it is possible the amount dedicated to risk mitigation could be higher for some of the cities as a legislative policy document might call for maintaining a given amount in fund balance as a reserve without creating

an accounting restriction that would show up in the financial report, which is the case for the Cities of Springfield, MA and Worcester, MA.

Exhibit 6.B.3 – Comparison of Providence's General Fund Balances to Peer Cities

	% of General Fund Revenues		
	Unrestricted	**Available for Risk Mitigation**	**Dedicated to Risk Mitigation***
Providence, RI	*5.1%*	*5.1%*	*0.0%*
Bridgeport, CT	4.5%	4.5%	0.0%
Hartford, CT	4.6%	3.7%	0.8%
Springfield, MA	11.1%	10.7%	0.0%
Worcester, MA	7.7%	7.7%	0.0%
Mean	6.6%	6.3%	0.2%
Median	5.1%	5.1%	0.0%

*The figures are based on details identified in each city's annual financial report. A city may have a legislative policy to maintain a certain amount in fund balances as a reserve without creating an accounting restriction.

Sources: FY 2020 annual financial report of the cities

As shown in the exhibit above, 5.1% of Providence's general fund balance is unrestricted and also available for risk mitigation. This represents the amount of unassigned general fund balance. For these two measures, Providence falls in the middle of the peer cities, with the two Massachusetts cities having a greater share that is unrestricted and that is available for risk mitigation than the two Connecticut cities.

Providence does not have funds specifically dedicated to risk. Of the five cities, only the City of Hartford, CT has imposed a strict accounting designation to devote portions of its fund balance to risk mitigation. As of FY 2020, Hartford assigned $5.0 million to economic uncertainty. Two cities, Springfield, MA and Worcester, MA, also set aside portions of their fund balance to hedge against risk per city policy. However, these funds are reported as part of the unassigned portion of the general fund balance. For example, the City of Springfield, MA has four stabilization funds that can be used for any general or capital purpose upon City Council approval that amounted to $50.9 million or 6.6% of the general fund balance as of FY 2020. The City of Worcester, MA also has reserves for bond rating stabilization and emergency stabilization within its unassigned general fund.

Compared to its peer cities, Providence is within the mid-point for unrestricted fund balance and fund balance available for risk mitigation relative to general fund revenues. A more deliberate analysis, such as the approach in this report, will provide greater insights into if such level is appropriate given the risk factors that the City faces. The City could impose more stringent accounting restrictions to portions of the fund balance to set aside funds for specific risks it faces.

Section 7 - Putting it All Together

In Sections 4 and 5 we examined individual risks such as recessions, hurricanes, and floods. We examined each of these risks individually in order to best understand the nature of each risk and the financial implications. However, to arrive at a final reserve strategy for the City, we need to consider these risks as a group. Considering the risks as a group has important advantages.

The first advantage is that considering risks as a group recognizes the diversity in the risks that the City faces. This diversity actually is an advantage for City finances! Diversity in risks means we should not simply add together a reserve for each individual risk. This may overstate the amount of reserves that the City really needs. This is because it is unlikely that the City will experience a deep recession, severe hurricane, and severe flood all within a short time period.

The second advantage of considering all of the risks together is that not all of the risks have an equal chance of occurring over a given time period. Extreme snowfalls are more common than a 100-year flood. The reserve analysis should reflect this fact. In the bullet points below, we show the relative chance of each of the major risks occurring over a ten-year period. We can use these probabilities to build a model of risks over a long-term time horizon.

- **Revenue loss due to a recession.** Historical data suggests that it is highly likely (over 90% chance) that there will be at least one recessionary year in a ten-year period.[21] The historical data also tells us there is a considerable chance of having more than one recessionary year in a ten-year period.
- **Hurricane**. The City has a 15% chance of experiencing a hurricane in a given year.
- **Flood**. Based on the flood data we have available, the model simulates 100-year and 500-year floods. These floods have a 1% and 0.2% annual chance of occurring, respectively. The GFOA Risk Model gives the City the option of increasing the likelihood of these floods, by up to 400% but we did not assume any increase for the purposes of this report. There is also a small chance of the Canada Pond dam failing during a flood.
- **Snow storm**. The City can be about 75% confident that the annual snow removal budget will be sufficient to cover annual snow removal costs after accounting for the possibility of FEMA reimbursement (66% chance its snow removal budget will be sufficient to cover cost without FEMA reimbursement).
- **High winds**. The City can be about 50% confident that its regular budget can absorb annual costs from high wind events.
- **Pandemic / Infectious diseases**. The model simulates pandemics occurring with a 1% annual likelihood, which is based on historical frequency of pandemics that impacted the United States.

