

Shaping the NCDOT of the future

September 2019

Over the past decade, the North Carolina Department of Transportation (NCDOT) has successfully deployed ~\$5-7B of capital yearly, while maintaining a cash balance of ~\$1-2B. Recent project disbursements and cash outflow have reduced that cash balance to \$432M^{1,2}, close to the minimum ~\$282M (7.5% of revenues) cash floor. This represents an increase relative to the end of Q2 FY19, when the cash balance was \$343M. The difference between the cash balance and floor is equivalent to less than two weeks of expenditures.

Going forward, projections suggest the cash balance will likely remain in tight proximity to the cash floor. Should these projections occur, it will likely be increasingly difficult for NCDOT to operate within the narrow cash balance window set by the General Assembly. In response, NCDOT has undertaken an effort to:

- Fully understand why the cash balance fell more than forecast in FY19
- Identify potential opportunities to address the root causes of the cash variance

This memo summarizes the root causes and actions NCDOT could take to address them.

NCDOT has historically operated as a top quartile DOT

- NCDOT is **among the most efficient managers of its network** (the second largest in the country), achieving top IRI ratings (4th best among peer states³), at a competitive spend per mile (5th best among peer states)
- NCDOT has managed a **surge level in disaster response**, reopening 98% of the roads closed by Hurricane Michael within 20 days, and 97% of the roads closed by Hurricane Florence within 45 days⁴
- NCDOT is proactively **thinking about the future of mobility**, assembling a team of business leaders and economists to think about future funding

NCDOT is also facing an increasingly complex environment, making it more challenging to deliver on its mission

NCDOT is currently facing five key factors that require increased precision of cash forecasting and greater agility in responding to real-time changes:

- **NCDOT is currently going through a transformation** (like most peers). With the majority of the Interstate Highway System now complete, NCDOT is

¹ The figures presented here reflect full year FY 19 numbers

² NCDOT Cash Models 2014-19 as of Aug 2019, "Qtr compare to baseline" tabs

³ Peer states defined as DOTs of the largest US states by population, as well as other select fast-growing medium sized states (GA, OH, NC, TX, WA, CA, VA, NY, FL and MA)

⁴ NCDOT 2018 Maintenance Operations and Performance Analysis Report (MOPAR)

shifting from building out new lane-miles, to maintaining an aging and complex asset base.

- Even as late as 1990, 20% of NCDOT’s network of 77K miles (~15K) was unpaved⁵
- Today, NCDOT manages a network of 80K miles, of which only 5% is unpaved⁶
- Operations expense as a share of total spend has risen: in 2009, operations expense was 43%, equal to relative share of construction expense, while today it is over 60%⁷
- **Legislatively-mandated window became increasingly tight.** This window is now between a minimum cash balance floor (7.5% of revenues) and maximum cash ceiling (\$1B). The ceiling (26% of FY19 appropriated state revenue⁸) is far lower relative to the cash balances of peer DOTs, such as Texas (53%), Florida (46%) and Virginia (43%). These peer states do not have cash ceilings (see Exhibit #1).
- **Revenue streams are increasingly at risk** given trends towards electrification, autonomy, and shared vehicles. These trends have an outsized impact on NC given revenue reliance on fuel taxes and vehicle fees to fund its infrastructure, with the 7th highest exposure among any state (see Exhibit #2).
- **Increased uncertainty around operations spend** (e.g., rise in disasters, less control over division-led spend), which has a rising variance from forecasts (36% in FY19 vs 10-19% in FY15-17)⁹
- **Greater complexity of construction** given the increased use of Design-Build and the increased technical requirements of infrastructure. Also, the amount of spend on larger projects has grown: projects over \$10M were 56% of lettings in FY08 versus 87% in FY19¹⁰ and projected to be +90% in FY23-25.¹¹

These challenges are already impacting NCDOT, driving significant variances in construction and operations spend relative to forecasts

From FY15 to FY17, variance in cash actuals vs. forecast accelerated from 7.9% to 17.2%. While improved forecasting techniques helped reduce variance to -0.2% in FY18, variance accelerated again in FY19, increasing to -4.3% (see Exhibit #3). Overall there were four major drivers of FY19 cash variance: three expenditure variances (overspending relative to forecast) and one positive variance in revenue that helped offset the overspending (see Exhibit 4):

⁵ NCDOT 2016 Highway and Road Mileage Transportation Asset Analytics Unit Road Inventory Section

⁶ Ibid.

