APPENDIX E

COMPACTING WASTE FEASIBILITY ANALYSIS

APPENDIX E – COMPACTING WASTE FEASIBILITY ANALYSIS

Compacting solid waste to increase its density prior to shipment to a disposal site is standard industry practice in North America. Large machines installed at transfer stations compress waste into a cube and then push it into a transfer trailer or container. Compacting waste increases disposal efficiencies and reduces transportation costs.

King County owns eight transfer stations. Of the eight, six stations were constructed in the 1960s, well before compactors became integral components of a modern solid waste handling system. Of the six, First Northeast will receive a compactor as part of reconstruction scheduled to begin in 2006. The Enumclaw and Vashon stations, constructed in the 1990s, are equipped with compactors. That leaves Algona, Factoria, Renton, Houghton and Bow Lake without compactors. These five stations handle about 85% of the solid waste processed in King County.

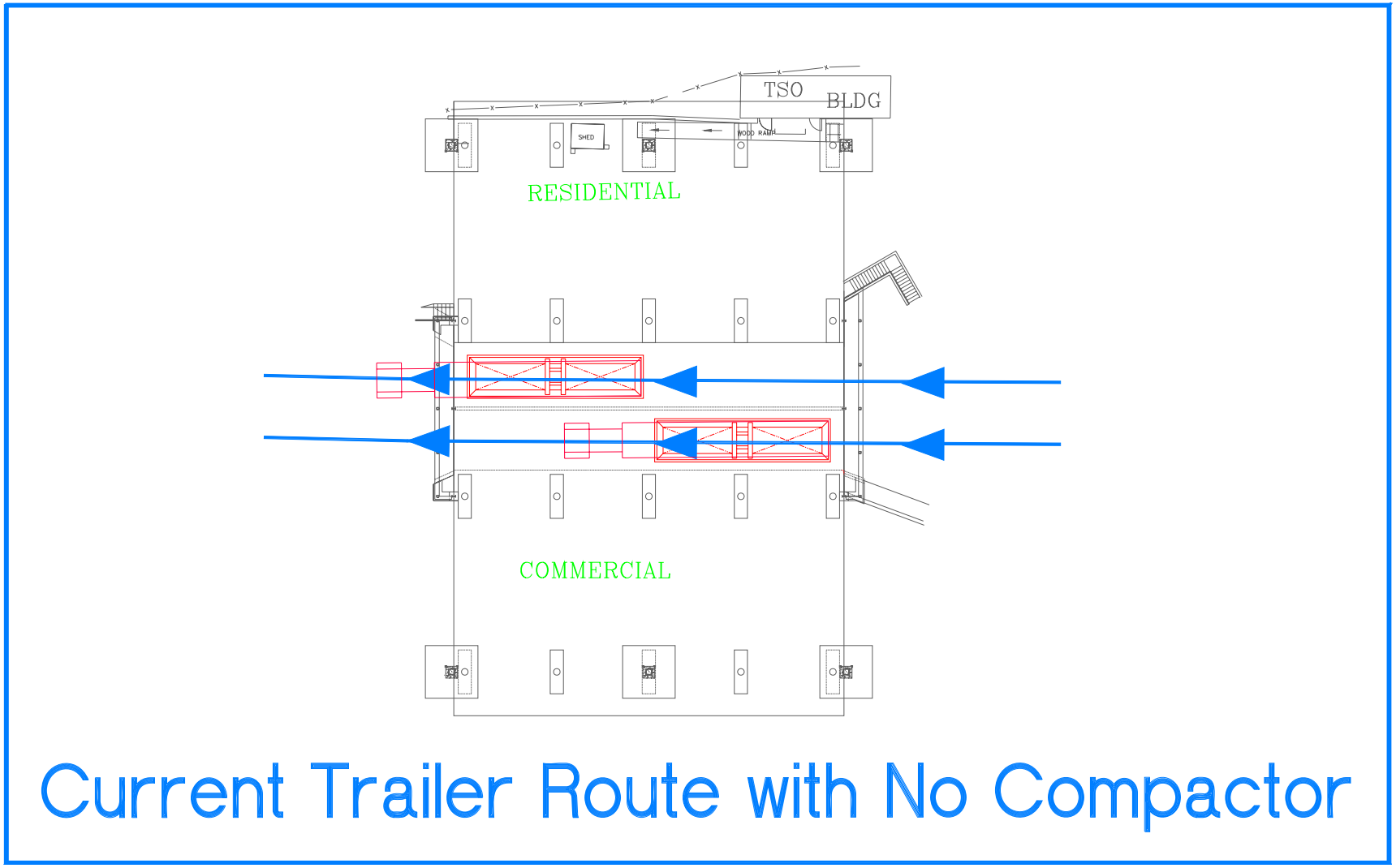
Currently, the stations without compactors load trailers with an average of 18 tons of waste. In contrast, the two transfer stations with compaction units fill trailers with about 27 tons of waste. The number of containers shipped is a major factor in the overall cost of exporting waste.

