

Summary

Alaska today is in the lucky position of having an estimated \$126 billion in petroleum wealth—\$45 billion in savings accounts derived from oil revenues, and \$81 billion in future state revenues from oil and gas still in the ground—if current official state projections prove accurate.

Almost all state revenues come from oil, as they have for 30 years. But oil production is now only a third of what it once was, and analysts think that even with new discoveries and enhanced recovery, production from state lands will keep dropping. So Alaskans face a dilemma: how can we preserve this petroleum wealth for future generations, while still benefitting from it ourselves?

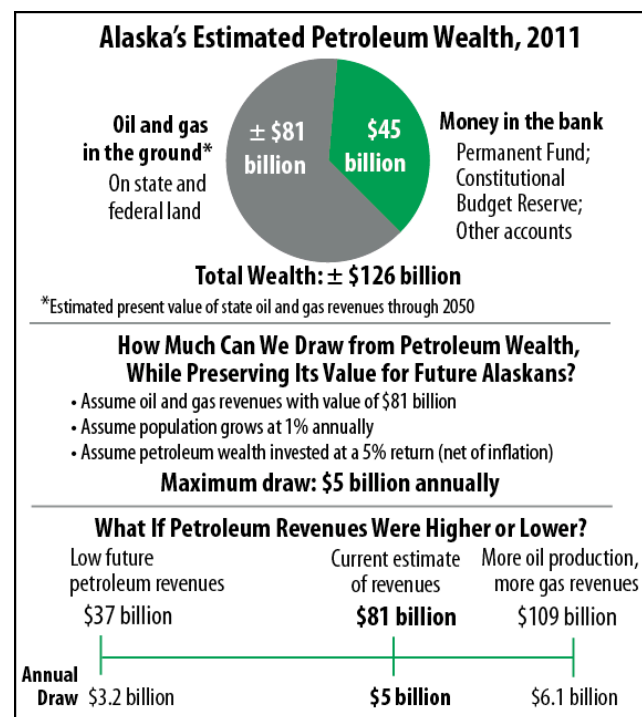
The answer is to limit how much we spend today from our petroleum wealth, and invest the savings in income generating assets. The income from those assets would grow over time and gradually replace declining petroleum revenues. We've already taken a major step, by depositing 24% of past oil revenues into savings accounts. Is that enough?

- *Alaska could draw up to \$5.0 billion this year and conserve its petroleum wealth at a constant value per resident.* That assumes \$81 billion in petroleum in the ground, state population growing at 1% a year, and annual income of 5% on state investments.

- *But the size of the wealth-preserving draw depends on actual future revenues.* It would be less if revenues projected by the Alaska Department of Revenue don't materialize, and more if production and prices are higher than currently expected. Because of this uncertainty, the level of the draw should take into account how much risk we feel comfortable with.

- *In the new fiscal year (FY2012), Alaska will draw about \$5.5 billion from petroleum wealth.* The overdraw means we're eroding its value and putting a **fiscal burden** on future generations.

Keep in mind that how much Alaska can draw from its petroleum wealth (oil revenues and financial reserves) isn't the same as what the state can spend. But state spending above the draw from petroleum wealth should be funded by non-petroleum taxes and other revenues. Then the beneficiaries of that spending would be bearing the cost.



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Northrim Bank

I. Introduction

Virtually all of Alaska's state revenues come from oil, and since production is declining, we need to set some aside for future needs.¹

The basic idea is simple. If some petroleum revenues are invested in productive assets like financial savings accounts, then income from those assets will grow over time and gradually replace declining petroleum revenues. In that way the non-sustainable petroleum tax base will be transformed into the sustainable tax base of a savings account. (See Appendix A for a simple arithmetic example of how this can work.)

Most Alaskans understand and support this idea, but it is hard to know HOW MUCH of current revenue to set aside. Future needs are unknown, and every dollar saved today means fewer dollars available to pay for the pressing needs we currently face.

Although Alaskans may never reach agreement about this tradeoff between current and future needs, we should not make the saving decision in a total vacuum and simply hope for the best. Rather, we should have some notion of a **target** —how much wealth we would like to have when we run out of petroleum, and a **rule** to guide our saving and spending decisions so that we can move towards that target.

II. The Target—Equal, Maximum, and Sustainable Benefits for All Alaskans

How much do we care about the well-being of future generations of Alaskans? As individuals many of us are likely to value our own current well-being over that of the next generation, for any number of personal reasons. We might expect to leave Alaska in the future, perhaps we have no children, or perhaps we feel the next generation should look out for themselves.

However, from the perspective of the state of Alaska, the next generation is important, and since future Alaskans are not yet here to speak for themselves, it falls to the state to look out for their interests. So when allocating public wealth, particularly from oil that belongs to all Alaskans, perhaps the state should show no favorites between current and future generations.

But equal treatment does not necessarily mean equal access to the oil wealth. For example, if we knew that the next generation of Alaskans would be twice as wealthy as we are, fairness might suggest that they should get a smaller share of the benefits of oil than we do. In that case we should use more of the oil revenues to meet current needs and save less.

But there is no guarantee that future generations of Alaskans will be better off than we are today. The current trend in the national economy suggests just the opposite might be the case. What is the likelihood that the next generation will be enjoying greater prosperity than us? No one can

¹ This is in addition to the need to set some aside for those “rainy days” when the oil price, and consequently revenues, takes a temporary dip. Unfortunately these price fluctuations have diverted our attention from the more fundamental problems discussed in this note.

answer that with confidence. But the neutral assumption seems to be that the next generation will be neither better nor worse off than we are.²

We also don't know how much wealth from our other natural resources will be available to the next generation. For example a dramatic increase in mining revenues could offset some of the fall in oil revenues, reducing the need to save.

But in the 50 years since Alaska became a state, revenues from our other natural resources have been insignificant compared to oil. It is safe to assume that the next generation will not be able to rely on state revenues from mining, seafood, timber, or tourism to replace those from petroleum in financing the state government. Since these other revenues are small compared with oil revenues, we can ignore them when deciding how much to save from oil revenues. (These other industries are of course important sources of jobs and income for Alaskans; we are referring here only to revenues the state derives from them.)

Because the Alaska population is growing, we need to decide whether equal treatment among generations means equal treatment for individuals. That seems reasonable, so the total benefit allotted to each generation would need to grow to maintain per capita equity across generations.

And finally, we need to decide how far into the future to look. Since the economic history of Alaska has always been based on resource development and there is little evidence that will change in the foreseeable future, we should conserve our wealth for all future generations of Alaskans.