The final advantage of considering all the risks together is that we can consider "risk interdependencies." This simply means that the occurrence of one risk could impact the probability and/or magnitude of a related risk. In Providence's case, there does not appear to be any critical interdependencies. This is not unusual for local governments GFOA has worked with.

[21] We took economic data since 1950 and used that to calculate the odds of a recession occurring in a ten-year period, including how many of those years would be recession years.

To realize the advantages described above, we built a model that considers the City's risks over a ten-year time horizon. The GFOA risk model runs hundreds, thousands, or even ten thousand simulations of possible futures for Providence. Below are the key assumptions behind the model. Some of these assumptions are user-definable so that the City can explore alternative scenarios to those described in the report. Below, we have italicized user definable variables and described the default values included in the model.

- **Probability of an undesirable event.** The probability of any undesirable event occurring is consistent with the assumptions described above.
- **Magnitude of an undesirable event.** Should a simulation show that an undesirable event occurs in a given year, the magnitude is generated randomly in a manner identical to how we described for the risks earlier in this report.
- **FEMA reimbursement.** The City could recoup some of its losses from extreme events, such as floods, hurricanes, and some snow storms from reimbursements from FEMA. The model assumes the reimbursements are received *two years after the event occurs*.[22] The model also assumes that any hurricane and any 100-year flood would qualify for FEMA assistance. We also assume the City will be reimbursed at the customary *rate of 75% of incurred costs*.
- **The City does cut some spending to help offset the impact of a recession or an extreme event.** At least some of the losses from a recession or extreme event could be absorbed by cutting back on the City's regular spending. The risk model provides a number of user definable budget balancing strategies. For the purpose of this report, we assumed the following response to a recession or sizable loss from extreme events:
    - Hiring freeze of 30 positions
    - Limit overtime by 50% for non-public safety employees
    - Use Internal Service Fund Reserves to reduce Medical Budget by 2%

  In the risk model, the City can *easily change these assumptions to deactivate these strategies, change the intensity of their use, activate other budget balancing strategies, or any combination of these actions.*

- **The City will generate budget surpluses and deficits with about equal frequency.** The City has historically generated surpluses and deficits about the same frequency (very slight tendency towards surpluses). Annual surpluses can be used to offset unexpected cost or help pay for capital projects. The Risk Model simulates budget surpluses for non-recessionary years based on the range of surpluses (and deficits) generated by the City in the past. The Risk Model also provides the City with the opportunity to override the historical pattern with a user-defined range of potential surpluses. For the purposes of this report, we have simulated surpluses between *3.4% and -3.4% (a deficit) each yea*r.
- **Critical threshold.** *This is the amount that the City does not want reserves to go below*. For the purposes of this report, we set the amount at $10.0 million, which is a conservative estimate of the amount needed to avoid cash flow problems due to timing mismatch between the point during the year at which property tax revenue is received and the relatively even rate at which the City spends money during the year. This amount can be easily adjusted by the City in the Risk Model in order to explore other thresholds.

[22] Our research shows that FEMA reimbursements are completed 18 months after the disaster occurs, on average. So, this is a conservative assumption.

We combined all of the information described above to create at ten-year probabilistic model. The City's goal for this analysis was to find an amount that can give the City sufficient comfort that its reserves will cover its risks. The following pages present a series of graphics based on this model. Exhibit 7.1 shows the chance that the City's current reserve will reach the critical threshold ($10.0 million) each year. GFOA has observed that most municipalities are comfortable with about 10% to 20% chance of reaching their critical threshold by the end of the analysis period. Providence has a higher chance than this – the percentages are in the mid-forties. It is important to note that, generally, the blue bars will always get higher the further in the future we look because more bad things can happen.

