

*The Urban Design Forum is an open-membership, participatory forum on urban issues by citizens, professionals, urbanists and others with a shared interest in the well being of the Albuquerque area. The members of the Urban Design Forum believe that the brief analysis and findings below, prepared by one of our participants, merit serious consideration by policy makers and technical staff serving the Albuquerque metropolitan community.*

20 July 2006

## Albuquerque Metro Area: Alternative Transit Options

With the opening of the RailRunner and proposals for other enhanced transit routes, officials have helped turn the region's attention to alternatives to driving. That much we are clear about, but we don't have a good picture of the solution yet. There are different ways to plan for regional transportation, and they yield different results. The following summary identifies an open, democratic planning process for transportation and land use, and gives some alternative strategies and technologies to meet our region's complex set of goals.

### Sample Alternative Systems

The following three alternative regional transit systems were considered for the Albuquerque metro region in an alternatives study (see the references at the end). Out of many possible choices, they represent a range of options. They are named "Plan A", "Loop Radial" and "Personal Rapid Transit" (PRT). We will explain each one and compare them to the existing transit system. All of these systems supplement, not replace, the existing public street network.

"Plan A" is from the city's Rapid Transit Project study of 2003, and features 55 miles of bi-directional light rail on four main routes - Central Ave, Louisiana, Montgomery, and Coors. Local bus routes connect to each of these main backbone routes. See Illustration 1.