If we value the well-being of individuals in future generations of Alaskans no more or no less than those in the current generation, if we have no strong reason to believe they will have higher incomes than current Alaskans, and if we think other natural resource wealth will remain about at its current level, then every Alaskan—current and future—should benefit equally from our petroleum wealth.³

That will happen, if our portfolio of petroleum wealth, no matter how it is held, grows at the same rate as population.⁴ And that target gives us a rule: save enough each year so the portfolio of petroleum wealth grows at the same rate as the population.⁵ Following this rule means that spending per person and petroleum wealth per person both remain constant over time, even after there are no more petroleum revenues to collect.

² We are assuming no significant growth in public sector needs per capita in the future—a strong assumption given past experience. But if there are new future needs they should be paid by the future beneficiaries.

³ This is somewhat like the idea of “Generational Accounting”, a method employed in Norway, to measure how different generations pay for and benefit from public services.

⁴ This also obviously requires we do not dissipate some of our wealth before we begin to save. Equal sharing of nothing is not an attractive alternative.

⁵ If wealth and spending per person are to remain constant while petroleum revenues fluctuate from year to year, the rule cannot be a constant savings RATE. The AMOUNT of saving each year must be set at the level that keeps wealth and spending per person constant.

There are many other possible targets that we could adopt, such as constant real wealth, maintenance of wealth for a fixed number of years, etc. and reasonable Alaskans can disagree on what target is the most appropriate.⁶ But this target of equal and sustainable wealth for all generations of Alaskans is a clear BENCHMARK against which to measure our actual savings behavior.⁷

III. Alaska's Main Assets

The state petroleum wealth is held in two forms—money in the bank and petroleum in the ground—which together have a value of roughly \$126 billion today.

III. a. Money in the Bank

The combined value of the largest financial assets—the Permanent Fund, the Constitutional Budget Reserve (CBR), the Statutory Budget Reserve, and the available balance in the General Fund—is about \$45 billion (Table 1).⁸

Table 1. State Financial Assets as of June 30, 2010 (Billion \$)

TOTAL	\$45	
Permanent Fund	\$33.3	Alaska Permanent Fund Corporation, 2010 Annual Financial Report
Constitutional Budget Reserve	\$8.7	Alaska Department of Revenue, Treasury Division, Combined Schedule of Invested Assets, June 30, 2010
Statutory Budget Reserve	\$1	Alaska Department of Revenue, Tax Division, <u>Revenue Sources</u> , Fall 2009
General Fund	\$2	Author estimate
Other	-	
Note: The general fund estimate is a very rough measure of the share of the general fund not in restricted accounts (of which the Statutory Budget Reserve is one) and not necessary to meet the cash flow requirements of the state. For completeness we show an "Other" category which would consist of other unrestricted financial assets that could be appropriated to support state spending.		

III. b. Petroleum in the Ground

The value to the state treasury of our other large asset—petroleum in the ground—depends on how much is ultimately produced, at what price, and under what fiscal terms. These factors will determine future petroleum revenues collected by the state.

⁶ It can be argued this is a "King Midas" approach to wealth management in that saving does not put petroleum wealth to work for the benefit of Alaskans, which usually means using savings to create jobs. However the sustainable flow of income generates a flow of benefits that is balanced between current and future generations whereas spending the wealth on job creation generally benefits only the current generation of Alaskans.

⁷ An alternative strategy sometimes suggested is to save all petroleum revenues as they are received and spend only the earnings on the fund created from those revenues. This would result in growing spending over time which would favor future generations of Alaskans at the expense of current needs. This is essentially what has come to be known as the Cremo Plan.

⁸ There are smaller unreserved balances in some other state accounts, which we exclude in order to keep the analysis simple.

The standard method for putting an economic value on a future stream of revenues is to calculate its present value. This is the amount someone would be willing to pay today for the right to receive those future revenues. For example, if revenues of \$25 million, \$20 million, \$15 million, \$10 million, and \$5 million were expected in the next five years, and the discount rate was 5 percent, that revenue stream would have a present value of \$67.05 million.

Present Value Example

End of Year	Annual Revenues	Discount Factor @ 5% Annually	Present Value of Revenues
Sum	\$ 75.00		\$ 67.05
1	\$ 25.00	95.2%	\$ 23.81
2	\$ 20.00	90.7%	\$ 18.14
3	\$ 15.00	86.4%	\$ 12.96
4	\$ 10.00	82.3%	\$ 8.23
5	\$ 5.00	78.4%	\$ 3.92

A person owning the asset that produces these annual revenues could hold onto it and collect the revenues as they are paid (Alternative 1) or sell the asset today (Alternative 2) for \$67.05 million. The person would be indifferent between these two alternatives because in either case if the revenues were reinvested as received, the person would have \$85.57 at the end of year 5.

Alternative 1. Invest Revenues as They Accrue

Year	Beginning Balance	Re-Investment Income	Annual Revenues	Ending Balance
1	\$ -	\$ -	\$ 25.00	\$ 25.00
2	\$ 25.00	\$ 1.25	\$ 20.00	\$ 46.25
3	\$ 46.25	\$ 2.31	\$ 15.00	\$ 63.56
4	\$ 63.56	\$ 3.18	\$ 10.00	\$ 76.74
5	\$ 76.74	\$ 3.84	\$ 5.00	\$ 85.57

Alternative 2. Take Net Present Value and Invest

Year	Beginning Balance	Re-Investment Income	Ending Balance
1	\$67.05	\$3.35	\$70.40
2	\$70.40	\$3.52	\$73.92
3	\$73.92	\$3.70	\$77.62
4	\$77.62	\$3.88	\$81.50
5	\$81.50	\$4.07	\$85.57

Unfortunately, there is no long run comprehensive projection of future state petroleum revenues from which to calculate a net present value estimate of the value of petroleum in the ground.

The most widely used estimate of future oil revenues is the 10-year forecast the Alaska Department of Revenue (ADOR). Within the next decade almost all production will be oil from state-owned land on the North Slope between the Colville and Canning Rivers.⁹ The most current projection forecasts nominal revenues for the period 2012 through 2020 to be \$66 billion. Converted to net present value (using a 5% discount rate and a 2.75% inflation rate) this stream of future revenues has a value today of \$45 billion (Appendix B.). In a world of perfect information and certainty, the state could sell this stream of future revenues today for that amount.

Looking further into the future, ADOR does estimate cumulative production of 5.3 billion barrels between FY2011 and FY2050.¹⁰ Assuming a constant oil price and production decline rate of 5 % annually, we can estimate the revenue stream from North Slope state lands after 2020 and from it derive a \$27 billion estimate of its present value (Appendix B). Thus the total net present value of oil revenues, primarily from state lands, is \$72 billion (\$45+\$27).

Revenues from oil production from regions and reservoirs not included in the ADOR estimate (ANWR, some NPRA, OCS and heavy oil) cannot be easily forecast. Because production costs will generally be higher and the federal government will be taking a larger share of the revenues from most of this production, it is safe to assume that the per-barrel revenue from this oil will be less than current production on state land.