⁷ NCDOT Cash Models 2014-19 as of Aug 2019, “Qtr compare to baseline” tabs

⁸ The cash ceiling, as a percentage of state revenue, is calculated based on the SFY2019 appropriation. This calculation is intended to mirror the basis on which the 7.5% minimum cash reserve is calculated, by law based on General Assembly appropriations rather than actual receipts.

⁹ Ibid.

¹⁰ Figure represents construction spend in FY 19 up to Apr 19

¹¹ NCDOT Construction data, multiple sources (e.g., HI-CAMs output)

1. **Disasters spend (\$246M variance in FY19, 22% of absolute variance, 35% of negative variance).** Historically, NCDOT has set aside approximately \$50M for declared (e.g., FHWA, FEMA) and undeclared (e.g., snow and ice) weather-related disasters. In the early part of the decade, this largely matched spend: FY09-13 weather disaster spend averaged \$54M per FY. Beginning in FY14, the pace and scale of weather-related disasters increased, averaging \$165M per FY between FY14-19. FY19 proved to be a particularly large year, with \$296M in disaster-related spend, well above the \$50M set aside, contributing \$246M, or 22% of absolute variance.¹²
2. **Preliminary engineering (\$194M variance in FY19, 17% of absolute variance, 28% of negative variance):** While construction represented a modest contribution to the overall reduction in cash (~10-15% of overall variance), the overage (~150%) is largely attributed to preliminary engineering (PE), that was partially offset by variance in other construction categories. Preliminary engineering is an area without sophisticated cash forecasting, and where accelerating delivery and spend have been prioritized over hitting cash targets.
3. **Culture of Cash (\$262M variance in FY19, 24% of absolute variance, 37% of negative variance):** Most of the remaining negative spend variance is difficult to attribute to a specific cause, but appears to stem from a general lack of a culture of cash, largely in divisions:
 - In FY19, **all divisions overspent their allocations**, and all but one division overspent by over \$20M. Divisions were planning their operations spend against total allocations from a central spend operating plan (which includes mid-year supplemental appropriations), rather than a cash forecast.¹³
 - **Central NCDOT has limited control** over division-level spend:
 - Divisions **often use multi-year contracts** (often 50-60% of operations spend), let well in advance of forecasts, reducing the ability of Central to respond to real-time changes in cash.
 - Divisions are **able to borrow from next year's allocation**, limiting the ability for Central to hold divisions accountable to cash forecasts.
 - Finance leadership are not part of monthly highway division staff meetings where project decisions are made, and division leadership is not a part of monthly finance meetings, **limiting coordination and communication.**
4. **Revenue (\$341M positive variance in FY19, 31% of absolute variance):** While there have been historical variances in revenue projections, overall revenues have been generally well-forecasted (within 7% variance in most years, and often much smaller). In FY19, as in many years with higher variance, the variance was

¹² Historical Data Emergency Expenditures & Reimbursement as of 5 August 2019, NCDOT cash models 2009-2019, "Qtr compare to baseline" tabs

¹³ NCDOT operations allocations and actuals by division by year, FY19; Dashboard modernization overview August 2019

driven by an unexpected increase in federal revenues, with federal sources comprising 62% of the FY19 revenue variance on an absolute basis.¹⁴ In FY19 this was potentially due to disaster reimbursements; in recent history, ARRA and other difficult to predict federal funding surges have also driven revenue variance. Trends in the future of mobility will present an additional revenue forecasting and funding challenge going forward.

NCDOT can continue to improve techniques and technology while also pursuing operating model changes to adapt to this new landscape

Given how close the cash balance is to the floor, near-term measures may be required to alleviate cash pressures and put NCDOT on sound financial footing. NCDOT's small cash balance (\$432M) relative to total expenses (\$6.7B), means that any shock could require a nimble response, to rapidly reduce spend.¹⁵ Short-term levers should be considered if the trajectory for the cash balance further tightens, or shocks begin to manifest themselves. For example, short-term management of payables and receivables, procurement levers (e.g., renegotiating priority spend categories), and adjusting project or maintenance disbursement schedules can create more room in the cash balance.