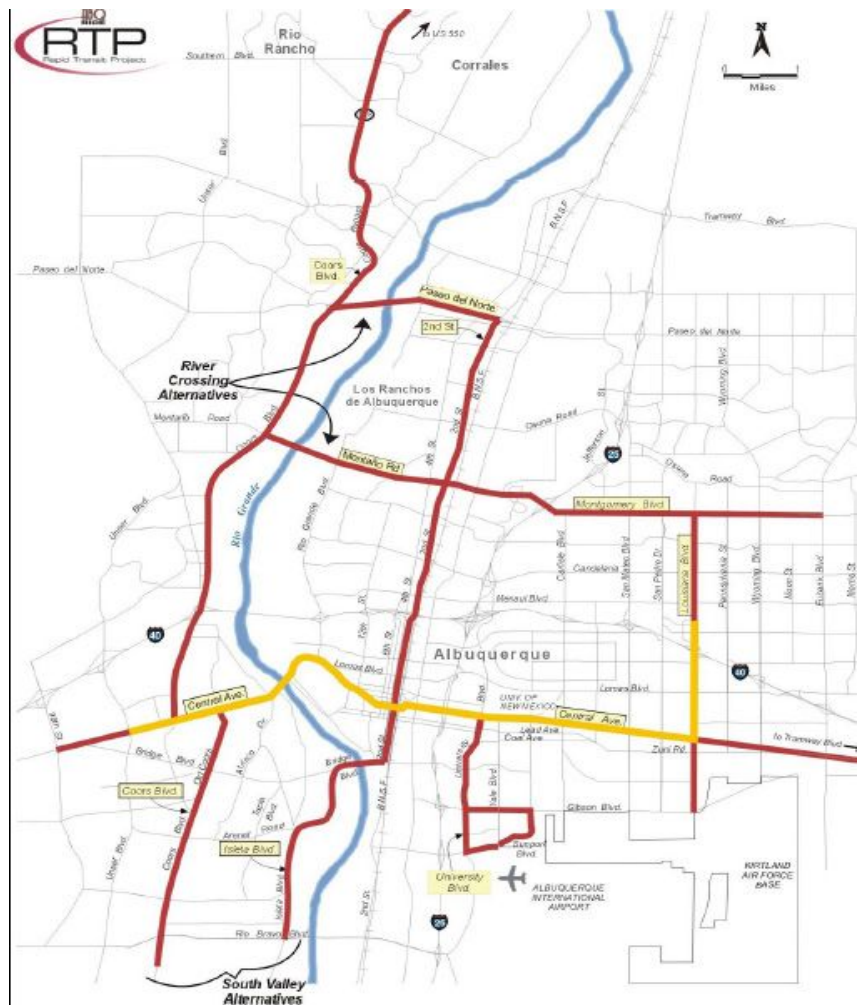
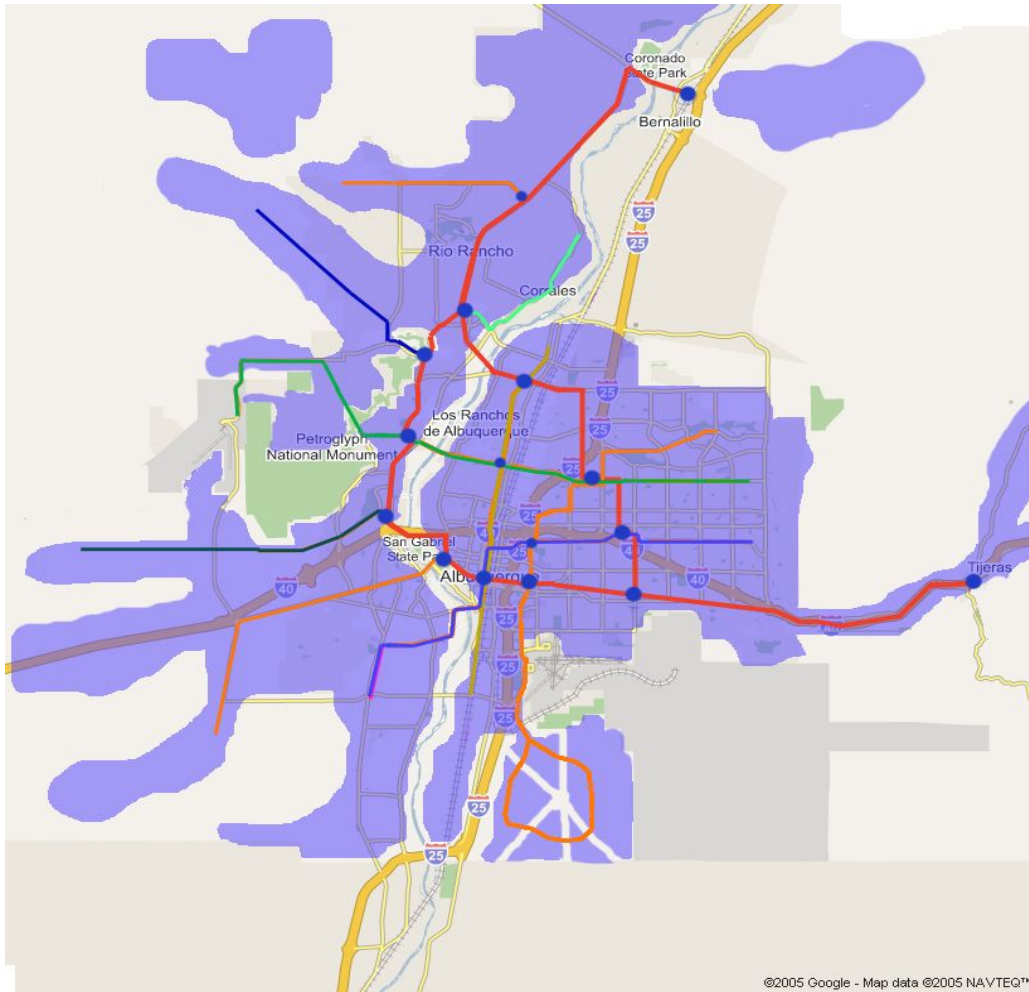


Illustration 1: Plan A



*Illustration 2: Loop Radial*

"Loop Radial" combines the radial rapid bus lines, with a loop of Group Rapid Transit (GRT). Group Rapid Transit is essentially an above-street, horizontal elevator - small driverless cars carry groups at very frequent intervals, and usually stop only at the stations where passengers need to get off. The Group Rapid Transit proposed here for the "Loop Radial" alternative is a monorail configuration connecting Old Town, Downtown, UNM, Uptown, Jefferson corridor, Cottonwood Mall, and Coors/I-40. Eight rapid bus routes cross the Group Rapid Transit loop, radially, and total 80 bi-directional miles. The rapid bus service is similar to the Central Avenue RapidRide, with signal priority but without any dedicated lane. The combination of a loop and radials forms a multi-hub network, rather than the extremes of a single hub or a totally dispersed system. See Illustration 2.