Transfer Station Analysis
The Solid Waste Division performed a detailed feasibility analysis of installing waste compactors at the five urban stations that were evaluated. The analysis was based on the standard units of the two major manufacturers of refuse compaction equipment. The analysis assumed that compactors would be installed in the stations with no expansion of the existing buildings.

<u>Current Operations:</u>
Of the five stations without compactors, four – Algona, Factoria, Houghton and Renton – have identical floor plans. Current operations of the four are addressed as a group. The remaining station, Bow Lake, has a different design and is addressed separately.

Customers at the four identical stations unload into two parallel chutes. Waste is unloaded directly into transfer trailers parked in a tunnel below each chute. The vertical drop allows vehicles to remain stationary as they empty their loads. These stations are known as direct load facilities. Figure 1 illustrates the current system of operation.

Figure 1 – Direct Load Facility



At Bow Lake, customers unload waste into a pit. Dozers then push the garbage into a single chute to a transfer trailer in a tunnel below. This is known as a push-pit facility.

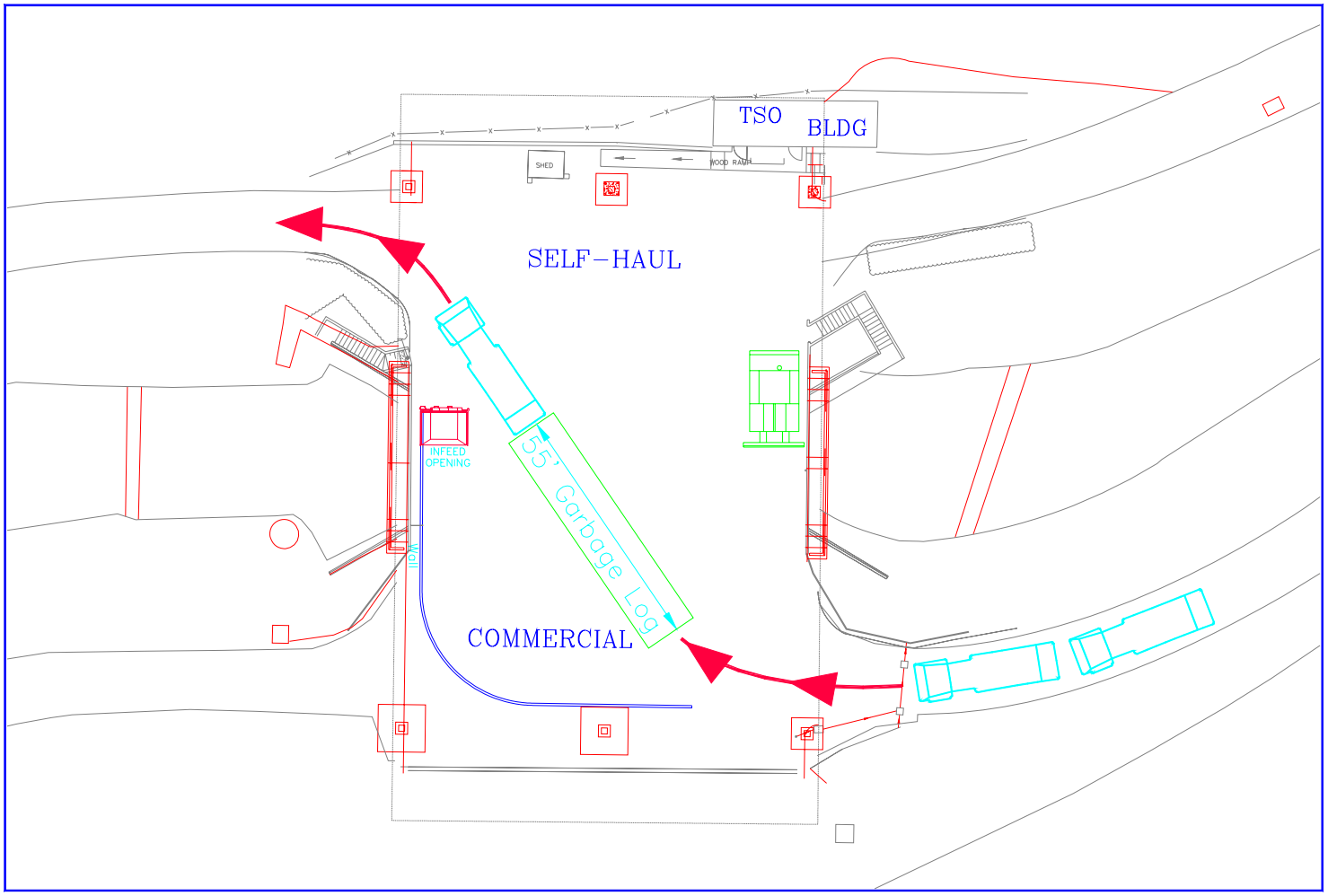
Compactor Installation and Operation:
At the direct load facilities, a single compaction unit would be installed in one of the two transfer trailer tunnels. The chute over the compactor would be replaced with a large hopper. The other tunnel would be covered to create a flat tipping floor.