Exhibit 7.1 – Chance to Reach Critical Threshold Each Year

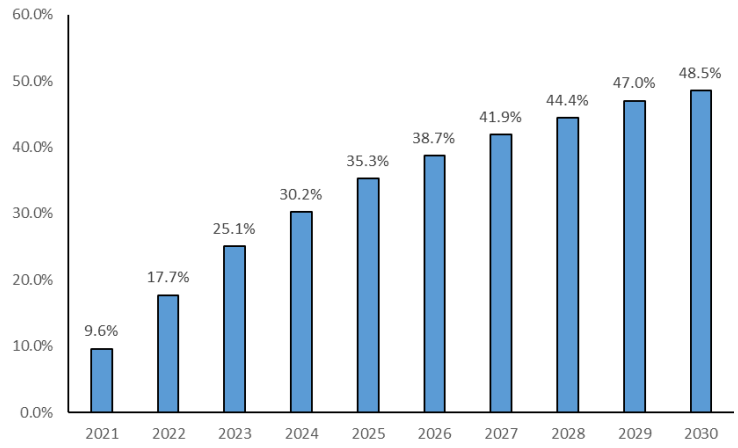
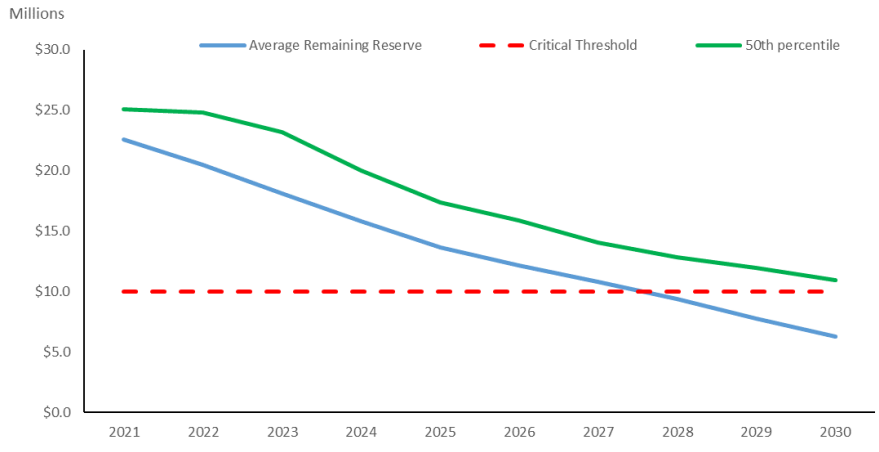


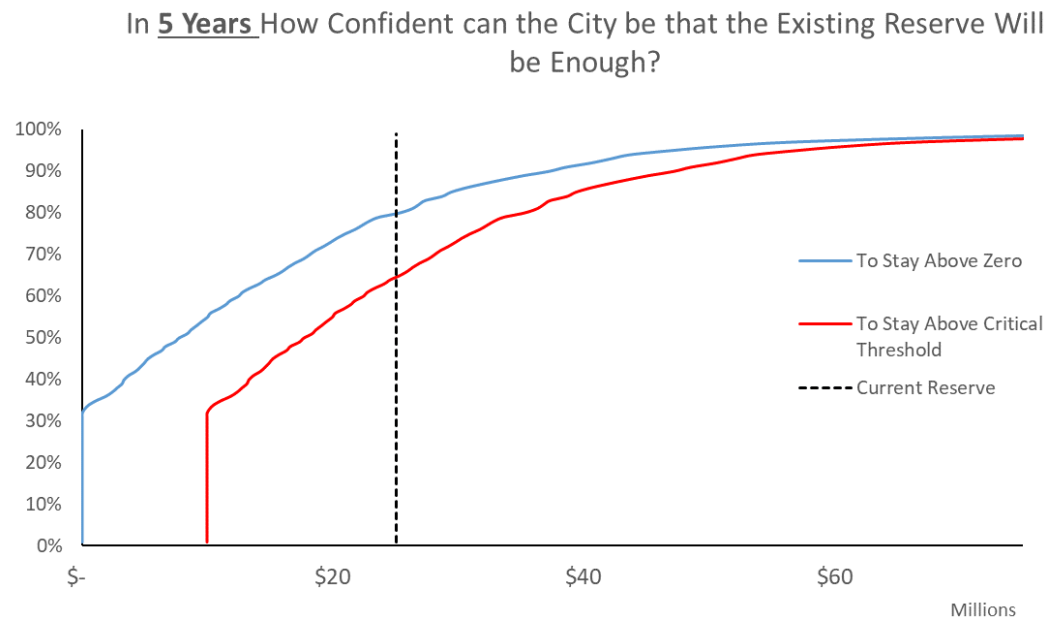
Exhibit 7.2 shows the average remaining reserve per year (blue line). We can see that the simulation shows the City's reserves are simulated to decline under "average" conditions. The chart also shows the 50th percentile (green line), which means the simulation shows reserves to be at or under the green line 50% of the time. This is another way to look at the "average". This illustrates the big impact such events can have.

