Comprehensive Operations Analysis
Outcomes Assessment

April 28, 2021

Cooperative Alliance for Seacoast Transportation

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1.0 Introduction

During the Comprehensive Operations Analysis process, COAST developed goals for the new system design in response to public input. These goals shaped how the new system was designed.

Once designed, COAST formulated anticipated benefits from the proposed system design.

In this first Outcomes Assessment, prepared after seven to nine months of new system operation, COAST is evaluating how well the new system achieved the stated goals, and the progress in achieving the anticipated benefits.

Where goals or benefits have not been achieved, root causes are discussed, and remedies outlined. All costs are based on a fixed route incremental cost of $66.51 per hour, based on FY21 costs and do not necessarily represent actual cost in future years. In some cases, where the service day would be extended, a cost of $85.15 per hour was used.

COVID-19 Pandemic Impacts

No discussion of the new system performance would be complete without an acknowledgement of the extraordinary circumstances in which the system redesign was launched. The COVID-19 pandemic significantly reduced ridership across the COAST system starting in March 2020. The new system was launched on June 29, 2020. As of March 2021, ridership continues to be well below previous norms, with the pandemic continuing to be the primary reason.

Because a driving factor for the system redesign was the requirement to reduce operating costs, combined with the significant public process that led up to the change and the anticipated improvements identified, COAST found it would be disadvantageous to delay the new system launch.

The COVID-19 pandemic means that ridership trends between the old and new system are not valid measures of system performance because any trends related to system design are drastically overshadowed by the pandemic's impacts. Therefore, ridership trends will not be referenced in this assessment.

While ridership is always desired, maximizing ridership was not the primary goal of this system redesign. Instead, coverage was prioritized due to limited funding. Therefore, the absence of ridership benchmarks is consistent with the goals and benefits anticipated under the system redesign, even without taking the COVID-19 pandemic into account.

For further discussion on the impact of COVID-19 on transit ridership and funding, see: https://www.apta.com/wp-content/uploads/APTA-COVID-19-Funding-Impact-2021-01-27.pdf

For further discussion on the ridership vs. coverage trade-off, see:
https://humantransit.org/2018/02/basics-the-ridership-coverage-tradeoff.html

2.0 Executive Summary

A detailed analysis of each goal and benefit is outlined in the following sections. However, some general results are summarized here.

On Time Performance
The new system is on time at an average rate of 5% more than the old system.

Frequency and Span of Service
The new system runs hourly service 95.6% of the time. Additionally, 73.3% of weekday service also runs on Saturdays, and 61.2% of service runs until 8:00pm or later.

Connections
Average wait times were reduced 6 minutes on Weekdays and 21 minutes on Saturdays, as compared to the previous system, with an average connection wait time of under 8 minutes.

Travel Times
Over half of the sample trips had reduced travel times in the new system, with most reductions significant. The trips that had increased travel times were increased by much smaller margins.

Clockface Scheduling
The new system has clockface scheduling on 96.5% of all runs, compared to none on the old system's schedule.

Reduce Costs
The new system was projected to reduce cost by 11%. Actual costs annualized, when compared to projected costs for the old system, demonstrate a cost reduction of 17%. However, some cost savings are due to reduced demand response demand due to the pandemic.

COAST's new system design has predominantly met the goals that were set for it. Additionally, the benefits of the proposed system design have largely been proven out over the first few months of operations.

Potential Service Enhancements

Several service enhancements are outlined that would remedy the areas where COAST did not fully achieve the goals of the Comprehensive Operations Analysis. In each case, the cost associated with implementing that enhancement—based in FY 21 figures—it presented. COAST has not done ridership or demand analysis on the need for these options but presents a general idea of high or low priority based on the feedback often received from customers.

