Pricing Network Assuming the Need for Dynamic Pricing (QR1)

Two main components are required:

1. **Tolling Equipment**
   - Dynamic pricing requires the toll to vary frequently (maybe as often as every minute – but every 5 or 6 minutes may be more realistic).
   - Since the price varies frequently, the current method of capturing transponder reads will not work. The current method cannot distinguish where, and more importantly *when*, the vehicle entered the HOT lane. For dynamic pricing, the system must be able to determine (with reasonable accuracy) when the vehicle entered the HOT lane.
   - Although this information needs to be recorded in real-time (as it is now), there is no need to process the data in real time. Billing could occur much as is done now. Currently, records of the exact transponder identification number, time, billing reader and date are stored and then sent to METRO at regular intervals. This would work for the dynamic pricing system as well, as long as a record of the price during each time period was also recorded and matched to the usage records.
   - To make reasonable assumptions on the time of entry of each paying QuickRide user would require data from the following readers:
     - Northwest Freeway, Inbound: 36, 37, 38, 40, 42
     - Northwest Freeway, Outbound: 43, 44, 46, 48, 49
     - Katy Freeway, Inbound: 12, 13, 15, XX
     - Katy Freeway, Outbound: YY, 18, 20, 21
     - XX and YY = required new readers between Post Oak and the Slip ramp
   - Note, these requirements are based on my examination of a rough schematic diagram of reader locations. I need your input to let me know if the list above includes sufficient readers to determine when a vehicle entered the HOT lane. Also, how inaccurate might these times be? Since we have average speeds on the lanes it should be straightforward to estimate the entry time of a vehicle with a reader a short distance from the entry. Would this be correct to assume?

2. **Speed and Flow Measurement**
   - To set the correct prince to ensure free flow conditions it is necessary to both (a) monitor speeds in real time and (b) monitor the entry and exit of vehicles in real time.
   - To accomplish these goals, Wavetronix vehicle detectors have been ordered. To date, two have been ordered for the Katy Freeway and two for the Northwest Freeway. We estimated a total of 12 would be necessary to accomplish goals (a) and (b) from above.
   - These devices would have to supply this data in real-time to a pricing algorithm. This algorithm would then both store the data (to later use for billing purposes) and send the data in real-time to the dynamic message signs displaying the price.
   - Due to the real-time requirements it will be necessary to ensure good communications between these vehicle detectors, the pricing algorithm (possibly housed at TranStar) and the dynamic message signs.

- With the assistance of Dan Middleton and Ricky Parker we have determined that the Wavetronix device will supply the necessary data on vehicle counts and speeds.
- The planned locations of all 12 devices are as follows (see Figures 1 and 2):

  Northwest Freeway:
  1. Northwest Station, just southeast of the T-ramp.
  2. West Little York, just southeast of the T-ramp.
  3. Speed reader northwest of Pinemont (where speeds are not influenced by Pinemont or West Little York ramps).
  4. Pinemont, just northwest of the T-ramp.
  5. Pinemont, just southeast of the T-ramp.
  6. Dacoma, just northwest of the T-ramp.
  7. Northwest Transit Center, two-lane road to the center.

  Katy Freeway:
  8. Addicks, east of the T-ramp.
  9. Gessner, east of the on ramp (counts vehicles entering at Gessner and traveling on the HOV lane).
  10. Speed reader at Silber.
  11. Post Oak exit/entry.
  12. Eastern Extension exit/entry.

- The first 4 to be installed will be numbers 3, 6, 10, and 12.