In the medium to long-term, NCDOT can consider four categories of levers to achieve best-in-class performance levels:

- **Continue refining forecasting methodology** to improve accuracy. Specifically, NCDOT could:
 - Improve division and modal coordination with Central through structured coordination meetings, bottom-up division forecasting, and increased division ownership over independent SOPs.
 - Enhance the learning loop of SAS to continue to increase the accuracy of Central construction forecasts (e.g., develop real-time mechanisms to communicate project changes to SAS model, create tools to flag early warning signs for projects, develop metrics to assess accuracy of model).
 - Develop a plan for snow/ice and disaster budgeting, given current planned spend is likely too low (e.g., snow/ice forecast is ~\$35M/year, while average spend FY14-19 was ~\$74M/year)¹⁶.
 - Add rigor to preliminary engineering (PE) forecasting – tying PE more closely to the letting schedule, conducting project level forecasting based on historical curves, and improving contractor estimates through benchmarking exercises.
- **Improve contracting practices to provide more flexibility and shift risk to contractors**, while enabling more agile cash management. Potential steps could include:

¹⁴ NCDOT Certified Budget Revenues, NCDOT Cash Models 2009-19 as of Aug 2019

¹⁵ NCDOT Cash Models 2014-19 as of Aug 2019

¹⁶ Historical Data Emergency Expenditures & Reimbursement, NCDOT cash models 2009-2019, "Qtr compare to baseline" tabs

- Assess current contracting practices and vendor landscape. NCDOT could determine pain points across contracting, and define future-state objectives of a revised contracting process (e.g., shorter timelines to enable agile cash management, improved overall cost profile, improved project delivery)
- Develop new contracting processes and approaches. Once the landscape and objectives are understood, NCDOT would define which contract structures (e.g., on-call vs. fixed scope) best meet objectives in each spend category, and define critical enablers to achieve those objectives including:
 - Operating model changes (e.g., role of central vs. division by category)
 - Processes for how additional inputs will feed contracting (e.g., real time budget/cash availability; real time performance data for SOW prioritization)
 - Vendor management process including critical supporting contract terms
- **Enhance organizational performance metrics and governance** to decrease variance and develop a more agile NCDOT. Potential initiatives could include:
 - Establish and prioritize cash variance-based KPIs, including developing KPIs and incentives to tie performance to finance objectives
 - Cascade cash reporting and decisions throughout the organization. This could include developing and communicating a consistent version of cash throughout the organization, reestablishing a ‘strategic management council’ that ties cash decisions with other strategic priorities, and establishing an SOP for cash levers that will be methodically evaluated with every cash flow need
 - Establish governance for timely cash decisions across NCDOT. NCDOT would be given the formal ability to adjust overspending in one area, with underspending to forecast in another. Key enablers could include:
 - Embedding of early warning signal tools to predict potential shortfalls
 - Creating contingency plans of which projects to accelerate or slow down, based on changes to cash forecast
 - Moving to shorter time periods for cash targets (e.g., quarter vs. annual)
 - Establish consequences for performance, e.g., adding cash management KPIs to performance evaluations, heighten executive scrutiny of business plans for divisions that miss targets for two quarters or more
- **Increase use of data and digital to enable cash agility and controls.** Potential initiatives could include:
 - Develop a baseline of existing data, through the development of a data lake, to understand what data and analytical capabilities currently exist at NCDOT
 - Create a single source of truth across the organization to ensure accuracy and consistency of data

- Establish a data governance structure to support business needs (e.g. assign clear data owners, develop procedures for data reporting)
- Enable real-time reporting of data (e.g. cash dashboards) to allow for more agile responses through the organization
- Embed predictive analytics into organizational functions to allow for pre-emptive decision-making (e.g., predictive maintenance, identification of ‘red flags’ signaling future cash shortfalls)

Additionally, there are potential changes outside of NCDOT’s direct control that could help alleviate cash reserve pressures, including:

- Adjusting reserve requirements (increase ceiling) to align the current cash ratio with peer states
- Consolidating funding sources into one fund to facilitate cash response agility
- Establishing a working capital loan facility to mitigate unforeseen short-term cash crunches
- Excluding disaster spending from cash balance requirements, e.g., ensuring that disaster spending, including that covered by Disaster Relief Cash Flow Loan Fund, does not count against legislative mandated cash balance, or borrow out of general fund for disasters

The result will be a more resilient, best-in-class DOT that will provide superior service for North Carolina citizens

All these efforts will result in a larger, more resilient NCDOT that could deploy \$7-8B on a yearly basis, while continuing to outperform peer state DOTs. Components of a transformation to a “new NCDOT,” enabled by these changes, could include:

- Superior technology applications, such as predictive maintenance, and unmatched logistics and route optimization capabilities to serve citizens’ needs end-to-end
- Leading-edge operating model and accountability that serves as a model for other DOTs, on how to support a seamless transition into a world where transportation is dominated by Mobility as a Service
- A robust and enduring set of funding sources that is linked more directly to the way that people use the transportation network
- An asset portfolio that includes an array of new infrastructure to accommodate innovative types of freight and passenger demand, and it will deliver these on time, and on budget, leveraging a clear set of project controls

NCDOT will support North Carolina’s ability to continue to exceed the US in both population and economic growth. Its portfolio will incorporate both supply (e.g., additional lane miles) and demand (e.g., pricing) solutions, to make the most of its existing network, while enabling North Carolina to achieve its full potential in high quality of life for its citizens and driving innovation in the global economy.