Exhibit 7.2 – Simulated Remaining Reserve Per Year



Finally, below is Exhibit 7.3. This is a cumulative probability chart. It shows the confidence available from varying levels of reserves. Providence's existing reserve intersects the red line about 65% confidence. The main take-away from this graphic is the reserves have a diminishing return at a certain point because the flatter the line gets, the less confidence an additional dollar of reserve "buys" you. This is because the further to the right you go on the graph, the more extreme the events are that must be covered by reserves. This graphic shows that the City would still get a good "bang for the buck" from higher reserves. This City would not be as well served by accumulating reserves past the point where the line goes flat.

Exhibit 7.3 – Cumulative Probability Chart



The implication of the line going flat is that not all points on the line are equally cost effective. Let's examine Exhibit 7.3 to illustrate. First, note that Exhibit 7.3 is a five-year outlook, so the numbers would be somewhat higher for a ten-year outlook. According to the graph, to be 70% confident of staying above the critical threshold requires $28 million and 80% confident requires a reserve of $35 million, a difference of $7 million. To be 90% confident requires a reserve of $47 million, a difference of about $12 million from 80% confidence. This means that the City gets more "bang for the buck" before the curve gets flatter. The most cost-effective reserve for the risks described in this report appears to be at around 75% to 80% confidence. This translates to $31 million to $35 million if we consider a five-year period and $38 million to $47 million if we consider a ten-year period. The table on the next page translates the dollar figures referenced in this paragraph to percentages of the City's budget.

What do these Reserve Targets look like as a Percent of City Revenues?	
A reserve policy typically expresses reserve targets as a percent of revenue. Below we have converted the dollar figures to a percent of revenues	
Dollars	Percent of Budget
$28 million (70% confident over **5** years)	6%
$35 million (80% confident over **5** years)	7%
$47 million (90% confident over **5** years)	10%

However, City officials will need to think about other factors to order to finalize the reserve target range. This is because Exhibit 7.3 cannot account for every possible factor that should go into deciding how much Providence should keep in its reserve. The figures shown in the exhibit are what is needed to protect the City from just the risks described in this report. Usually, municipal governments have other concerns they expect their reserves to address. Here are three examples of such concerns:

- There are risks that are sometimes called "unknown unknowns." These are risks that are totally unanticipated.
- Our Risk Model is based largely on historical data, which, by definition, does not capture the potential future impacts of global climate change. Though the model has some accommodations for climate change (see discussion of floods and pandemics), it is impossible to say what the future impacts of climate change will be. This might suggest a more "risk averse" approach to reserves (i.e., maintaining more, rather than less).
- The City might wish to use reserves for purposes other than mitigating risks – for example, building a capital project using cash financing. The Risk Model gives the City the ability to estimate the cost of potential projects to see the financial impact on these reserves.[23]

The GFOA Excel risk model allows the City to add these considerations to what we call "minimum acceptable reserves" or "critical threshold." GFOA's discussions with the City staff suggest a critical threshold of $10.0 million is reasonable for cash flow given the City's recent experiences. This amount is shown in Exhibit 7.3. The City could choose to vary this critical threshold, which would then change the total amount of reserves the City would need to maintain in order to achieve a given degree of confidence that reserves would stay above the threshold.

Here are some other conclusions we can draw from the graphics presented on the previous pages:

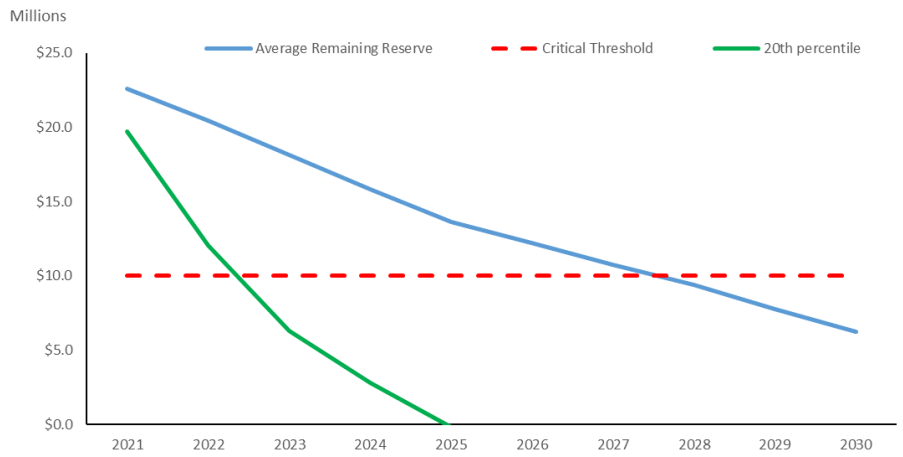
- Providence's existing reserve provides a lower level of confidence than GFOA has observed most public officials are comfortable with. Most municipalities are comfortable with around 85% to 90% confidence of the reserve. That is does not mean that Providence must adopt the same

[23] Note that the City has historically done some level of cash financing of projects. The model already accounts for "normal" spending that takes place in the City's annual budget, so this feature of the risk model would be used for larger projects that exceed what might be considered "typical."

attitude towards risk. Providence could have different goals and circumstances that make its officials willing to accept a lower degree of confidence.

- Our analysis of Providence's historical budget data shows that the City only has about a 50% chance of generating a budget surplus in any given year. This means that, on average, surpluses don't contribute to building the reserve. If the City could adopt budgeting practices that make it more likely to generate a surplus, this could have a considerable positive impact on its long-term risk profile. The Risk Model allows the user to change the chance or a surplus and observe the results.
- The City should remain mindful of the potential for extreme consequence events. To illustrate, Exhibit 7.4 updates Exhibit 7.2 to change the 50th percentile to the 20th percentile (green line) to show the effect of more extreme events. This shows that 20% of the time the City reaches its critical threshold by 2026 and reserves even goes to zero by 2025. The exhibit suggests the City might consider alternatives to reserves to help manage extreme events, like insurance. We will discuss parametric insurance as one such option, later in this report.

Exhibit 7.4 – Simulated Remaining Reserve Per Year (showing 20th percentile)



- The figures we cited for the 75% to just over 80% confident range were $31 million to $35 million if we consider a five-year period and $38 million to $47 million if we consider a ten-year period. These fall short of the minimum standard established by GFOA's "Best Practice" recommended minimum (which would translate to $81 million[24]), but it does put the City in a favorable position compared its peer municipalities (the peer municipalities are examined in Section 6 of this report).
- Finally, the City can use this report and the Risk Model to find consensus on reserve strategy all stakeholders are comfortable with. Meaning, are City officials willing to accumulate more reserves? Or, are they comfortable with current levels? This is a personal choice officials must make, but the Risk Model helps by showing the risk that different choices entail. GFOA suggests the City arrive at range of acceptable reserves and strive to keep reserves in that range. GFOA's

[24] The "Best Practice" minimum is set at 16.7% of revenues or expenditures, but this is rule-of-thumb that does not take into account the risk profile an individual government.

experience with other municipalities suggests that the City's current reserve does not provide as a high degree of confidence as municipal officials often prefer.

GFOA discussed all of the factors above with the City's finance staff and the conclusion of this discussion was that the City of Providence would be well served by a policy that calls for reserves equal to between 7% and 10% of its budget. This gives the City between 80% and 90% confidence of being able to handle the risks included in our analysis. This represents raising the "floor" on the City's current policy (5%), but keeping the same "ceiling" (10%). The rationale was that the previous floor of 5% of the budget gave the City about 60% confidence of handling the risks described in our report. Given the various liabilities the City is subject to (e.g., pensions), the conclusion was that the City would benefit from more financial flexibility. A 60% confidence level means that the City would go below its critical threshold 4 out of 10 times – almost a coin-flip chance. Of course, if we consider the various other liabilities the City must address, its ability to manage risk might actually be less than 60% confidence. An 80% confidence level gives the City more leeway, especially considering the liabilities the City is subject to. Keeping the ceiling the same recognizes that there is a cost to holding reserves – the City might need to invest in new assets to build its resiliency against climate events, for example. Hence, the new range will not result in the City "over-reserving" either.

