Framing Scenarios for Royal Oak Transit Service
DRAFT FOR DISCUSSION PURPOSES ONLY – 3/2/2018

Overview:
This memo outlines six scenarios for local transit enhancements in Royal Oak. An optional enhancement to SMART's existing Route 430 service on Main Street is also discussed. Scenarios were derived from feedback obtained at previous meetings with Transit Task Force members, and are focused on the general objectives presented below:

Objectives of a Royal Oak Transit Service:

- Serve major destinations within Royal Oak, including Downtown, the Detroit Zoo, and Beaumont Royal Oak Hospital
- Connect to grocery stores on the edge of the city (e.g. Meijer, Kroger)
- Improve access to high-frequency SMART service on Woodward
- Provide service that middle school and high school students can use
- Increase service available in mid-day, evening, and weekend periods
- Offer a service that is convenient, cost-effective, and easy to use

Each scenario contains different transit service designs, including fixed-route bus, flex routes, and flex zone services. "Service hours" delivered, operating costs, and vehicle fleet needs are determined for each scenario. These scenarios are not final service plans. Rather, they are intended to spark conversation about trade-offs between different styles of service. Elements of each scenario can be combined or modified as needed, and all cost and service estimates are subject to revision as the preferred service design is further refined.

Summary of Scenarios:
The tables below summarize service levels and service hours provided in each scenario. Scenarios 1, 2, and 3 are conventional fixed-route bus systems. Scenarios 4 and 5 are flexible route services. Scenario 6 is a zone-based service. Also included is an optional enhancement to SMART's existing Route 430 service on Main Street. This enhanced service can be added to the service totals shown in each scenario. It is not included in individual scenario costs.

Service Details – Royal Oak Services

	Weekday	Saturday	Sunday
Hours of Operation	6:00am - 12:00am (18 hours)	7:00am - 11:00pm (16 hours)	7:00am - 8:00pm (13 hours)
Frequency	15-30 minutes	30 minutes	30 minutes

Scenario Summaries

ROYAL OAK TRANSIT SCENARIOS

	1. ROGO MAX	2. ROGO MIN	3. ZIG ZAG	4. FLEX ROUTE 1	5. FLEX ROUTE 2	6. ZONE SERVICE
Routes/Zones	8	3	1	2	2	3
Annual Service Hours	100,234	44,706	77,060	78,080	71,072	58,704
Vehicle Fleet Required	27	13	22	22	21	16
ANNUAL OPERATING COST (Millions)	$5.9-$6.7	$2.4-$3.0	$4.2-$5.1	$4.3-$5.2	$3.9-$4.7	$3.2-$3.9
COST RANK	$$$	$	$$	$$	$$	$
CONVENIENCE RANK	***	**	*	****	***	**
LEGIBILITY RANK	***	****	**	***	***	**

$$$ is most expensive rank. ******** *is most favorable rank*

"Annual Service Hours" is a measure of service delivered. It is calculated by multiplying the number of vehicles that must operate simultaneously in order to maintain a given service frequency by the length of time (hours) during which that frequency is provided. If a bus route operates at 15 minute frequencies between 7:00am and 10:00am (morning rush hour), and the length and travel time of the route require 6 buses to be operating during those 3 hours, then the number of "service hours" is [3 hours] x [6 vehicles] = 18 service hours.

"Vehicle fleet required" is equal to the maximum number of vehicles that are on the road during the highest demand periods of day, plus a couple of extra spare vehicles in case of mechanical issues. Spare vehicles are included in the totals above, and range from 2-4 vehicles.

"Annual Cost" comes from adding up all weekday, Saturday, and Sunday service hours for the year and multiplying by an estimated service delivery unit cost. The unit cost is called cost per service hour. SMART uses two modified unit costs based on its own Connector operating costs to provide an estimated cost window.

"Cost Rank" attempts to group the scenarios by cost for ease of comparison. **"Convenience Rank"** describes the directness of routes, availability of vehicles, and capacity to meet needs with minimal wait time and travel time. **"Legibility Rank"** describes how easy it is to understand the service.

Optional Enhancement – Route 430 Expansion

SMART explored the potential for improving the Route 430 service. Route 430 runs through the heart of Royal Oak, connecting Troy to the Royal Oak Transit Center via Main Street. Currently, SMART deploys two full-size buses on this route on weekdays only between 7:00am-10:00am and 2:00pm-7:00pm. There is no afternoon, late evening, or weekend service. Frequencies vary from 30-45 minutes.

SMART proposes adding a third bus to the Route 430 and adding weekday afternoon and Saturday/Sunday service to the route. The third bus will allow SMART to deliver consistent,

predictable 30-minute frequency service all day, making the route more convenient for riders in addition to the added hours of operation.

Adding a third bus would also allow SMART to extend the route to the Detroit Zoo and to Downtown Birmingham at no additional cost. SMART expects the additional service to **cost $1.2 to $1.6 million per year**. The enhanced service can be added to any of the scenarios. Below are proposed service characteristics:

Service Characteristics – Route 430 Improvements

	Weekday	**Saturday**	**Sunday**
Hours of Operation	6:00am - 12:00am (18 hours)	7:00am - 11:00pm (16 hours)	7:00am - 7:00pm (12 hours)
Frequency	30 minutes	30-60 minutes	60 minutes

Scenario 1 – RoGo "MAX"

This is the original RoGo service map presented at early meetings. It consists of eight fixed routes with pre-determined stops serving the entire city. Providing the most service hours and requiring the largest vehicle fleet, this scenario is the least feasible and least efficient. Many routes are spaced so closely that their coverage areas (1/2 mile walk area) overlap significantly. This level of coverage may not be necessary. The sheer number of routes in the system also may make the service more difficult to navigate for prospective users.