The last alternative, "Personal Rapid Transit", features 200 miles of elevated Personal Rapid Transit (PRT). PRT is similar to Group Rapid Transit, except that each 3- to 6-passenger vehicle is reserved for one destination - one person, or a party of up to six traveling together - and the service is always non-stop. (For more information about this, see references and websites listed at the end of this paper.) While no specific Personal Rapid Transit map has been worked out, the routes would follow most of the region's arterials.

## Ridership

The three options shown, out of many possible variations, represent a range. There are many ways to compare them - by cost, ridership, visual impact, environmental impact, and so on. Let's start by comparing ridership. A model was developed that projects ridership based on least cost, including valuing each commuter's time at a certain rate (here, for example, \$7/hr). A commuter is expected to take transit if the total cost of transit (including the time cost) is less than the cost of driving. Transit systems differ primarily in their speed, in their wait time, and coverage. The model includes other variables such as differences in transit aversion, walking aversion, distance to transit, and cost of parking. The results are striking: The model predicts that the existing transit system would attract 1% of trips, which is approximately the actual rate. "Plan A" is predicted to attract 3%, "Loop Radial" to attract 15%, and "Personal Rapid Transit", as projected, would attract 39%.

These numbers show that the particular system we use for regional transit matters a lot. Why the huge differences? "Plan A" uses light rail, which is heavy, despite its name, not very fast, and the plan calls for only 55 miles of route. So it just isn't very persuasive - it doesn't give many people a better option than they have today. The "Loop Radial" plan is more extensive, so most locations are a lot closer to a premium route. Also, the average speed is higher since the Group Rapid Transit system is elevated and therefore not constrained to road speeds. Because of these factors, it is a faster, cheaper alternative to driving for a lot more people. The Personal Rapid Transit plan is even faster (50 mph average) and even closer to more destinations, so it would attract an even higher ridership.

## Cost

What about cost? A detailed cost model was done for these three sample systems. Despite huge performance differences, the annualized cost for all the systems is nearly the same (the annual costs in the table below include capital depreciation). What is even more important than the system cost is the savings from the cost of driving. The systems' "profits" are defined as the virtual revenue from avoided driving minus the actual costs. The results of the total profits analysis are in the table below, while a more detailed analysis is available at [www.abqtransp.org](http://www.abqtransp.org).

<i>Alternative</i>	<i>Initial Construction</i> <i>M\$</i>	<i>Annual</i> <i>M\$/year</i>	<i>Savings of avoided driving</i> <i>M\$/year</i>	<i>Total Profit</i> <i>M\$/year</i>
Plan A	1,978	154	44	-110 (loss)
Loop Radial	1,328	134	222	+88
Personal Rapid Transit	1,950	169	577	+407

## Money

Over 90% of the total cost of transportation is carried directly by the consumer in the form of automobile purchases, operations, and maintenance. Less than 10% is funneled through government in the form of taxes and fees, which pay for roads and transit. Based on the Metropolitan Transportation Plan 2025, of the amount of the total cost handled by government, 29% goes to transit.

How could we afford a transit system that costs 150 M\$/year? MRCOG estimates that we already spend about 1,700 M\$/year on transportation (public plus private). The costs to the transit operator would be 9% of our collective total. If we went with "Loop Radial" or "Personal Rapid Transit", we would actually come out ahead in total. The amount that gets funneled through government, versus the

amount carried directly by the consumer, changes just slightly. Therefore, we should not see this as a barrier.

Cost is only one of many factors to consider in decision-making. The next sections expand to include other factors.

## **The Planning Process**

How is it that the process presently in use by local government proposed a transit solution that would have almost no effect on the region's transportation, and would be a large economic drain? We think the problem lies in the process used to arrive at the proposed solution. We submit that a more effective process of analysis and decision making is described here.