But in addition, because future revenues have a lower net present value than current revenues, estimates of the net present value of revenues from these regions will be small compared to those from state lands.¹¹ A rough estimate of the value of this oil in the ground is \$2 billion, based on heavy oil production and modest OCS revenues (no sharing of federal royalties) with NPRA revenues included in the ADOR projection and no production from ANWR (Appendix C).

We assume commercialization of natural gas, but because of discounting, the net present value of gas revenues is also modest. Our estimate is based on the TransCanada AGIA application projection of revenues, but because it is several years old and the gas market has changed dramatically in the last few years, we adjust the net present value downward by 75%.

Adding these net present value amounts together, the total estimated value of state wealth in the form of petroleum in the ground is \$81 billion with most of that wealth composed of near term production of oil on state lands.

⁹ Alaska Department of Revenue, Fall 2010 Revenue Sources Book, page 38 states....“We do not include any estimates for undiscovered oil ... We exclude from our estimates production from most of the known heavy or viscous oil deposits; in fact we consider none of the approximately 20 billion barrels from the giant Ugnu deposit.... We exclude 97% of the viscous/heavy oil from the large West Sak field, projecting roughly 331 million barrels recovery out of the roughly 10 billion barrels in place. We also exclude 93% of the heavy oil at Schrader Bluff, projecting roughly 131 million barrels recovery out of over 2 billion barrels in place... We exclude these resources, both known and unknown, in order to avoid speculation and to reduce the uncertainty typically associated with the commercialization, timing and magnitude of resource development. Accordingly, we believe that our current estimates of ultimately recovery from the North Slope are reasonable.”

¹⁰ Alaska Department of Revenue, Fall 2009 Revenue Sources Book, page 37.

¹¹ For example, at a discount rate of 8% (5% real return plus inflation at 3%) a dollar of revenue available in 10 years has a net present value of only 46 cents and if available in 20 years its net present value is 21 cents.

Table 2. Value for State Petroleum Wealth in the Ground in 2010 (Billion \$)

Total	\$81	
Oil	\$74	
State Land—North Slope 2011-2020	\$45	Alaska Department of Revenue
State Land—North Slope 2021+	\$27	Author estimate
State Land—Other Locations	-	
State Land—Heavy Oil	\$1	Author estimate
Federal NPRA	-	Included in ADOR forecast
Federal OCS	\$1	Author estimate
Federal ANWR	-	Author estimate
Gas	\$7	TransCanada AGIA Application adjusted by author
Includes projected general fund and permanent fund revenues.		

Unlike the value of our financial assets, which we know with certainty, any estimate of the value of petroleum wealth in the ground could be off by 100% or more. If our estimate turns out to be too high, we might not save enough for the future. If it is too low, we could save more than necessary to maintain equity with future generations. We discuss how to deal with this uncertainty below.

IV. Establishing a BENCHMARK -- The Wealth Preserving Draw

A portfolio of assets worth \$126 billion consisting of \$45 billion in the bank and \$81 billion in the ground could generate annual income of \$6.3 billion in perpetuity (2010\$), assuming a 5% real rate of return.¹² But for our wealth to grow with population increasing 1% each year, we would need to reinvest \$1.25 billion of that income to maintain constant real per capita wealth. Consequently the current --BENCHMARK— or wealth preserving draw in FY2012 would be \$5.0 billion (about \$7,200 per person)—4% of our wealth, or the real rate of earnings minus the population growth rate (Table 3).

Table 3. FY2012 Wealth-Preserving Draw Calculation (Billion \$)

Petroleum Wealth (Billion \$)	Annual Sustainable Income (Billion \$)	Population Growth Rate	BENCHMARK--Wealth Preserving Draw		
			Rate	Amount (Billion \$)	Per Capita Amount
\$126	\$6.3	1 %	4 %	\$5.00	\$7,180

If we draw and spend more than this BENCHMARK, the value of our assets will not keep up with population growth and future generations will bear a **fiscal burden** (measured as the loss in per capita wealth of future generations due to overspending today).

¹² This is the target return on the Permanent Fund. If our other financial assets were similarly invested, they could earn a similar rate of return. Here we assume they are invested like the Permanent Fund.

If we draw less than the wealth preserving amount, our wealth will increase, future earnings will be higher, and with more wealth, future generations will be better off than us.

V. Implementation of the Rule—Are We Saving Enough Today?

The actual draw on our wealth in FY 2012 is yet to be determined, but is likely to be more than \$5.5 billion, about \$.5 billion more than the wealth preserving level of \$5.0 billion.¹³ This draw will reduce our per-capita wealth.

Spending from our wealth will consist of petroleum general fund revenues not saved (\$4.6 billion), fund earnings spent (.2 billion) and Permanent Fund dividends paid (\$.75 billion).

Table 4. FY2012 Estimated State Draw from Assets—FY2012 (Billion \$)

General Fund Spending	\$5.28	Office of Management and Budget, June 2010 Fiscal Summary—FY 2011 Enacted—This is increased by 3% by author assumption to estimate FY2012 spending
Minus: Non-Petroleum Revenues—Collected and Spent	\$.49	Alaska Department of Revenue, <u>Revenue Sources</u> , Fall 2010
Equals: GF Petroleum Wealth Spending	\$4.79	
Petroleum Revenues Spent	\$4.60	
Earnings on Reserves Spent	\$.20	
Plus: Permanent Fund Dividend Distributed	\$.75	Permanent Fund Corporation, Fall 2010 adjusted by author to estimate CY 2011 spending
Equals: Total Asset Draw	\$5.54	

Because the \$5.54 billion draw from wealth will exceed the BENCHMARK or wealth-preserving amount--\$5.0 billion, the value of state wealth (oil in the ground plus cash in the bank) will decline between the beginning and end of FY2012, as will the BENCHMARK moving forward into the next year.¹⁴

Table 5. State Wealth: Change in Value, FY2012 (Billion \$)

Start of FY 2012	\$126
Non-Sustainable Draw on Wealth	\$.5
End of FY 2012	\$125.5
% change	-.4%

Table 6. Sustainable Draw: Change in Value, FY2012 (Billion \$)

Start of FY 2012	\$5.04
Spend out of Assets	\$.02
End of FY 2012	\$5.02
% change	-.4%

¹³ The FY 2012 budget level will be determined during the spring of 2011.

¹⁴ Because we assume no inflation over the year, these changes are in real dollars.

These reductions are small, but in a year when there was much talk of “saving a portion of our windfall,” they should give us pause. The amount of savings is not enough to maintain our wealth.