APPENDIX – Main exhibits

EXHIBIT 1: CASH THRESHOLDS

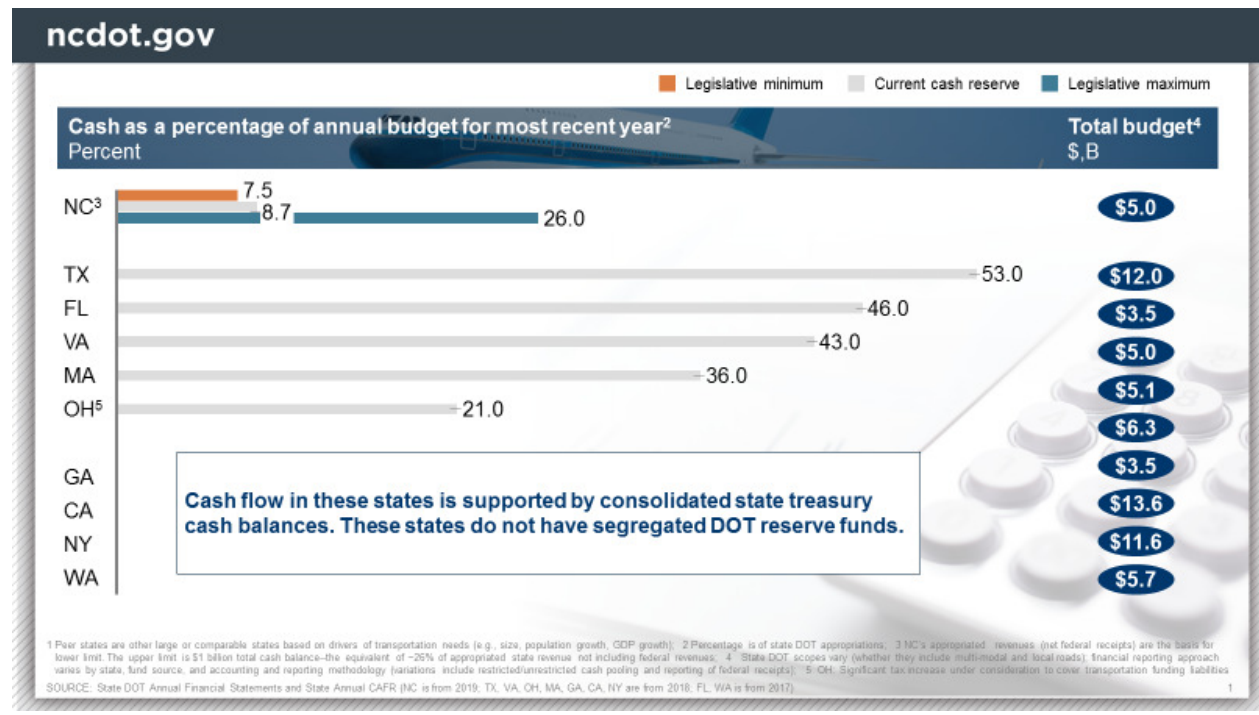


EXHIBIT 2: EXPECTED REVENUE RISK