Having compactors at the four direct load stations would add an intermediate step to the transfer process. After the waste is unloaded directly onto the tipping floor, it would then be preprocessed before being loaded into the hopper. Preprocessing the waste is necessary because oversize items could jam the compactor. The waste would be sorted for oversize items and then crushed and shredded by a dozer. This would require construction of a new push wall on the tipping floor. After preprocessing, a front-end loader would load the waste into the hopper.

Preprocessing requires a flat tipping floor, which would eliminate the vertical drop that currently allows vehicles to remain stationary while unloading. With a flat floor, commercial collector vehicles would have to move forward an average of 55 feet on the tipping floor to completely unload.

Virtually all of the tipping floor space at the four direct load stations would be needed for commercial haulers to unload and to preprocess garbage. Figure 2 depicts commercial operations at a flat floor facility.

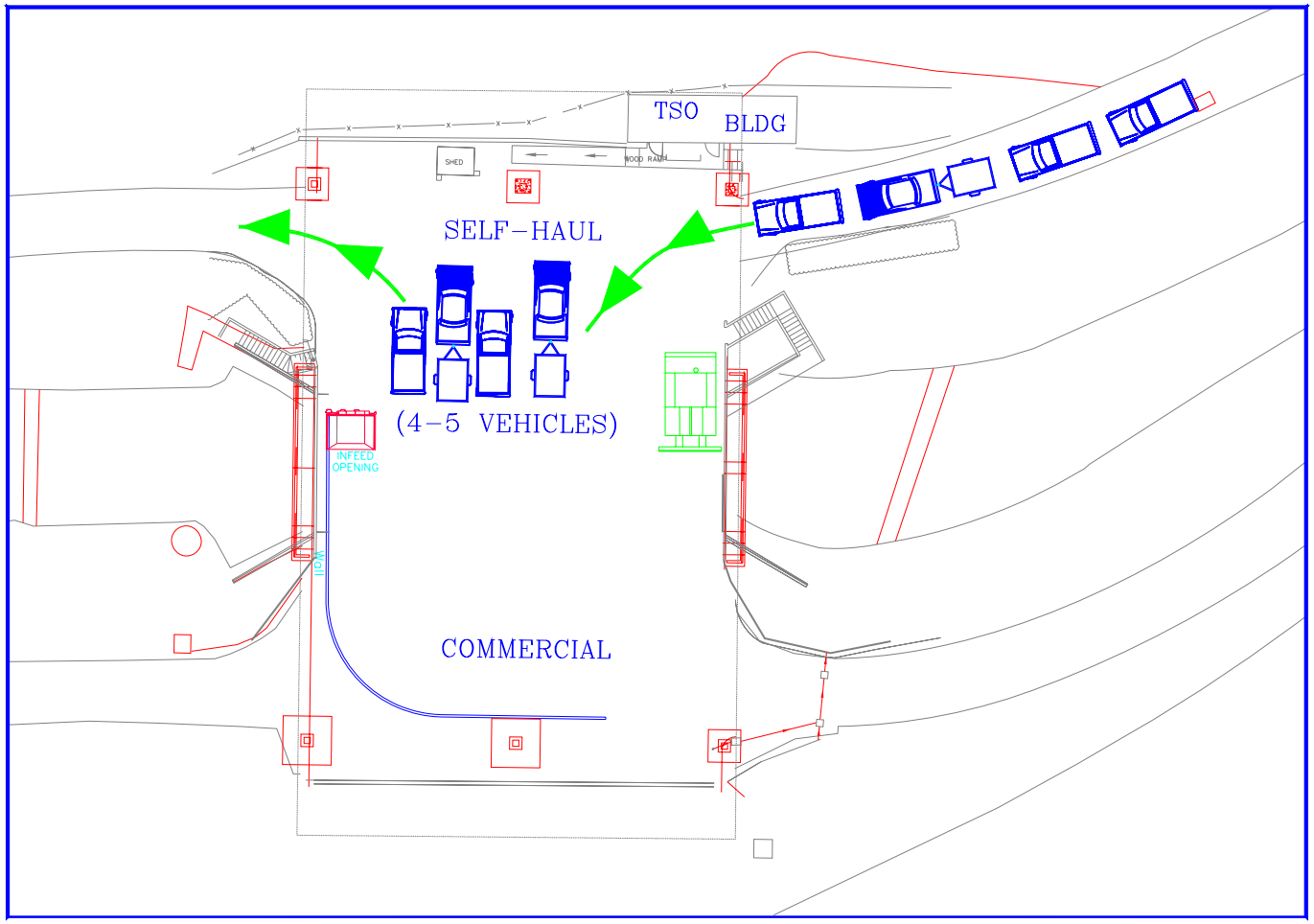
Figure 2



COMMERCIAL

Floor space at the direct load stations would be sufficient for only one commercial hauler to unload at a time. Self-haul traffic would be stopped while commercial haulers unload just as commercial haulers could not unload when self-haulers were doing so. Waste also could not be unloaded during preprocessing. This would create unavoidable service delays. Figure 3 shows self-haul operations at a flat floor facility.