VI. How Sensitive is the Wealth-Preserving Draw Rate to Future Petroleum Revenues?

We can easily measure the value of our financial assets, but more than half of our wealth is petroleum in the ground. What if future petroleum revenues turn out to be more or less than we expect today? How would that change the calculation of the wealth preserving draw, and how should we deal with that uncertainty?

Table 7 shows a few cases to demonstrate that the range of estimates of our wealth is wide, and that the draw varies directly with the wealth estimate.¹⁵ The known value of our financial assets puts a floor beneath the range, but because of the uncertainty about future petroleum revenues, the wealth preserving draw could easily range upwards of \$6 billion.^{16 17}

Table 7. Sensitivity of 2012 BENCHMARK to Wealth Estimate

				Estimate in this Note			
WEALTH (billion \$)	\$ 82	\$ 97	\$ 113	\$ 126	\$ 133	\$ 147	\$ 154
FINANCIAL ASSETS	\$ 45	\$ 45	\$ 45	\$ 45	\$ 45	\$ 45	\$ 45
PETROLEUM ASSETS	\$ 37	\$ 52	\$ 68	\$ 81	\$ 88	\$ 102	\$ 109
State Land North Slope 2012-2020	\$ 22-	\$ 22	\$ 45	\$ 45	\$ 45	\$ 45	\$ 45
State Land North Slope 2021-2050	\$ 14	\$ 27	\$ 14	\$ 27	\$ 27	\$ 27	\$ 27
State Land Heavy Oil	0	\$ 1	\$ 1	\$ 1	\$ 1	\$ 1	\$ 1
NPRA	0	0	0	0	0	0	0
ANWR	0	0	0	0	0	0	\$ 7
OCS	0	\$-1	\$ 1	\$ 1	\$ 1	\$ 1	\$ 1
Gas	0	0	\$ 7	\$ 7	\$ 14	\$ 28	\$ 28
BENCHMARK @ 4%	\$ 3.26	\$ 3.88	\$ 4.50	\$ 5.04	\$ 5.32	\$ 5.88	\$ 6.16

Given this uncertainty we need to consider what happens if the draw rate is set wrong. If we draw too much, we run down our wealth. If we draw too little, we end up with more wealth as time goes by. Either is unfair, if we’re attempting to keep benefits equal between current and future Alaskans.

¹⁵ The value of petroleum in the ground is also sensitive to the discount rate used to calculate present value.

¹⁶ Limiting the time horizon—for example if our target were to cash out the asset in 50 years—would increase the draw.

¹⁷ Increasing the population growth rate would reduce the draw for any given level of wealth.

The state should “hedge its bets” to increase the likelihood of not running out of its petroleum wealth too soon, by trying to draw somewhat less than the “best guess” amount. But just how much less is impossible to say.¹⁸

VII. Should Investment Count as Savings?

We have used the example of a financial account to illustrate the question of how much to save to preserve our wealth. But accumulating physical assets and human capital are also essential for a strong economy, and both generate benefits for Alaskans. Alaska is certainly richer today for the roads, airports, schools, and other public infrastructure that oil revenues have paid for. And spending on educational and health facilities have improved the quality of human capital.

We should count the spending of petroleum revenues on physical assets and human capital as investments that preserve wealth if they produce a sustainable flow of benefits valued as highly as the return on money in the bank. In fact this flow of money is the “opportunity cost” against which that spending should be compared (because that flow of money can be used directly to purchase benefits).

Unfortunately, public spending on physical assets or human capital is rarely subjected to a rigorous analysis of its benefits or comparison to its opportunity cost. If it were, much of it would come up short compared to its opportunity cost, and have to be classified as spending rather than investment.

Ideally, we should calculate how much wealth we have accumulated from investing in physical infrastructure and human capital development. This would provide a more complete picture of our current wealth when added to the value of oil in the ground and money in the bank.

But if we included physical infrastructure and human assets of the state in the wealth account, we would also need to allocate a share of the BENCHMARK spending each year to the preservation of those assets through expenditures on maintenance and replacement. This spending to maintain that part of our wealth portfolio would reduce the amount available for other purposes.

VIII. How Does Debt Influence the Calculation?

Debt financing of capital projects serves a useful function. It spreads payment for a project over its useful life. In that way, the direct beneficiaries of the project pay for it.

A portion of the BENCHMARK--wealth-preserving draw--could be used for debt service payments on capital projects financed by bonds, but borrowing would not change calculation of the size of the draw.

In some circumstances the interest rate on bonds might be less than the return on state financial investments, making it attractive to engage in “arbitrage”—borrowing at a low interest rate and investing the proceeds at a higher rate. If successful, this strategy would increase the total return on state wealth and therefore the size of the wealth-preserving draw.

¹⁸ Using the “best guess” estimate of a wealth preserving draw means there is about a 50% chance of setting the draw too low, but also a 50% chance of setting it too high. “Hedging your bet” means setting it at a level that reduces below 50% the chance of it being too high.

IX. Have We Preserved our Wealth from North Slope Oil?

From FY1978 (when North Slope production began) through FY2010 the State of Alaska has collected \$156 billion (in 2010 dollars) in oil revenues. That includes all taxes and royalties paid into the Permanent Fund, the Constitutional Budget Reserve, and the general fund (which includes the statutory budget reserve). Of that total, about \$37 billion (24%) has been put into our various financial savings accounts—either through required or special contributions.

Has this saving been sufficient to preserve our wealth?

Based on actual revenues collected, expected revenues yet to be collected (Table 2), and a projected annual population growth rate of 1%, we appear to have done a pretty good job of preserving our wealth for both the current and future generations.

Prudhoe Bay wealth in 1978, in the form of future petroleum revenues (assuming the current projection of yet to be collected revenues is accurate), had a net present value of \$88 billion (2010 \$). Based on actual population growth, that could sustain a maximum annual draw of \$7,180 per capita (2010\$). If the state had adopted a BENCHMARK based on that amount, we would have accumulated \$48 billion in financial assets today and our current portfolio would have a value of \$127 billion. Since our estimate of actual wealth today is \$126 billion, we appear to be on track (Appendix D.).

But in 1978 no one had put a dollar value on our petroleum wealth, and if they had, the estimate would have been much lower than \$88 billion. No one expected the future price of oil to come anywhere close to \$100, and ultimate production was not expected to exceed 10 billion barrels. (Cumulative North Slope oil production has recently passed the 16 billion barrel mark.)

So our apparent success at wealth preservation has been largely due to good luck. We appear to be on track today because prices, production, and oil revenues have all been higher than we anticipated. Of course if future revenues turn out to be less than we expect today, we will fall off the wealth preserving path.

X. Tracking Our Performance

As part of the annual state government budgeting process, we should keep track of our entire portfolio of wealth. If our goal is to preserve our wealth to share with future generations, we should then limit the annual draw from that wealth (use of current oil revenues and spending from financial reserves, including the Permanent Fund) to the BENCHMARK amount.