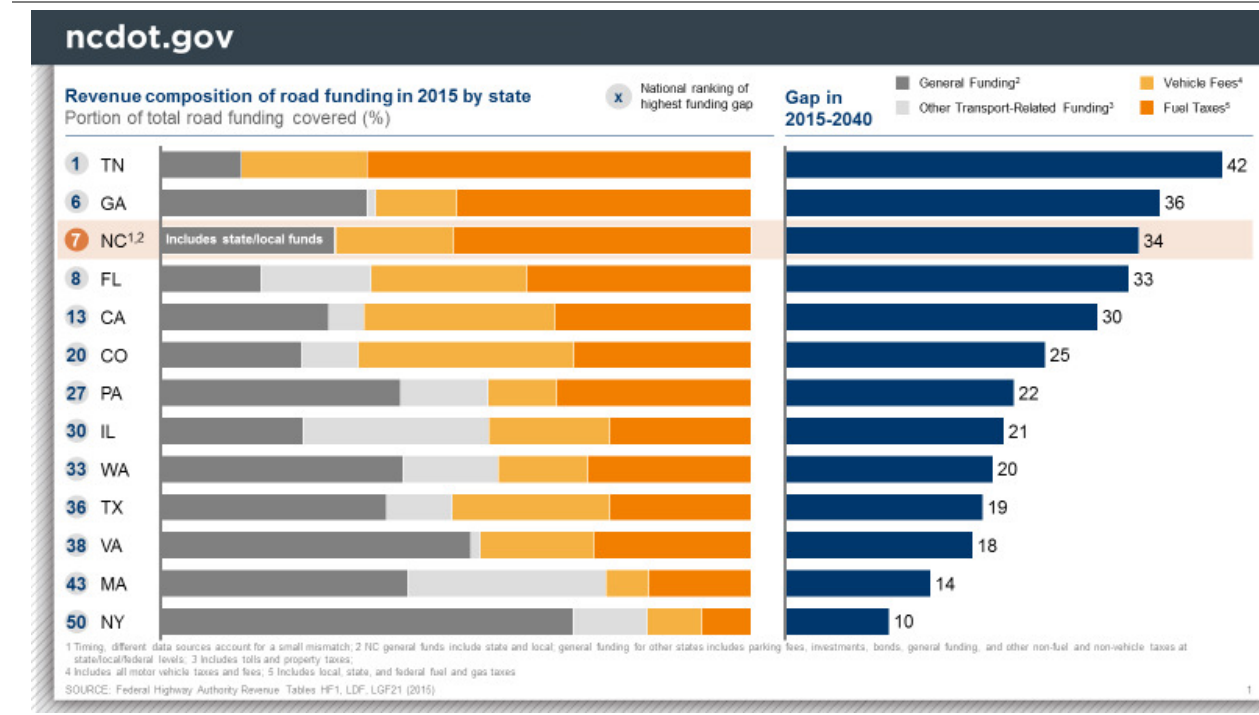


EXHIBIT 3: CASH EVOLUTION

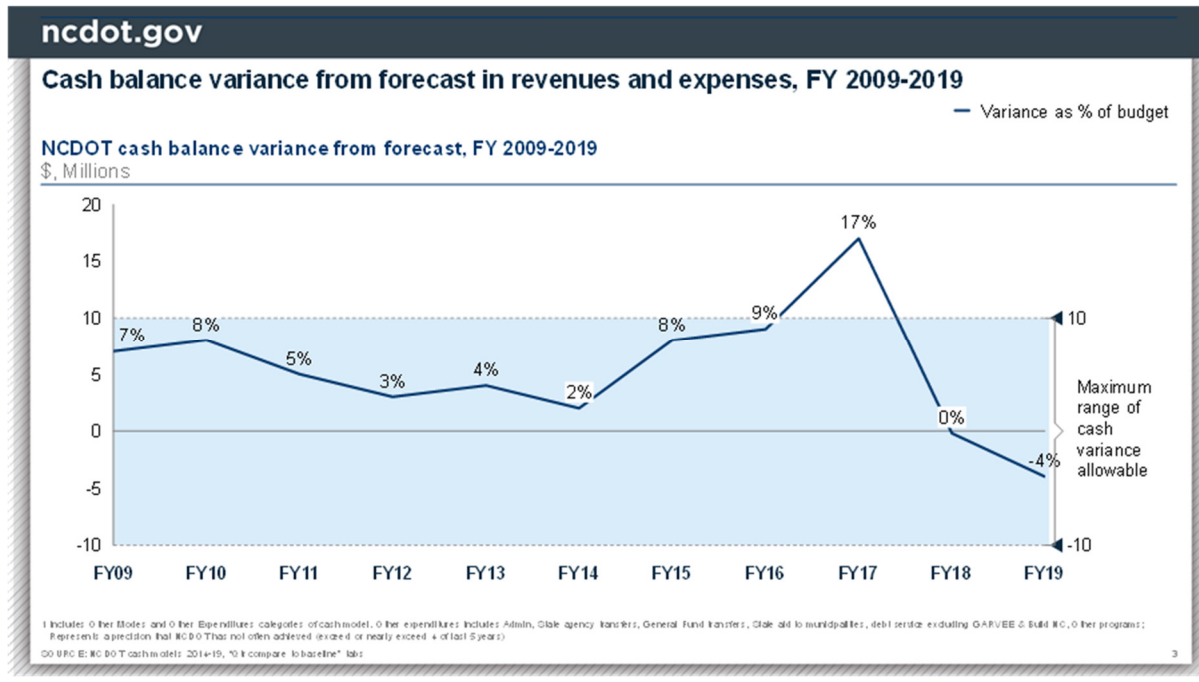


EXHIBIT 4: CHANGE IN CASH BALANCE IN FY 2019