Item	Enhancement	Item Corrected	Annual Cost	General Priority
1	Add mid-service missing run of Route 1	Maintain hourly frequencies.	$20,751	High
2	Add mid-service missing run of Route 6	Maintain hourly frequencies.	$51,878	Medium
3	Add mid-service missing run of Route 33	Maintain hourly frequencies.	$20,751	Low
4	Add mid-service missing run of Route 40	Maintain hourly frequencies.	$20,751	Low
5	Add mid-service missing run of Route 42	Maintain hourly frequencies.	$17,293	Low
6	Add mid-service missing run of Route 44	Maintain hourly frequencies.	$17,293	Medium
7	Add Saturday Service to Route 6	Maximize consistency between Weekdays and Saturday	$34,585	Medium
8	Add one later Route 1 run	Operate services until 8:00pm	$20,751	High
9	Add two later Route 6 runs	Operate services until 8:00pm	$34,590	Low
10	Add one later Route 6 run **Included in item 9*	Maintain service span	$17,293	Medium
11	Add one later Route 43 run **Would likely require item 12 to be useful.*	Maintain service span	$20,751	Medium
12	Add one later Route 13N through to 12N run	Maintain service span	$66,417	Medium

3.0 Goals

Goal 3.1: Separate Local and Regional Routes

By separating local and regional routes, COAST sought to design each type of route to maximally serve its purpose, rather than having blended routes compromise on both items. To this end, regional routes aim to speed up regional travel, while local routes seek to maximize geographic coverage within local communities, while still ensuring a reasonable trip time.

Routes 12, 13, 14, and 100 were identified as regional routes. Routes 1, 6, 33, 34, 40, 41, 42, 43, and 44 are identified as local routes. The performance of each of these goals is addressed in sections 3.1 and 3.4, respectively.

Goal 3.2: Maintain Hourly Frequencies

All routes were designed to have hourly frequencies. Several runs are missing one run to provide the operator with a break, without the need for a separately paid break driver. As a result, some routes have a time during the day where there is a two hour gap between runs.

The exception to this is Route 6, which has a three hour gap where two runs are missing, as has historically been the case with this route.

Routes	Number of Round Trip Runs Daily	Number of Runs Missing from Hourly Frequency
1	12.75	1
6*	10	3
12	15.5	0
13	16	0
14	15.25	0
33	13.25	1
34	14.5	0
40	13	1
41	15	0
42*	12	1
43	14.5	0
44*	16	1
100*	1	0

*Does not run on Saturdays.

- Total Weekday Daily Runs: 168.75
- Total Saturday Daily Runs: 129.75

- Total Weekday Runs Missing: 8

- Total Saturday Runs Missing: 3

- Percent of hourly frequencies operated on weekdays: 95.2%
- Percent of hourly frequencies operated on Saturdays: 97.7%
- Percent of hourly frequencies operated per week: 95.6%

COAST achieved 95.6% of the stated goal with this system on weekdays. To expand service to fill each of the missing hourly runs, COAST would need to operate an additional approximately 43 hours of revenue service weekly. This would cost approximately $149,000 annually to correct. This is approximately broken down as follows:

Route	Annual Cost
1	$20,751
6	$51,878
33	$20,751
40	$20,751
42	$17,293
44	$17,293

Goal 3.3: Operate Weekdays and Saturdays

In COAST's previous fixed route system, there were nine numbered fixed routes, of which only four—or 44%—operated on Saturday.

In COAST's redesigned system, there are thirteen numbered fixed routes, of which nine—or 69%—operate on Saturdays.

Goal 3.4: Maximize Consistency Between Weekdays and Saturdays

In COAST's previous fixed route system, the four fixed routes that operated on Saturday operated with a reduced schedule and different times on Saturday as compared to weekdays.

For COAST's nine fixed routes that operate both weekdays and Saturdays in the redesigned system, all but half of one operate the identical schedule all six days.

Of the 168.75 runs that operate on weekdays, 123.75 of them operate on Saturdays identically to their weekday operation. Half of Route 33's twelve full runs serve a different end point on Saturday, and that difference is included in this figure.

In summary, COAST's new Saturday service is 73.3% identical to COAST's weekday service.

Root Cause
Routes 42, 44, and 100 do not operate on Saturdays because of insufficient demand, mainly due to the nature of the businesses served by these routes.

Route 6 has been the subject of requests for Saturday service, which would incur an estimated additional 520 revenue hours annually, for an estimated annual cost of $34,585.

Goal 3.5: Operate Until 8:00 PM or Later

Eight of thirteen fixed routes operate until 8:00pm or later.

Runs ending just a few minutes before 8:00pm, whose next hourly run would start at 8:00pm, are counted as running until 8:00pm. Runs that serve a portion until 8:00pm, but not the whole run, are counted as a half route.