Spending above the BENCHMARK should be paid for with other taxes and revenues. In that way each generation would share equally in the benefits of our wealth and share equitably the responsibility of paying for the public services it enjoys.

Further Reading

Investing for Sustainability: The Management of Mineral Wealth, by Rognvaldur Hannesson (Norwegian School of Economics and Business Administration), Kluwer Academic Publishers, Boston, 2001.

“Living on Borrowed Time: Alberta at the Crossroads,” by Ronald Kneebone et al., Institute for Advanced Policy Research at the University of Calgary, Policy Brief #0401, 2004.

“Resource Revenues and Fiscal Sustainability in Alberta,” by Leslie Shiell and Colin Busby, University of Ottawa, Department of Economics #0807E, 2008.

Appendix A: The Mechanics of Wealth Preservation: A Simple Example

Table A. shows how a stream of petroleum revenues can be converted into a permanent financial asset that grows in value with the population. Initially the only asset is the future stream of petroleum revenues with a net present value of \$227.8 million, using a 5% discount rate. At a 5% real rate of return an asset of that size can generate income of \$11.4 million. If population (starting at 100 thousand) grows at 1% per year, \$9.1 million of that income could be spent (with \$2.1 million reinvested) and total wealth would increase at the same 1% rate as population. This would keep wealth per capita constant at \$2,278. Each year both the asset and its income would grow 1% so the draw can also grow by 1%. The draw per capita would stay constant at \$90.20 (Figure A.1). (Inflation is assumed to be zero to keep the example simple.)

In the first year, the state collects revenues of \$50 million, which it allocates 82% (\$40.9 million) to savings in a fund of financial assets and the remainder—\$9.1 million—to the draw which it spends. At the start of the second year the net present value of the remaining stream of petroleum revenues has fallen to \$189.2 million, but the decline has been offset by the \$40.9 million in the financial account. Total assets have increased in value by 1%, to \$230.1 million (Figure A.2).

In the second year, \$45 million in revenue is collected, the draw is now \$9.2 million, and the rest of the revenue, \$35.8 million, is added to the \$40.9 million in the financial account. This generates earnings at 5%, so at the end of the year the state has assets of \$232.4 million—consisting of \$153.7 million worth of oil in the ground and \$78.7 million in the financial account.

In the early years, the draw for spending comes from a portion of petroleum revenues. Saving consists of the remainder of petroleum revenues, deposited into the fund, and all the earnings of the fund, which are reinvested. Over time the savings rate (share of petroleum revenues deposited in the fund) falls as a larger portion is required for the draw.¹⁹

Starting in year 10, funding the draw begins to transition to the earnings of the fund, and in year 11, the entire draw comes from the earnings of the fund, which has an ending balance of \$251.7 million when the flow of petroleum revenues ends.

From that time forward the draw comes entirely from fund earnings. The fund and earnings continue to grow to maintain constant per capita levels.

¹⁹ If during this time part of the draw comes from the financial assets, then saving from current petroleum revenues must be greater by an equal amount. Column D in the table is actually the net savings that must occur, regardless of its source.

**Table A. Transforming Petroleum Revenues into a Permanent Asset: Example
(Million 2010\$)**

End of Year	Petroleum Revenues (A)	Present Value of Future Petroleum Revenues (B)	Actual Draw = BENCHMARK (C)	Petroleum Revenue Savings* (D=A-C)	Financial Fund Balance (E)	Sum of Assets (B+E)	Saving Ratio (D/A)	Pop (Thou)	Assets per Person (dollars)	Draw per Person (dollars)
		\$227.8			\$0.0	\$227.8		100.0		
1	\$50.0	\$189.2	\$9.1	\$40.9	\$40.9	\$230.1	82%	101.0	\$ 2,278	\$ 90.2
2	\$45.0	\$153.7	\$9.2	\$35.8	\$78.7	\$232.4	80%	102.0	\$ 2,278	\$ 90.2
3	\$40.0	\$121.4	\$9.3	\$30.7	\$113.4	\$234.7	77%	103.0	\$ 2,278	\$ 90.2
4	\$35.0	\$92.4	\$9.4	\$25.6	\$144.6	\$237.1	73%	104.1	\$ 2,278	\$ 90.2
5	\$30.0	\$67.1	\$9.5	\$20.5	\$172.4	\$239.4	68%	105.1	\$ 2,278	\$ 90.2
6	\$25.0	\$45.4	\$9.6	\$15.4	\$196.4	\$241.8	62%	106.2	\$ 2,278	\$ 90.2
7	\$20.0	\$27.7	\$9.7	\$10.3	\$216.6	\$244.3	52%	107.2	\$ 2,278	\$ 90.2
8	\$15.0	\$14.1	\$9.8	\$5.2	\$232.6	\$246.7	35%	108.3	\$ 2,278	\$ 90.2
9	\$10.0	\$4.8	\$9.9	\$0.1	\$244.4	\$249.2		109.4	\$ 2,278	\$ 90.2
10	\$5.0		\$10.0		\$251.7	\$251.7		110.5	\$ 2,278	\$ 90.2
11	\$0.0		\$10.1		\$254.2	\$254.2		111.6	\$ 2,278	\$ 90.2
12	\$0.0		\$10.2		\$256.7	\$256.7		112.7	\$ 2,278	\$ 90.2
13	\$0.0		\$10.3		\$259.3	\$259.3		113.8	\$ 2,278	\$ 90.2
Sum	\$275.0			\$184.5						
	5% Discount rate									
	1% Population Growth Rate									
	* Petroleum revenue savings is deposited into Fund.									

Figure A.1. Draw Per Person (Thousand 2010\$)

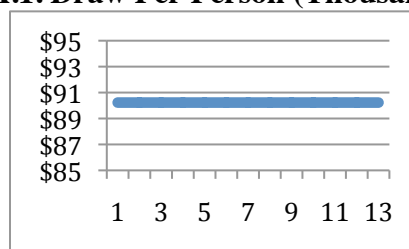
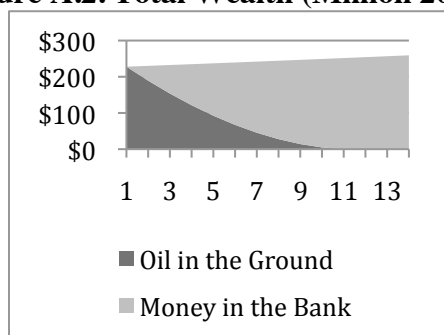


Figure A.2. Total Wealth (Million 2010\$)



Appendix B. Present Value of North Slope Petroleum Revenues from State Lands (Million 2010 \$)