Figure 3

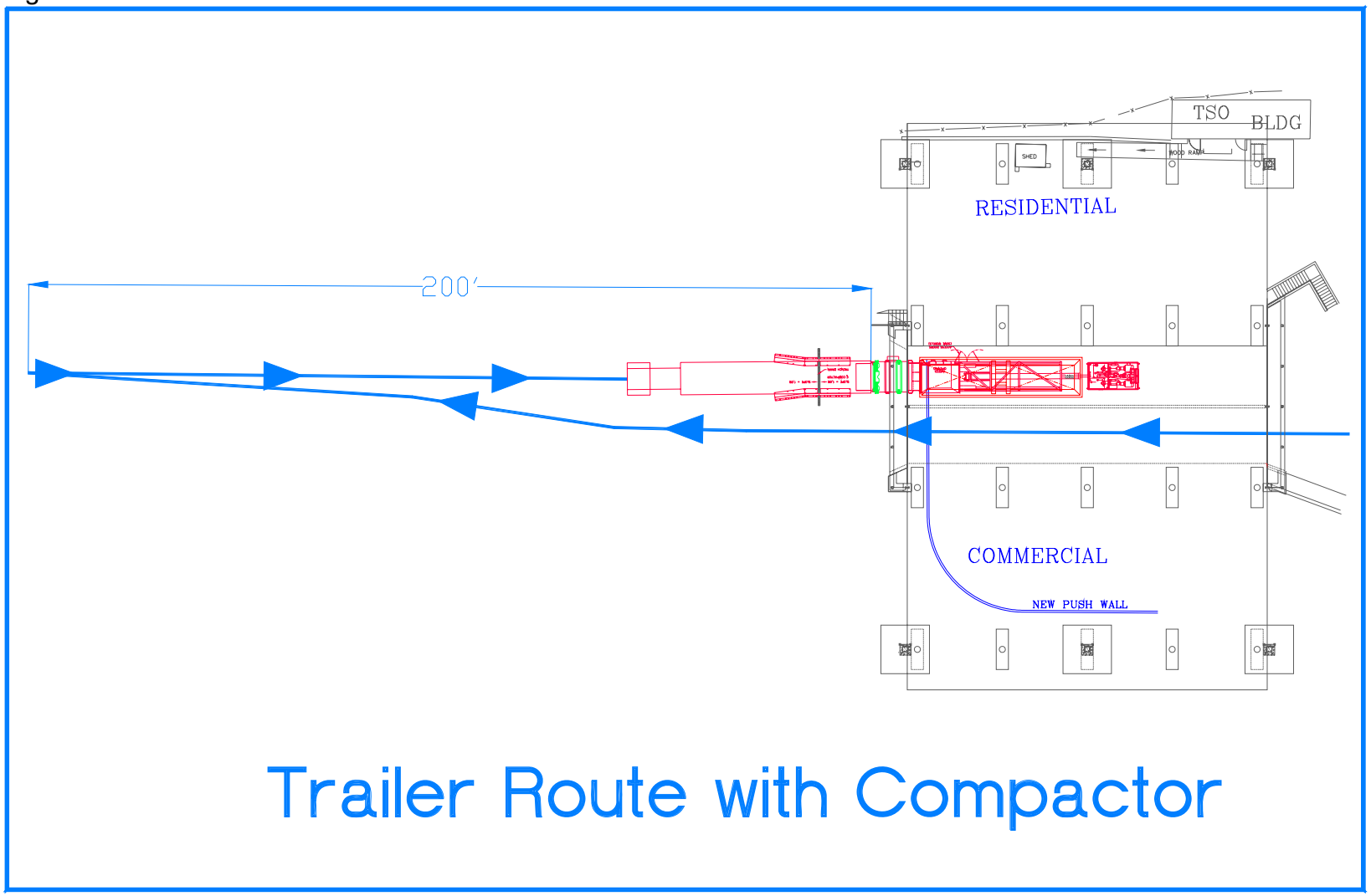


SELF-HAUL

To load a transfer trailer with compacted waste, it would first be pulled through the open tunnel (formerly the second chute). When it is clear of the tunnel, it would then have to be backed up into the other tunnel to connect to the compactor.

Driving through the tunnel and then backing up to the compactor would require about 200 linear feet of space. This is an important constraint for installing compactors at the existing stations. Additional back-up space would be needed at all five transfer stations. Figure 4 shows station operation with a compactor.

Figure 4



Trailer Route with Compactor

Facility Evaluations

The tables below summarize the results of the feasibility analysis for stations to be retrofitted with compactors. The first table specifically addresses tonnage and traffic impacts of compactor installation.

Compactor Installation in Existing Transfer Stations
Tonnage and Vehicle Capacity

	Algona	Bow Lake	Factoria	Houghton	Renton
Current No. Commercial Stalls (weekday)	2	2 or 3	2	4	2
Future No. Commercial Stalls	<1	2 to 4	<1	<1	<1
Current No. Self Haul Stalls (weekday)	8	10	8	6	4