A typical transportation planning process starts with a scope (such as a corridor), and an array of possible solutions, then narrows them down in stages to one final solution. There is often a box drawn around the possible solutions, as if to announce that the thinking must stay inside the box.

To think outside the box would mean to turn the process upside-down, from a narrowing process to a widening process. Instead of starting with a scope and solutions, we suggest starting with goals and an unrestricted scope. The only way alternatives like "Loop Radial" and "Personal Rapid Transit" could ever be included in a study is if creativity and public participation is part of the basic functioning of the process. Here is how that can be done.

Four activities making up a democratic and creative planning process are (1) setting goals, (2) designing solutions, (3) evaluation, and (4) decision making.

**GOALS:** A good goal is justified by common sense, abstract enough to be met in more than one way, measurable enough so we know to what extent we have reached it, and programmatic enough so that we can track changes in the measure to specific policies and expenditures. The goals set by the Albuquerque Goals Commission have most of these qualities, so they are a good place to start. Goals are necessarily a public participatory process. A smaller set of similar goals was developed for the study cited above, and those are listed along with evaluations below.

**SOLUTIONS:** A "solution" can be considered as an application of land, money, technology, or policy. It is important that design options can come from any source, not just one agency. To be creative and democratic, the solutions could come from anyone, and encompass anything, not be limited to an arbitrary scope. Solutions that the planners didn't originally expect, because they are "outside the box", must be permissible. Solutions must be specific enough to be analyzed for cost and operational benefits. For transit, a solution needs to include specific routes, not just a technology.

**EVALUATION:** Evaluation is done by experts as free of bias as possible, and without authority to decide on a solution. The evaluation process compares each design against each goal to produce a numerical apples-to-apples comparison. Evaluations should be published with complete data sets, so as to be transparent and reproducible, like any valid scientific experiment.

**DECISION MAKING:** The above three steps involved no decision making at all - unlike a typical transportation planning process, which eliminates options in several stages. Decision makers need to have a complete understanding of the goals, solutions proposed, and the evaluation.

## **Sample Systems Evaluation**

Returning to the three sample alternative systems, we will now report on how well those did against

several goals, compared to today's system. This is not a complete set of goals, because we only included those that we have the capacity to project. The evaluation for each alternative is based on the ridership that the system is projected to attract, and is reported in terms of the whole region, not just the people affected by transit. The goal numbers correspond with the more detailed study referenced below; the missing goals were not possible to project in this brief summary.

1. Safety, as measured by fatalities in the region per year: Buses and automated guideways have the best safety record (based on federal data), so the alternatives that use those technologies did the best. "Plan A" projects a 1% improvement over the current fatality rate, "Loop Radial" projects a 10% improvement, and Personal Rapid Transit projects a 32% improvement.

11. Cost-effectiveness, as measured by average personal income going to transportation: "Plan A" actually costs 6% *more* than the current system, because the savings of avoided driving is outweighed by the system cost. "Loop Radial" saves 5%, and "Personal Rapid Transit" saves 25%.

12. Clean air, as measured by cost of energy for the system, which is roughly proportional to the use of fossil fuel: "Plan A" cuts regional energy costs by 1%, while "Loop Radial" cuts it by 11% and "Personal Rapid Transit" cuts it by 34%. (Not surprisingly, these numbers are close to the ridership numbers.)

14. Commute time, as measured by average speed (This ignores land use factors in determining commute time.): "Plan A" does not affect average commute time. Based on the formula's estimate of the current average speed of 19.9 mph, and an arbitrary target value of 40 mph, "Loop Radial" projects a 4% improvement, while "Personal Rapid Transit" projects a 59% improvement. As with all these evaluations, the numbers are averages for the region including drivers.

15. Travel time equity, as measured by the ratio of transit travel time to driving time: Today's measure is 338%, meaning transit takes over three times as long as driving on average. "Plan A" reduces this to 276%, "Loop Radial" reduces this to 204%, and "Personal Rapid Transit" reduces this to 118% (bringing transit travel times to nearly the same as driving times).