Fiscal Yr	Wellhead Oil Price (WTI Nominal)	NS Production in Barrels		Revenues (\$ million nominal)			Revenues per barrel	Inflation Discount Factor to 2010 \$	Revenues (2010 \$)
		per day (000)	per year (million)	Unrestricted	Restricted	Total			
2010	\$ 69	644	235	\$ 4,915	\$ 1,281	\$ 6,196	\$ 26	1.000	\$ 6,196
2011	\$ 72	616	225	\$ 4,674	\$ 689	\$ 5,363	\$ 24	0.973	\$ 5,219
2012	\$ 76	622	227	\$ 5,061	\$ 775	\$ 5,836	\$ 26	0.947	\$ 5,528
2013	\$ 82	642	234	\$ 5,513	\$ 815	\$ 6,328	\$ 27	0.922	\$ 5,833
2014	\$ 86	629	230	\$ 6,068	\$ 846	\$ 6,914	\$ 30	0.897	\$ 6,203
2015	\$ 91	608	222	\$ 6,520	\$ 855	\$ 7,375	\$ 33	0.873	\$ 6,440
2016	\$ 93	623	227	\$ 7,092	\$ 845	\$ 7,937	\$ 35	0.850	\$ 6,745
2017	\$ 96	607	222	\$ 7,251	\$ 820	\$ 8,071	\$ 36	0.827	\$ 6,675
2018	\$ 98	582	212	\$ 7,308	\$ 798	\$ 8,106	\$ 38	0.805	\$ 6,525
2019	\$ 101	551	201	\$ 7,044	\$ 769	\$ 7,813	\$ 39	0.783	\$ 6,120
2020	\$ 104	520	190	\$ 6,798	\$ 740	\$ 7,373	\$ 39	0.762	\$ 5,621
2021		494	180	\$ -	\$ -	\$ 7,005		0.742	\$ 5,197
2022		469	171	\$ -	\$ -	\$ 6,655		0.722	\$ 4,805
2023		446	163	\$ -	\$ -	\$ 6,322		0.703	\$ 4,443
2024		424	155	\$ -	\$ -	\$ 6,006		0.684	\$ 4,108
2025		402	147	\$ -	\$ -	\$ 5,705		0.666	\$ 3,798
2026		382	140	\$ -	\$ -	\$ 5,420		0.648	\$ 3,512
2027		363	133	\$ -	\$ -	\$ 5,149		0.631	\$ 3,247
2028		345	126	\$ -	\$ -	\$ 4,892		0.614	\$ 3,002
2029		328	120	\$ -	\$ -	\$ 4,647		0.597	\$ 2,775
2030		311	114	\$ -	\$ -	\$ 4,415		0.581	\$ 2,566
2031		296	108	\$ -	\$ -	\$ 4,194		0.566	\$ 2,373
2032		281	103	\$ -	\$ -	\$ 3,984		0.551	\$ 2,194
2033		267	97	\$ -	\$ -	\$ 3,785		0.536	\$ 2,028
2034		254	93	\$ -	\$ -	\$ 3,596		0.521	\$ 1,875
2035		241	88	\$ -	\$ -	\$ 3,416		0.508	\$ 1,734
2036		229	84	\$ -	\$ -	\$ 3,245		0.494	\$ 1,603
2037		217	79	\$ -	\$ -	\$ 3,083		0.481	\$ 1,482
2038		207	75	\$ -	\$ -	\$ 2,929		0.468	\$ 1,370
2039		196	72	\$ -	\$ -	\$ 2,782		0.455	\$ 1,267
2040		186	68	\$ -	\$ -	\$ 2,643		0.443	\$ 1,171
2041		177	65	\$ -	\$ -	\$ 2,511		0.431	\$ 1,083
2042		168	61	\$ -	\$ -	\$ 2,386		0.420	\$ 1,001
2043		160	58	\$ -	\$ -	\$ 2,266		0.409	\$ 926
2044		152	55	\$ -	\$ -	\$ 2,153		0.398	\$ 856
2045		144	53	\$ -	\$ -	\$ 2,045		0.387	\$ 791
2046		137	50	\$ -	\$ -	\$ 1,943		0.377	\$ 732
2047		130	48	\$ -	\$ -	\$ 1,846		0.366	\$ 677
2048		124	45	\$ -	\$ -	\$ 1,754		0.357	\$ 625
2049		117	43	\$ -	\$ -	\$ 1,666		0.347	\$ 578
2050		112	41	\$ -	\$ -	\$ 1,583		0.338	\$ 535
TOTAL 2012+ (Million)			4,797			\$ 175,779			\$118,044
TOTAL 2012-2020 (Million)			1,965	\$ 58,655	\$ 7,263	\$ 65,753			\$ 55,690
TOTAL 2021-2050 (Million)						\$ 110,025			\$ 62,354
NPV 2012+ (Billion)						\$73			
NPV 2012-2020 (Billion)						\$45			
NPV 2021+ (Billion)						\$27			
5% production decline rate from 2020									
5% real discount rate									
2.75% inflation rate									

Source: Alaska Department of Revenue, Revenue Sources, Fall 2010, and ISER.

Appendix C. Present Value of Revenues from New Petroleum (Million 2010 \$)

BASE CASE used in this paper includes gasoline (25% of TransCanada), OCS, and Heavy Oil.