To complement the reserve analysis, we offer the following additional recommendations:

The City should adopt a robust reserves policy. GFOA has conducted extensive research into what it takes for a local government to be financially sustainable. We call this body of work "Financial Foundations for Thriving Communities" (Financial Foundations). This research has shown that local governments require clear decision-making boundaries. A policy on the target level of reserves that the City should maintain and the acceptable use of those reserves provides clear decision-making boundaries for reserves. Furthermore, GFOA has found that a policy that identifies a floor and ceiling for reserves, rather than just a single target number, may provide more useful guidance. This is because a City government will rarely, if ever, have exactly the amount of reserves called for by its policy. Having a range defines the acceptable tolerances the reserves should stay within. The City currently has a policy under consideration. GFOA has reviewed the policy and it contains all the important features that a policy should include. Particularly noteworthy features include:

- The City limits the use of the reserve to purposes that are sustainable over the long-term.
- The policy provides guidance on how the reserve will be replenished.
- The policy includes a range of acceptable reserves. We'll see why this is important in the next section.

The City's policy is included as Appendix 1 to this report.

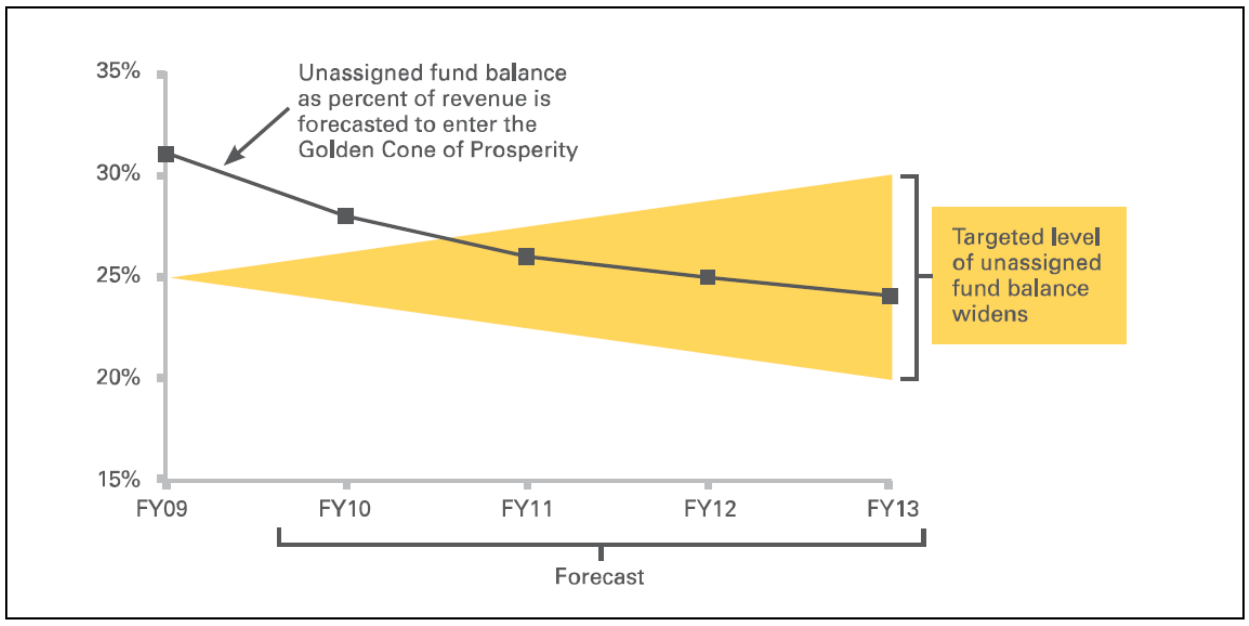
The City should adopt a mechanism to monitor its own compliance with the policy. GFOA's Financial Foundations research suggests that boundaries (e.g., financial policies) must be monitored in order to be fully effective.

The City of Tempe, Arizona provides a good example of how a reserve policy can be monitored. Tempe's policy is to maintain the general fund reserve equal to between 20% and 30% of general fund revenues.