What do these numbers tell us? "Plan A" loses money, and has the least impact towards the goals chosen for the study. The planning process that is in place today (which produced "Plan A") is not good at including out-of-the-box ideas or evaluating them. The process described here is capable of producing solutions that are vastly superior to those that come out of traditional planning processes. The two alternatives were dreamed up by just one person, and it was not difficult to design systems that meet the goals better than "Plan A". Imagine if dozens of people participated in the design step - we would certainly produce ideas that are better than anything you see in this paper.

## Visual and Functional Integration

One of the goals that we do not have the funds to evaluate is the ability of each system to be visually and functionally integrated into the urban form.

Generally speaking, on-street options like bus, express bus, and trolleys are more easily integrated, and present fewer challenges. Options that use a dedicated right of way are more challenging to integrate, because they have to be elevated, tunneled, or fenced off. These include heavy rail (subways and commuter rail) and automated peplemovers (including Personal Rapid Transit and Group Rapid Transit).



*Illustration 3: Photomontage of PRT integration*

Beauty is a public goal. This can actually be projected numerically just like the other goals of safety, fuel use, travel time, and so on. One way it can be done is by survey using photomontages (see illustration). It is our *guess* that "Plan A" and "Loop Radial" would score better than "Personal Rapid Transit" on this goal. The planning process should include this step, so that decision makers have good information on the public response to a system. Also see the end of this paper for more references to visuals.

## Phases of Implementation

It will take years, or decades, to build a transit system that achieves high ridership, and it has to be done in stages. Nevertheless, the system planning can be done now. That way, we know that the pieces we build first will fit with the other pieces to be built later, in a big coordinated network.

It should be noted that Personal Rapid Transit is not currently an off-the-shelf option, and it could not realistically be put into service at the scale that we include here. Personal Rapid Transit is a paradigm-shifting technology, so it takes some patience and study to understand how it works. There is often a tendency to dismiss it as unworkable, even among professionals, even though it has been demonstrated in actual operation and more extensively in simulation modeling. It would need to be implemented in a pilot project, which could result in better cost estimates.

With these limitations in mind, one possible phased scenario is as follows:

- Start running the "Loop Radial" plan, using standard buses every 5 minutes. Use a bus for the "loop" route instead of Group Rapid Transit at first.
- Add enhancements like signal priority and traveler information systems over several years.
- Build a Group Rapid Transit pilot project along one part of the loop route - perhaps the Jefferson corridor connecting the Paseo del Norte RailRunner stop to Uptown via Jefferson and Montgomery.
- Depending on the results of the pilot project, possibly extend the Group Rapid Transit to complete

the full loop.

- Depending on the actual costs and integration issues, add spurs to the Group Rapid Transit loop and run Personal Rapid Transit service on the same track, but extending to more places.

### **Further Reading**

1. The full study cited throughout this paper is titled “A Democratic Approach to Transportation and Land Use Planning for the Albuquerque Metro Region”. It is available at [www.abqtransp.org](http://www.abqtransp.org). It includes all assumptions, data, sources, and spreadsheets, and even the ability to change assumptions and recalculate the results.
2. Sources for more information on innovative and emerging transit options are: The Advanced Transit Association ([www.advancedtransit.org](http://www.advancedtransit.org)), and Innovative Transit Technologies ([faculty.washington.edu/jbs/itrans](http://faculty.washington.edu/jbs/itrans)). Also see SkyWeb Express ([www.skywebexpress.com](http://www.skywebexpress.com)) for one of the leading Personal Rapid Transit developers at this point.
3. Visuals, including photomontages can be found on most Personal Rapid Transit vendors web sites, accessible through [faculty.washington.edu/jbs/itrans](http://faculty.washington.edu/jbs/itrans). Also see [www.abqtransp.org](http://www.abqtransp.org), under "Other Articles and Links".
4. Current procedures, goals, and plans for the Albuquerque Metro region are available from MRCOG at [www.mrcog-nm.gov](http://www.mrcog-nm.gov).