Fiscal Yr	Gas-Line	OCS	Heavy Oil	ANWR	NPRA	Total Other Revenues (2010 Million \$)	BASE CASE Total Other Revenues (2010 Million \$)
2010							
2011	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 0	\$ 0
2012	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 0	\$ 0
2013	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 0	\$ 0
2014	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 0	\$ 0
2015	\$ -	\$ -	\$ 87	\$ -	\$ 87	\$ 175	\$ 87
2016	\$ -	\$ -	\$ 87	\$ -	\$ 87	\$ 175	\$ 87
2017	\$ -	\$ -	\$ 87	\$ -	\$ 87	\$ 175	\$ 87
2018	\$ -	\$ -	\$ 87	\$ -	\$ 87	\$ 175	\$ 87
2019	\$ -	\$ -	\$ 87	\$ -	\$ 87	\$ 175	\$ 87
2020	\$ 1,997	\$ -	\$ 87	\$ -	\$ 87	\$ 2,171	\$ 586
2021	\$ 1,980	\$ -	\$ 87	\$ -	\$ 87	\$ 2,155	\$ 582
2022	\$ 2,095	\$ -	\$ 87	\$ 1,444	\$ 87	\$ 3,714	\$ 611
2023	\$ 2,134	\$ -	\$ 87	\$ 1,444	\$ 87	\$ 3,753	\$ 621
2024	\$ 2,286	\$ -	\$ 87	\$ 1,444	\$ 87	\$ 3,905	\$ 659
2025	\$ 2,436	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,221	\$ 863
2026	\$ 2,608	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,393	\$ 906
2027	\$ 2,644	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,430	\$ 915
2028	\$ 2,709	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,494	\$ 931
2029	\$ 2,823	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,608	\$ 959
2030	\$ 2,975	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,760	\$ 997
2031	\$ 3,093	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,879	\$ 1,027
2032	\$ 3,167	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,953	\$ 1,046
2033	\$ 3,154	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,940	\$ 1,042
2034	\$ 3,139	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,924	\$ 1,038
2035	\$ 3,121	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,907	\$ 1,034
2036	\$ 3,102	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,887	\$ 1,029
2037	\$ 3,080	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,866	\$ 1,024
2038	\$ 3,056	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,842	\$ 1,018
2039	\$ 3,031	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,816	\$ 1,011
2040	\$ 3,002	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,788	\$ 1,004
2041	\$ 2,971	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,756	\$ 997
2042	\$ 2,937	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,723	\$ 988
2043	\$ 2,900	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,685	\$ 979
2044	\$ 2,859	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,645	\$ 969
2045	\$ 2,819	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,605	\$ 959
2046	\$ 2,780	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,565	\$ 949
2047	\$ 2,741	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,526	\$ 939
2048	\$ 2,702	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,488	\$ 929
2049	\$ 2,665	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,450	\$ 920
2050	\$ 2,627	\$ 166	\$ 87	\$ 1,444	\$ 87	\$ 4,413	\$ 911
SUM	\$ 85,634	\$ 4,327	\$ 3,143	\$ 41,884	\$ 3,143	\$ 138,132	\$ 28,879
NPV (Billion)	\$28	\$1	\$1	\$13	\$1	\$45	\$10

Initial nominal value for estimates are \$250 million for OCS, \$100 million for heavy oil, \$2,000 million for ANWR, and \$100 million for NPRA.

Appendix D. Saving History and Future Potential

This table shows that in 1978 the wealth preserving draw was \$7,180 per person (2010\$), based on actual historical oil revenues and population combined with projected oil revenues (Table 2 in the text) and population growth of 1% annually.

At that level of draw each year we would have financial savings of \$48 billion today (assuming a 5% real rate of return on investment), slightly more than actual financial savings of \$45 billion.

End of Year	Petroleum Revenues (A)	Present Value of Future Petroleum Revenues (B)	BENCHMARK DRAW RATE = Actual Draw (C)	Petroleum Revenue Savings* (D=A-C)	Financial Fund Balance (E)	Sum of Assets (B+E)	Saving Ratio (D/A)	Pop	Assets/Pop (Thousand 2009\$)	Real Per Capita Draw
		\$87.7			\$0.0	\$87.7				
1978	\$1.3	\$90.8	\$2.96	(\$1.6)	(\$1.6)	\$89.1	-126%	412	\$ 216	\$ 7.18
1979	\$2.2	\$93.1	\$3.0	(\$0.8)	(\$2.5)	\$90.6	-35%	414	\$ 219	\$ 7.18
1980	\$5.8	\$92.0	\$3.0	\$2.8	\$0.1	\$92.1	48%	420	\$ 219	\$ 7.18
1981	\$7.6	\$88.9	\$3.1	\$4.5	\$4.6	\$93.6	59%	435	\$ 215	\$ 7.18
1982	\$7.8	\$85.6	\$3.3	\$4.4	\$9.3	\$94.9	57%	465	\$ 204	\$ 7.18
1983	\$6.7	\$83.2	\$3.6	\$3.1	\$12.9	\$96.1	46%	500	\$ 192	\$ 7.18
1984	\$6.0	\$81.3	\$3.8	\$2.3	\$15.8	\$97.1	37%	525	\$ 185	\$ 7.18
1985	\$5.6	\$79.8	\$3.9	\$1.7	\$18.3	\$98.1	31%	544	\$ 180	\$ 7.18
1986	\$5.3	\$78.4	\$4.0	\$1.4	\$20.6	\$99.0	25%	551	\$ 180	\$ 7.18
1987	\$2.8	\$79.6	\$3.9	(\$1.1)	\$20.5	\$100.1	-40%	542	\$ 185	\$ 7.18
1988	\$4.2	\$79.4	\$3.8	\$0.3	\$21.9	\$101.2	8%	536	\$ 189	\$ 7.18
1989	\$3.6	\$79.8	\$3.9	(\$0.3)	\$22.6	\$102.4	-9%	539	\$ 190	\$ 7.18
1990	\$3.9	\$79.9	\$4.0	(\$0.1)	\$23.7	\$103.5	-3%	554	\$ 187	\$ 7.18
1991	\$5.1	\$78.7	\$4.1	\$1.0	\$25.9	\$104.6	20%	570	\$ 184	\$ 7.18
1992	\$3.9	\$78.8	\$4.2	(\$0.3)	\$26.8	\$105.6	-9%	587	\$ 180	\$ 7.18
1993	\$4.7	\$78.1	\$4.3	\$0.4	\$28.5	\$106.6	8%	597	\$ 178	\$ 7.18
1994	\$2.8	\$79.2	\$4.3	(\$1.6)	\$28.4	\$107.6	-56%	601	\$ 179	\$ 7.18
1995	\$4.8	\$78.4	\$4.3	\$0.5	\$30.3	\$108.7	10%	602	\$ 180	\$ 7.18
1996	\$3.4	\$78.9	\$4.4	(\$1.0)	\$30.9	\$109.8	-28%	606	\$ 181	\$ 7.18
1997	\$3.8	\$79.0	\$4.4	(\$0.5)	\$31.9	\$110.9	-14%	610	\$ 182	\$ 7.18
1998	\$2.5	\$80.4	\$4.4	(\$1.9)	\$31.5	\$112.0	-77%	618	\$ 181	\$ 7.18
1999	\$1.5	\$83.0	\$4.5	(\$3.0)	\$30.1	\$113.1	-208%	623	\$ 182	\$ 7.18
2000	\$3.1	\$84.1	\$4.5	(\$1.5)	\$30.1	\$114.3	-48%	628	\$ 182	\$ 7.18
2001	\$2.8	\$85.5	\$4.5	(\$1.7)	\$29.9	\$115.4	-62%	633	\$ 182	\$ 7.18
2002	\$2.0	\$87.8	\$4.6	(\$2.6)	\$28.8	\$116.6	-128%	641	\$ 182	\$ 7.18
2003	\$2.4	\$89.7	\$4.7	(\$2.2)	\$28.0	\$117.8	-93%	649	\$ 182	\$ 7.18
2004	\$2.8	\$91.4	\$4.7	(\$1.9)	\$27.5	\$118.9	-70%	658	\$ 181	\$ 7.18
2005	\$3.7	\$92.3	\$4.8	(\$1.0)	\$27.8	\$120.1	-28%	665	\$ 181	\$ 7.18
2006	\$4.7	\$92.2	\$4.8	(\$0.1)	\$29.1	\$121.3	-3%	672	\$ 180	\$ 7.18
2007	\$5.4	\$91.4	\$4.9	\$0.6	\$31.1	\$122.5	10%	677	\$ 181	\$ 7.18
2008	\$11.4	\$84.5	\$4.9	\$6.5	\$39.2	\$123.7	57%	683	\$ 181	\$ 7.18
2009	\$6.0	\$82.8	\$5.0	\$1.0	\$42.1	\$124.9	16%	693	\$ 180	\$ 7.18
2010	\$6.2	\$80.7	\$5.0	\$1.2	\$45.4	\$126.1	19%	700	\$ 180	\$ 7.18
2011	\$5.2	\$79.5	\$5.1	\$0.1	\$47.8	\$127.3	3%	707.0	\$180.1	\$7.2