Routes	Last Full Run Start	Last Full Run End
1	6:30 PM	7:24 PM
6	5:31 PM	6:23 PM
12*	7:56 PM	9:58 PM
13	8:30 PM	9:25 PM
14*	8:00 PM	8:53 PM
33**	6:30 PM	7:24 PM
34	7:17 PM	8:03 PM
40	7:00 PM	7:46 PM
41	8:00 PM	8:48 PM
42	6:00 PM	6:34 PM
43	8:00 PM	8:56 PM
44**	6:36 PM	6:53 PM
100	3:15 PM	4:07 PM

**Two directions of last run not completed by same bus, potentially creating an overlap or gap difference between the inbound/outbound last run, or the northbound/southbound last run.*

***Has a partial run or runs after the last full run, serving some areas until 8:00 pm.*

61.2% of COAST routes meet the stated goal.

Root Cause
The runs that do not operate until 8:00pm are cut short either because of inadequate demand, or insufficient funding. It is likely Routes 1 and 6 would both benefit from later service. The portions of Routes 33 and 44 that do not run later are unlikely to have demand for later service, due to the nature of the destinations along those routes. Route 100 could potentially benefit from additional runs, but this goal is not directly applicable to this route, due to its current status of having a single run in each direction during commute hours.

Remedy
Operating Routes 1 and 6 until 8:00pm on their current service days would incur the following costs:

	Weekly Revenue Hours	Annual Cost
Route 1	6	$20,751
Route 6	10	$34,590

Goal 3.6: Prioritize Hourly Service Over Peak Service

Of the redesigned service's 168.75 hourly round trip runs, only two runs—or 1%—are uniquely scheduled to benefit peak times. The rest of the runs are focused on maintaining hourly service.

Goal 3.7: Prioritize Service Over Amenities

Funds for new amenities that have been expended since the new system launch have been on grants previously awarded for such activities. The focus of these amenities has been on the top priorities identified through public input for improvement. These have included solar lighting in our bus stop shelters and additional bus stop shelters.

Goal 3.8: Prioritize Fixed Route Service Over General Public Demand Response Service

No fixed routes were replaced with general public demand response services as part of the system redesign.

Goal 3.9: Operate Within Available Revenues

A driving factor for the system redesign was the requirement to reduce operating costs and operate within available resources. Early in the COA process it was readily apparent that the fixed route service redesign, if it were to meet the stated needs of the public and partners who participated in the public input process, would not be possible without additional revenues.

An important factor in COAST being able to move forward with the approved service design was a commitment by the NHDOT to transfer available CMAQ and 5307 large urban funds, thereby expanding COAST's available resources. The Department committed $3.6M of CMAQ funds over three (3) to five (5) years and $1.354M of 5307 large urban funds over three (3) years. Without these funds the current approved service design would not have been possible.

Additionally, due to the ongoing worldwide pandemic over the past year, unprecedented levels of Federal support have been granted to public transit systems such as COAST. These funds have been targeted to specifically assist public transit systems overcome the long-term impacts and financial losses directly attributable to the COVID-19 pandemic.

Over the first 7 months of operations, COAST has operated well within current available revenues, and under budget. It must be understood however, that these figures represent an operation that has been impacted significantly by the pandemic. This is particularly evident in the reduced demand we continue to experience on our demand response operations. Lower demand for these services equates to lower costs being incurred.

Over the longer term, we continue to assess a very dynamic funding landscape. Three major influences on our 5+ year projections include the American Rescue Plan (ARP), passage of a Federal Infrastructure Bill, and the next Surface Transportation Program Authorization.

A major potential hurdle may be the increasing upward pressure on wages, particularly for CDL Operators, which COAST continues to struggle to keep up with. In an incredibly competitive marketplace, our current wage rates for this position are not attracting candidates.

4.0 Customer Service

Benefit 4.1: Reduce Travel Times

Regional travel times have primarily been improved across the system. However, there are travel times in the redesigned system which are longer than they were in the previous system due to the design of the routes. Travel times between common destinations are outlined below for comparison. Due to the number of possible trips, the examples outlined are by necessity representative trips.