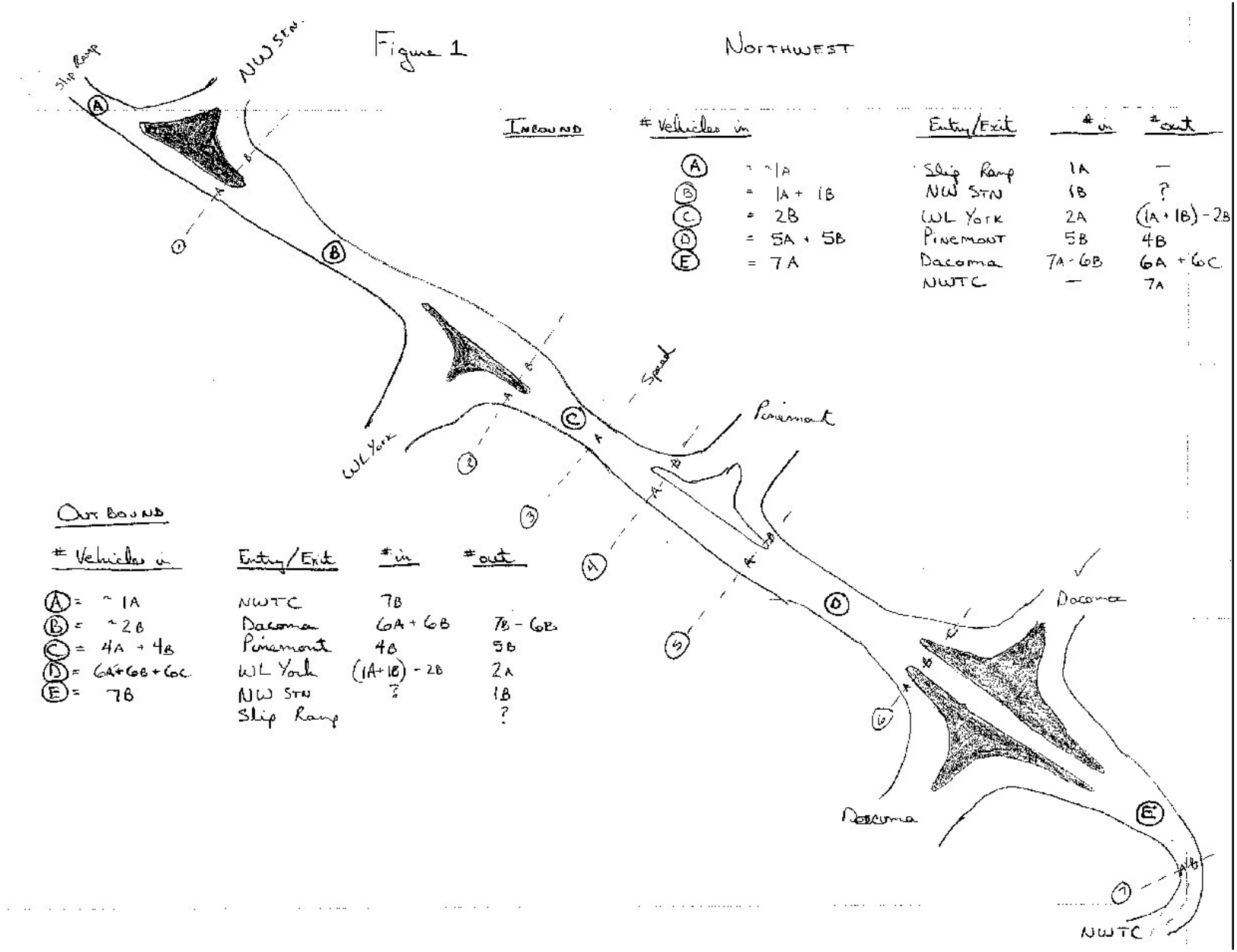
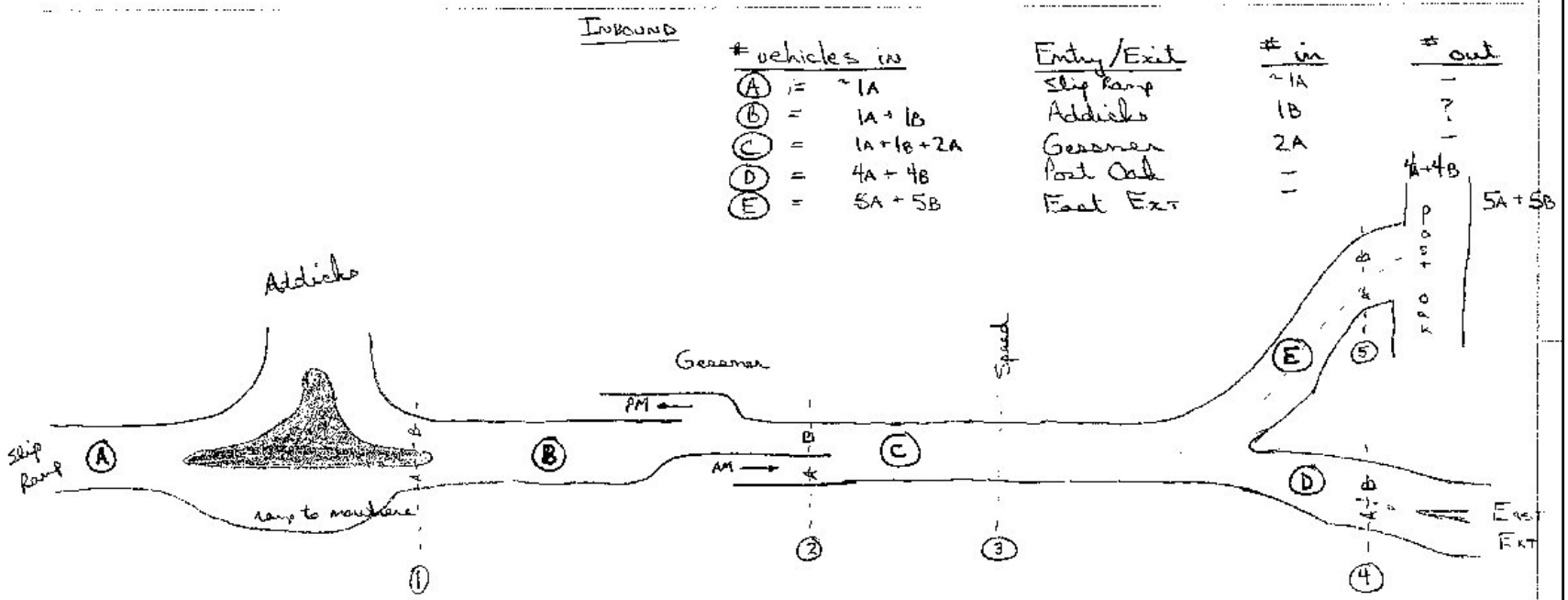