The general fund reserve policy is combined with Tempe's five-year financial forecast, where the goal is to keep reserves within the 20% to 30% boundary during the five-year forecast period. This approach originated in 2009 when Tempe had a policy to maintain reserves equal to 25% of general fund revenues. However, Tempe had been maintaining fund balances above 30%, which was causing some to question why Tempe was not in alignment with the policy and whether Tempe had a fund balance that was too large. City Council and staff agreed to change the policy to set a goal for the reserves to be between 20% and 30% of revenues. This range would provide more discretion, but it would also create clear bounds for what Tempe would consider acceptable maximum and minimum reserves.

Tempe staff developed a presentation of Tempe's revenue forecast in the context of this new arrangement and informally called it the "Golden Cone of Prosperity." Exhibit 7.5 shows the presentation as it was in 2009, where the yellow cone representing the range of desired fund balance widens over the forecast horizon as the new policy is phased in and the black line representing actual fund balance gradually enters the cone.

Exhibit 7.5 —Tempe's Golden Cone of Prosperity in 2009



The meaning of the Golden Cone of Prosperity is straightforward, and its design and name give it a memorable character. As of 2020, Tempe staff still present the Golden Cone twice per year to help public officials to understand the big picture and to show whether Tempe is staying within agreed-upon boundaries. This is a testament to the communicative power of the Golden Cone. Providence could develop a similar presentation to help make sure the City stays within its agreed upon financial boundaries.

The City could consider a robust internal borrowing policy. There will always be some chance that Providence could find that it needs access to more financial resources than are available in its reserves. GFOA's research suggests that interfund borrowing could be a practical tool in emergency circumstances.

Some other funds might be able to make short-term loans to the general fund in the case of an emergency. The City could develop policies to provide the flexibility to use these borrowing tools while also providing the necessary guidelines and limitations to ensure that borrowing occurs in a fiscally prudent manner.

Providence might consider if a policy could recognize internal borrowing's role as a supplementary risk management tool. A policy could address the following points:

- The rationale for using internal borrowing (reserves may not be able to handle every possible contingency);
- When internal borrowing may be used (if reserves are ever exhausted by an extreme event);
- Differentiate between short-term (to be paid back within the same fiscal year) and long-term borrowing;
- How the interest on the borrowing will be calculated (can have multiple alternatives to be determined on a case-by-case basis); and
- General repayment terms (interest only, fully amortized, duration, etc.).

Consider "parametric" insurance in addition to traditional indemnity insurance. Indemnity insurance is the type of insurance that most governments have traditionally purchased, where the insurance corresponds to the value of the assets being insured and reimbursement is paid out after a certain deductible has been met. The advantage of traditional indemnity insurance is that there is a known damage threshold past which the City is covered.

Parametric insurance is a newer type of insurance for providing coverage for extreme events, having increased in popularity in the last 15 years or so in the public sector but has been in use in the private sector for decades. Parametric coverage provides the policyholder (the City) with a payment amount that is defined ahead of time, should a defined event come to pass (a hurricane of a certain magnitude). Parametric insurance could be more useful for providing an injection of liquidity because the holder of the policy receives the defined payment immediately upon verification by a third-party that the given event occurred, which usually would be within a matter of days. As a simple illustration, a parametric policy might provide the City of Providence with $5 million upon the occurrence of a hurricane of some given wind speed, after speed is verified by a third-party. This feature of parametric insurance also eliminates much of the administrative hassle that would be associated with a traditional indemnity policy (e.g., working with claims adjusters). A final advantage is that the proceeds from the policy payout are completely fungible – the City could use them to fund whatever service it deems necessary or to counteract revenue loss from tax base impairment, whereas indemnity policies might require the policyholder to use the funds to repair or replace the asset that was insured. Parametric policies are not without their drawbacks, though, and are not a substitute for traditional insurance. The City can learn more about parametric policies in the publicly available GFOA research report "Parametric Insurance: An Emerging Tool for Financial Risk Management."[25]

A robust insurance strategy could make use of both traditional indemnity and parametric insurance. For example, traditional indemnity insurance could be used to protect against loss of the City's assets, while

[25] Available at: https://www.gfoa.org/parametric-insurance/.

parametric insurance could be used to compensate the City for the losses in tax revenue it would experience from an impaired tax base, for instance.

The City should update its reserve policy if the school systems comes under City control. As of the time of this report it is not clear if, when, or under what terms the schools will join the City of Providence government. At the point where this happens, the City should updated its reserve policy to recognize its new risk profile that reflects the addition of the schools. Generally, the schools should lower the City's risk profile. This is because the schools don't have the same public safety responsibilities as the City government to respond to extreme events and the school may have a more stable revenue portfolio (state aid may be more stable). The GFOA risk model can be updated to reflect the changes to the City's risk profile.