Weekday Travel Time Comparison

Origin	Destination	Old System	New System
Wakefield St. Rochester	Dover Transportation Center	34 minutes	31 minutes
Wakefield St. Rochester	Downtown Portsmouth	86 minutes	45 minutes
Wakefield St. Rochester	Fox Run Mall	65 minutes	71 minutes
Dover Transportation Center	Lilac Mall	41 minutes	29 minutes
Dover Transportation Center	Downtown Portsmouth	51 minutes	26 minutes
Dover Transportation Center	Fox Run Mall	30 minutes	52 minutes
Whittier St. Dover	Somersworth Walmart	20 minutes	28 minutes
Downtown Somersworth	Rochester City Hall	75 minutes	44 minutes
Downtown Somersworth	Downtown Portsmouth	116 minutes	55 minutes
Downtown Somersworth	Commerce Way, Portsmouth	101 minutes	71 minutes
Rochester Park & Ride	PNSY (AM Report)	32 minutes	47 minutes
Downtown Portsmouth	Lafayette Rd. Walmart	16 minutes	20 minutes
Feaster Apartments	Portsmouth Regional Hospital	18 minutes	31 minutes

Times in the old system could vary significantly throughout the day due to the absence of clockface scheduling and connections varying. Times were estimated around the 8am hour. The new system travel times are much more consistent.

When comparing travel times between two schedules, it is important to note that the scheduled times may not be realized if buses run late. Therefore, a comparison of scheduled times must be rounded out by a comparison of on time performance. In other words, the schedule is only good when the buses can actually stick to it.

	Old System	New System
Percent On Time	90%	95%

The improved on time performance of the new system means that even when some trips appear longer by comparison, they are 5% more likely to be performed in the time listed than under the old system.

Benefit 4.2: Improve Connections

The redesigned system creates a pulse-type network originating out of two hubs: the Dover Transportation Center and Hanover Station. Connections made at these hubs happen at the same time each hour, simplifying connections. There are also connections made at the Rochester City Hall and the Exit 9 Park and Ride in Dover. These connections are not timed as succinctly.

In the previous system, connection times were varied throughout the day, without the consistency offered in the new system.

Calculating average wait times for connections between routes requires adjusting for routes with different spans of service or service frequencies. For connections where one route operates at higher frequency, only wait times for the run closest to the connection are calculated. For example, if one route arrives at the connection point at both 3:00pm and 3:45pm, and the other route only departs at 4:00pm, this is calculated as a 15-minute wait only, and not a 60 minute and 15 minute wait, as the first run is simply considered to not have a connection. Similarly, wait times for routes that are simply not yet running are not included.

Average Wait Times for Connections

	Old System	New System
Weekdays	14 minutes	8 minutes
Saturdays	26 minutes	5 minutes

The new system has seen significant improvements in average wait times for connections.

Additionally, the new system has 5% better on time performance, meaning these connections are more reliable.

	Old System	New System
Percent On Time	90%	95%

Benefit 4.3: Clockface Scheduling

Clockface scheduling is the name for a transit schedule where the times a stop is served by a given route are consistent each hour of the day.

Example

Clockface Schedule	Not Clockface Schedule
6:32	6:32
7:32	7:27
8:32	8:44
9:32	9:23
10:32	10:15

Clockface schedules are easier for transit customers to read and remember, improving the overall customer experience. COAST's previous system, operated until June 28, 2020, did not have clockface schedules, though COAST has had them in the past.

Under the new system, 34.5 out of 973.5 weekly runs do not align with clockface schedules, meaning COAST achieved 96.5% of this goal.

The runs that do not conform with clockface schedules are due to Portsmouth Naval Shipyard schedule alignment, including an additional run between normal clockface runs, or the first or last run of the day being slightly altered. COAST does not recommend changing any of these runs at this time.