Figure 1
NORTHWEST
Slip Ramp
NW STN
WL York
Spout
Pinemont
Dacoma
NWTC
INBOUND
# Vehicles in
A = ~1A
B = 1A + 1B
C = 2B
D = 5A + 5B
E = 7A
Entry/Exit
in
out
Slip Ramp 1A —
NW STN 1B ?
WL York 2A (1A + 1B) - 2B
Pinemont 5B 4B
Dacoma 7A - 6B 6A + 6C
NWTC — 7A
OUTBOUND
# Vehicles in
A = ~1A
B = ~2B
C = 4A + 4B
D = 6A + 6B + 6C
E = 7B
Entry/Exit
in
out
NWTC 7B
Dacoma 6A + 6B 7B - 6B
Pinemont 4B 5B
WL York (1A + 1B) - 2B 2A
NW STN ? 1B
Slip Ramp ?

Figure 2

Katy



Outbound

# vehicles at	Entry/Exit	# in	# out
A = ~1A	East Ext	4A + 4B	—
B = 1A + 1B	Post Oak	5A + 5B	—
C = 4A + 4B + 5A + 5B	Gessner	—	(2A + 2B) − (1A + 1B)
D = 4A + 4B	Addicks	?	1B
E = 5A + 5B	Slip Ramp	—	~1A