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2011	\$5.2	\$79.5	\$5.1	\$0.1	\$47.8	\$127.3	3%	707.0	\$180.1	\$7.2
2012	\$5.5	\$78.0	\$5.1	\$0.4	\$50.6	\$128.6	7%	714.1	\$180	\$7.18
2013	\$5.8	\$76.1	\$5.2	\$0.7	\$53.7	\$129.8	11%	721.2	\$180	\$7.18
2014	\$6.2	\$73.7	\$5.2	\$1.0	\$57.4	\$131.1	16%	728.4	\$180	\$7.18
2015	\$6.5	\$70.8	\$5.3	\$1.2	\$61.5	\$132.3	19%	735.7	\$180	\$7.18
2016	\$6.8	\$67.5	\$5.3	\$1.5	\$66.1	\$133.6	22%	743.1	\$180	\$7.18
2017	\$6.8	\$64.1	\$5.4	\$1.4	\$70.8	\$134.9	20%	750.5	\$180	\$7.18
2018	\$6.6	\$60.7	\$5.4	\$1.2	\$75.5	\$136.2	18%	758.0	\$180	\$7.18
2019	\$6.2	\$57.6	\$5.5	\$0.7	\$79.9	\$137.5	11%	765.6	\$180	\$7.18
2020	\$6.2	\$54.2	\$5.6	\$0.7	\$84.6	\$138.8	11%	773.2	\$180	\$7.18
2021	\$5.8	\$51.2	\$5.6	\$0.2	\$89.0	\$140.2	3%	781.0	\$179	\$7.18
2022	\$5.4	\$48.3	\$5.7	(\$0.2)	\$93.2	\$141.5	-5%	788.8	\$179	\$7.18
2023	\$5.1	\$45.7	\$5.7	(\$0.7)	\$97.2	\$142.9	-13%	796.7	\$179	\$7.18
2024	\$4.8	\$43.2	\$5.8	(\$1.0)	\$101.0	\$144.2	-21%	804.6	\$179	\$7.18
2025	\$4.7	\$40.7	\$5.8	(\$1.2)	\$104.9	\$145.6	-25%	812.7	\$179	\$7.18
2026	\$4.4	\$38.3	\$5.9	(\$1.5)	\$108.7	\$147.0	-33%	820.8	\$179	\$7.18
2027	\$4.2	\$36.1	\$6.0	(\$1.8)	\$112.3	\$148.4	-43%	829.0	\$179	\$7.18
2028	\$3.9	\$33.9	\$6.0	(\$2.1)	\$115.8	\$149.8	-53%	837.3	\$179	\$7.18
2029	\$3.7	\$31.9	\$6.1	(\$2.3)	\$119.3	\$151.2	-63%	845.7	\$179	\$7.18
2030	\$3.6	\$29.9	\$6.1	(\$2.6)	\$122.7	\$152.6	-72%	854.1	\$179	\$7.18
2031	\$3.4	\$28.0	\$6.2	(\$2.8)	\$126.0	\$154.0	-82%	862.7	\$179	\$7.18
2032	\$3.2	\$26.2	\$6.3	(\$3.0)	\$129.3	\$155.5	-93%	871.3	\$178	\$7.18
2033	\$3.1	\$24.4	\$6.3	(\$3.3)	\$132.5	\$156.9	-106%	880.0	\$178	\$7.18
2034	\$2.9	\$22.7	\$6.4	(\$3.5)	\$135.7	\$158.4	-119%	888.8	\$178	\$7.18
2035	\$2.8	\$21.1	\$6.4	(\$3.7)	\$138.8	\$159.9	-133%	897.7	\$178	\$7.18
2036	\$2.6	\$19.5	\$6.5	(\$3.9)	\$141.8	\$161.3	-147%	906.7	\$178	\$7.18
2037	\$2.5	\$18.0	\$6.6	(\$4.1)	\$144.9	\$162.8	-163%	915.7	\$178	\$7.18
2038	\$2.4	\$16.5	\$6.6	(\$4.3)	\$147.8	\$164.3	-178%	924.9	\$178	\$7.18
2039	\$2.3	\$15.0	\$6.7	(\$4.4)	\$150.8	\$165.8	-195%	934.2	\$178	\$7.18
2040	\$2.2	\$13.6	\$6.8	(\$4.6)	\$153.7	\$167.4	-212%	943.5	\$177	\$7.18
2041	\$2.1	\$12.2	\$6.8	(\$4.8)	\$156.7	\$168.9	-229%	952.9	\$177	\$7.18
2042	\$2.0	\$10.8	\$6.9	(\$4.9)	\$159.6	\$170.4	-248%	962.5	\$177	\$7.18
2043	\$1.9	\$9.5	\$7.0	(\$5.1)	\$162.5	\$171.9	-267%	972.1	\$177	\$7.18
2044	\$1.8	\$8.1	\$7.1	(\$5.2)	\$165.4	\$173.5	-287%	981.8	\$177	\$7.18
2045	\$1.7	\$6.8	\$7.1	(\$5.4)	\$168.3	\$175.0	-307%	991.6	\$177	\$7.18
2046	\$1.7	\$5.4	\$7.2	(\$5.5)	\$171.2	\$176.6	-328%	1,001.5	\$176	\$7.18
2047	\$1.6	\$4.1	\$7.3	(\$5.7)	\$174.1	\$178.2	-350%	1,011.6	\$176	\$7.18
2048	\$1.6	\$2.7	\$7.3	(\$5.8)	\$177.0	\$179.7	-372%	1,021.7	\$176	\$7.18
2049	\$1.5	\$1.4	\$7.4	(\$5.9)	\$179.9	\$181.3	-395%	1,031.9	\$176	\$7.18
2050	\$1.4	\$1.4	\$7.5	(\$6.0)	\$182.9	\$184.3	-418%	1,042.2	\$177	\$7.18