Benefit 4.4: Extend Service Area

With the new system, COAST extended service coverage to eight areas:

- Knox Marsh Road in Dover
- Portland Ave. in Dover
- Washington St. and the NHDOT Park & Ride in Rochester
- Town Hall in Newington
- The Northeast side of the Pease International Tradeport
- Atlantic Heights in Portsmouth
- Junkins Ave. in Portsmouth
- Kittery Foreside in Kittery

COAST removed service from the follow areas:

- North of Lilac Mall in Rochester
- East Rochester
- Main St. and Indigo Hill Rd. in Somersworth
- Pine Hill Rd. in Berwick
- Department of Motor Vehicles in Dover

COAST has received requests for service at the following locations, which were not accommodated in the new service:

- Industrial Way in Rochester
- Gonic
- Innovation Dr. in Rochester
- Sagamore Ave. in Portsmouth

Benefit 4.5: Maintain Service Hours

COAST sought to maintain the span of service operated under the old system in the new system redesign.

Span comparisons represent the challenge that changes in the speed of service may cause a service to appear to end earlier or start later, when the effective arrival is the same. Similarly, because many destinations may be used along a route, no single point of first arrival/last departure can be used. For this comparison, spans within a half hour are considered the same, spans between half an hour and an hour are considered slightly reduced, and anything greater is reduced. However, this may not accurately reflect the impact on all customers.

Weekday Span Comparison

Location / Service*	Previous Span**	New Span**	Comparison
Route 1 (Dover / Somersworth / Berwick)	5:19 am to 7:52 pm	5:44 am to 7:25 pm	Same
Route 6 (Farmington / Rochester)	5:46 am to 7:13 pm	5:31 am to 6:24 pm	Slightly Reduced
Rochester to Dover and Portsmouth	5:25 am to 9:04 pm	5:09 am to 8:56 pm	Same
Portsmouth to Dover and Rochester	6:41 am to 10:24 pm	5:54 am to 9:59 pm	Improved
Route 33 (Dover)	6:25 am to 5:29 pm	6:12 am to 7:57 pm	Improved
In and Out of Newington	5:47 am to 9:31 pm	6:30 am to 8:57 pm	Slightly Reduced

Location / Service*	Previous Span**	New Span**	Comparison
In and Out of Pease Tradeport	5:47 am to 7:34 pm	6:22 am to 6:37 pm	Slightly Reduced
Route 100 (PNSY)	Single Run	Single Run	Same
NH to / from PNSY	5:50 am to 4:42 pm	5:54 am to 8:54 am	Improved
Route 40 (Borthwick Ave.)	5:47 am to 7:34 pm	6:00 am to 7:52 pm	Same
Route 41 (Lafayette Rd.)	5:59 am to 9:08 pm	6:00 am to 8:51 pm	Same

Saturday Span Comparison

Location / Service*	Previous Span**	New Span**	Comparison
Route 1 (Dover / Somersworth / Berwick)	6:30 am to 7:34 pm	5:44 am to 7:25 pm	Improved
Rochester to Dover and Portsmouth	7:25 am to 9:45 pm	5:09 am to 8:56 pm	Shifted – Improved in AM, Reduced in PM
Portsmouth to Dover and Rochester	8:54 am to 11:07 pm	5:54 am to 9:59 pm	Shifted – Improved in AM, Reduced in PM
Route 33 (Dover)	None	6:12 am to 7:57 pm	Improved
In and Out of Newington	8:31 am to 10:11 pm	6:30 am to 8:57 pm	Shifted – Improved in AM, Reduced in PM
In and Out of Pease Tradeport	8:31 am to 6:59 pm	None	Eliminated
Route 40 (Borthwick Ave.)	7:05 am to 8:38 pm	6:00 am to 7:52 pm	Shifted – Improved in AM, Slightly Reduced in PM
Route 41 (Lafayette Rd.)	7:28 am to 9:09 pm	6:00 am to 8:51 pm	Improved

*** Span is calculated as the first departure to the final arrival of the service and does not represent the earliest possible arrival at a destination, or the latest possible departure from on origin.*

** Because route names and locations served by routes have changed between systems, where the route names are not comparable a service description is used instead.*

On weekdays, the new system improved three service areas, maintained span for five, and slightly reduced span for three.

On Saturdays, the new system improved span for three service areas and shifted span on four.

Areas where service was entirely new or eliminated are not addressed in this summary.

Root Cause

Span was reduced on some evening Saturday routes, in the evening in Farmington, in and out of Newington, and in and out of the Pease Tradeport.