GFOA's analysis has its limits. It is impossible for any risk analysis to be completely comprehensive of all considerations facing the City. Appendix 2 to this report lists the important limitations of this analysis.

Appendix 1 – DRAFT City of Providence Fund Balance Policy

[insert document]

Appendix 2 – Limitations of GFOA's Analysis

This section highlights the most important limitations of our analysis.

Our analysis is not predictive. GFOA does not forecast future recessions, natural disasters, or other extreme events. Rather, our model generates hundreds or even thousands of different scenarios to show how the future could unfold. This helps the City think more broadly about risk so that it can be more prepared for whatever future event does eventually come to pass. Finally, it is important to note that low probability events are still possible events. Hence, even if our model says an event has a low probability, then that does not mean it won't occur.

GFOA is not a risk management consultant. We worked with the City to find out which risks the City believes are most salient and then modeled those risks quantitatively to judge the potential financial impact. We are not risk managers and it is not our role to tell the City which risks it should be more concerned or less concerned about or what the best way is to manage those risks.

Our analysis is based on historical records. Historical data is often a good way to model potential future outcomes. However, historical data may not be perfect. For example, global climate change could increase the City's vulnerability to naturally occurring extreme events.[26] This means that historical data could underestimate the likelihood and/or severity of extreme events in the future. Unfortunately, no one can say precisely what the impact of climate change will be. Hence, GFOA can't speculate if an upward adjustment to the reserves is necessary and, if so, by how much. However, this does mean that there could be a case for reserving a higher amount than the efficient range described in our report (or pursuing other risk management strategies). Also, GFOA's Microsoft Excel risk model provides the City with the ability to adjust the likelihood and/or magnitude of floods. This feature could be used to test different scenarios, including ones where climate change is assumed to increase the likelihood and/or magnitude of extreme events.

Our analysis is not inclusive of every risk the City could possibly face. We examined the City's past history and worked with City staff to identify the risks that posed the most clear and present danger to the City. However, it is possible that the City could experience a shock that no one was expecting. Hence, there is a case for reserving more than our analysis suggest is efficient. This could provide additional protection against risks that no one can foresee. Being prepared for these "unknowable" events is part of the value of the "red line" or critical threshold that our reserve analysis took into account. However, this does not mean that the City doesn't need to prepare for risks that aren't included in our model.

Our model is focused on general fund reserves as a risk mitigation tool. Other mitigation tools, such as insurance, can provide additional resources to respond to an extreme event. We did not judge the adequacy of the City's insurance program.

[26] According to the Fourth National Climate Assessment created by the U.S. Global Change Research Program (USGCRP) and released in November 2018: "more frequent and extreme weather and climate-related events, as well as changes in average climate conditions, are expected to continue to damage infrastructure, ecosystems, and social systems." The report cites climate-related risks to communities "from adverse weather and climate related events such as extreme storms or wildfires." https://nca2018.globalchange.gov/chapter/1/.

Good decisions do not always lead to good outcomes. Excel simulation tools can enhances one's perception and understanding of uncertainty and risk.[27] However, when dealing with uncertainty, even the best decision may not lead to a good outcome, if luck goes against you.[28] To illustrate, imagine an insurance company was willing to sell Providence an insurance policy against being hit by a meteor for $50 million. A meteor strike is an extremely remote risk, so spending $50 million on an insurance policy would not be a wise decision. Imagine Providence does then get hit by a meteor that causes $100 million in damage. Should you criticize the decision not to buy insurance? No, because the decision was reasonable given the information available at the time and there was no way to predict a meteor hitting the City. Similarly, our model may show that a given amount of reserves is reasonable under most conditions, but Providence could encounter a confluence of undesirable events that the reserves are insufficient to address.

[27] To survive in an increasingly unpredictable world, we need to train our brains to embrace uncertainty, Emre Soyer, Quartz Magazine, January 9, 2017 https://qz.com/879162/to-survive-in-an-increasingly-unpredictable-world-we-need-to-train-our-brains-to-embrace-uncertainty/.

[28] This is one of the primary lessons in: Annie Duke. *Thinking in Bets: Making Smarter Decisions When You Don't Have All the Facts*. Portfolio. 2019.