Scenario 2 – RoGo "MIN"

RoGo MIN is another fixed route alternative, using only three routes. It achieves a high degree of coverage without the overlap and complex route structure of Scenario 1. It also does so at a far lower cost. One notable characteristic of this service design is that it shifts the convergence point for all routes northward, away from the Royal Oak Transit Center and closer to the geographic center of the city.

This transfer location provides an opportunity for users of the east-west route to transfer to and from the two north-south routes, both of which provide direct service to Beaumont Hospital and Downtown. During the weekday morning and afternoon peak periods, with buses running every 15 minutes on all three routes, transfers could be timed so that transfer waits would be no more than 5 minutes. Also, two routes pass within ½ mile of Royal Oak Middle School, and one within ½ mile of Royal Oak High School.

Scenario 3 – "Zig Zag"

This option consists of one fixed route that weaves back and forth across the city, following the mile roads. While it provides nearly full coverage, this service would be significantly less convenient than the first two options given the indirect nature of the route. North-south travel would nearly always require a transfer to SMART service on Woodward, or enhanced SMART service on Main Street (introduced in the map for this scenario as an important supporting component). The service is also expensive to operate due to its 20-mile length.

Scenario 4 – "Flex Route 1"

Scenario 4 deploys two flexible bus routes that combine elements of an easy to understand regular fixed-route bus service with aspects of a more convenient on-demand service. Two routes would begin and end at time points, where small buses would arrive and depart according to a set schedule like any bus route. A third time point is included on each route to facilitate timed transfers to the Woodward FAST service and to serve Beaumont Hospital.

Between these time points, however, buses would spend much of their travel time leaving the main road to pick up passengers in their own neighborhoods, minimizing walking time. Deviations like these can be scheduled in advance, either prior to a bus departing a time point, or with a minimum advance notice as required. Each route would serve deviations within a fixed zone. Both routes would serve deviations between 12 Mile Road and 13 Mile Road to improve reliability.

To maximize ease of use, "fixed stops" are provided at roughly one-mile intervals. If a customer sees on a bus tracker app that a bus is 10 minutes away from a fixed stop, and they are an 8 minute walk from the stop, the passenger could walk to the stop and wait for the bus to arrive at the stop without a reservation. Buses always pass by the fixed stops between deviations.

Scenario 5 – "Flex Route 2"

Scenario 5 exhibits some slight modifications of Scenario 4. The southern flex route is changed from a two-way loop to a small zig-zag, which enables a direct extension of the route to Beaumont Hospital. Additionally, the use of "peak overlay" trips (light blue lines) slightly reduces costs by reducing frequencies on the main two-way route (dark blue lines) to 30 minutes during peak periods.

The peak overlay runs would operate every 30 minutes and would only travel toward Woodward in the morning and away from Woodward in the evening, serving commuters living in Royal Oak. Departure times for the overlay runs would be staggered with the main two-way routes to achieve combined 15 minute peak period frequencies in the peak travel direction only. Though the map looks more complicated, user experience would be comparable to Scenario 4.

Scenario 6 – "Zone Service"

Scenario 6 turns to a completely zone-based reservation and on-demand model. Passengers would request a pick-up and drop-off location, and a trip-planning algorithm would combine multiple reservations into a service run. Passengers may receive curbside service, or they may be asked to walk to a more central pick-up point. There would be no fixed stops or fixed routes of any kind, though each zone could use one scheduled time point at Woodward FAST stops.

This scenario assigns a certain number of vehicles to each zone on certain days and at certain times of day. Vehicles originating in one zone can drop off at destinations in the other zones, but must immediately return to the origin zone before picking up other passengers. The lower costs associated with this model assume that the system would need less capacity than the previous scenarios provide. There is nothing inherently more cost effective about this service design unless demand for the service is not expected to be high. The model does account for some reserve capacity during peak periods, as well as additional service during the highest-need days at the Detroit Zoo and on Thursday, Friday, and Saturday evenings.

Management Possibilities:

- Operated as part of existing Royal Oak Community Partnership Program (CPP) through SMART
- Operated as part of a NEW Royal Oak ROGO CPP
- Other?

CPP Gets You:

- Access to grant dollars for vehicles
- Planning, operations, maintenance assistance
- Reduced direct costs
- Leverages more benefit from SMART membership

Capital Costs (unit pricing):

- SMART-style 23' buses = $80,000 (propane or gas)
- Larger capacity small buses = $100,000-140,000
- Short (30') heavy-duty buses = $400,000
- Short (30') HD Hybrid buses = $600,000
- Shelters for high-use locations = $20,000
- Marketing materials/bus stop signs
- CAD/AVL system (incl tracker) = $20,000
- Bus camera system (recording) = varies
- Customer service system/website = varies

Management Possibilities:

- Buses could be fueled and maintained at SMART Troy Terminal
- Fuel at SMART cost
- Maintenance at parts only (part of membership)
- Storage opportunities
- "Loaner" possibilities
- SMART can assist in capital procurements
- City Roles
- Daily operations of service
- Human resources, payroll, benefits
- Tracking, maintenance, reporting
- Customer service, website, complaints

Develop a mobile app, which could include:

- Real-time location and time of next vehicle
- Interactive community map with business/community information around stops
- Shuttle information paired with reservations portals
- Develop/implement wayfinding to aid in multi-modal transportation