Remedy

Correcting this would require an additional run be operated on each affected route in the evening. COAST does not recommend an additional run on the Pease Tradeport or Route 40. A later run on routes 6, 12, 13, and 43 may have value. However, a later run on Routes 12 and 13 would also extend total service hours for ADA service and COAST supervision, causing several additional costs.

Cost for Remedy

	Weekly Revenue Hours	Annual Cost
Route 6 Weekdays	5	$17,293
Route 43 Weekdays and Saturdays	6	$20,751
Route 13N through to Route 12N Weekdays and Saturdays	15	$66,417

5.0 Cost Efficiencies

Benefit 5.1: Reduce Cost by 11%

A critically important part of COAST's new service plan was to reduce overall costs. After performing our financial analysis, we had projected that we would be able to reduce ongoing operating costs by 11%.

Had we continued to operate the system as it was before June 29, 2020, we had projected annual operating cost in FY21 of $6.403M.

Annualizing the operating costs through the first seven (7) months of the new system operations (minus one time COVID-19 related operating expenses), current annual operating costs are projected to be $5.312M. This would represent a 17.0% reduction in operating costs.

It must be understood however, that these figures represent an operation that has been impacted significantly by the pandemic. This is particularly evident in the reduced demand we continue to experience on our demand response operations. Lower demand for these services equates to lower costs being incurred.

Benefit 5.2: Enable Route Operation Flexibility by Demand

One of the important considerations in a new service design was to increase the flexibility to only operate routes when adequate demand existed. Consideration was particularly focused on whether certain routes made more sense to operate M-F vs. M-Sat. Routes that were targeted for building in such flexibility included Route 33, Route 40, and the new Routes 42 and 43.

Route 33 (Saturday)
Much of the businesses operating off the outer portions of Sixth Street and the County Complex are not operational on Saturdays. An alternate Saturday route, to better serve portions of the City that would have higher demand was developed. The result was the current Saturday routing, including service on Central Avenue north of downtown and Portland Avenue out to the Dover Ice Arena and Outdoor Pool.

Routes 40 & 42
Much of the commercial activity at Pease International Tradeport is dormant on Saturdays. When redesigning services there, a concept to split the former Route 40 into two routes was developed. Route 40 was altered to terminate at the Portsmouth Transportation Center on Pease and now operates M-Sat. A new Route 42 was developed to service Pease more directly and comprehensively M-F, expressing between downtown Portsmouth and the NH Route 33 entrance/exit to the Tradeport.

Route 43
Service into Newington proper has long been mentioned by the Town. There is also longstanding demand for service to commercial businesses along River Road, and the desire for the ADA service area to extend further into Newington. In developing the service concept for Route 43, flexibility was built in to serve both purposes, on-demand, at different points of the day.

Benefit 5.3: Maximize Revenue Service

Reducing the percent of deadhead miles and hours (time spent moving vehicles to where they need to be, while not picking up customers), was a predicted benefit of the new system. By operating a higher percentage of our service as revenue miles and hours, COAST maximizes the amount of service provided for the costs incurred.

Deadhead Miles and Hours Comparison

	Old System	New System
Percent Deadhead Miles	20%	7%
Percent Deadhead Hours	14%	6%

Percentages are calculated as percent of total vehicle miles or hours.

Benefit 5.4: Eliminate Low Ridership Service / Times

COAST saved cost by eliminating service to the Pease Tradeport on Saturdays, and by eliminating service to North and East Rochester.

Service to East Rochester represented 1% of annual service hours but only 0.39% of annual boardings.

Service North of Lilac Mall represented 1% of annual service hours, but only 0.34% of annual boardings.

Finally, Saturday service to the Pease Tradeport represented 0.2% of annual service hours, but only 0.03% percent of annual boards.

Benefit 5.5: Reduce Fleet Requirements

Some costs, primarily insurance and capital replacement costs, scale based on fleet vehicles owned, rather than miles or hours driven. By reducing the fleet size required, significant savings can be found.

	Old System	New System
Vehicles Operated in Maximum Service (VOMS)	16	13
Fleet Requirements	25*	18

** The old system required a higher spare ratio due to the variety of types of vehicles required for the service, including coach buses without video cameras for service to the PNSY.*

In FY20 that average actual cost of auto liability and physical damage coverage was $11,467 per vehicle. Reducing our fleet requirements translates to significant savings in insurance related expenditures.