Current No. Self Haul Stalls (weekend)	16	18	16	16	16
Future No. of SH Stalls (weekend)	5	18	5	5	5
Current Tonnage Capacity, tph	74	74	74	74	74
Future Tonnage Capacity, tph (Commercial Only)	28	Up to 200 assuming 2 compactors	28	28	28
Current SH Vehicle Capacity, vph	86.5	74	74	74	74
Future SH Vehicle Capacity, vph	37	74	37	37	37

Notes:

1. Average Self Haul unloading time on floor ~ 8 minutes.
2. Current tonnage capacity is constrained by the number of trailers that can be switched out per hour.
3. Future tonnage capacity constrained by the ability to process a 25 to 28 ton bale. Operations assumption is that it would take 15 minutes to tip commercial vehicle, push waste into small hopper (due to lack of height from floor to compactor receiving floor), and form bale. Estimate number of commercial vehicles that can tip per hour is 4 commercial vehicles at 7 tons each.
4. Current vehicular capacity constrained by outbound scale.
5. Future vehicle capacity approximated by: (60 minutes/hr)/(8 minutes/vehicle) x (no. of stalls). If less than outbound scale capacity (74 vehicles/hr.), then this quantity is used.

The second table illustrates, if an insurmountable obstacle or "fatal flaw" is identified, the subsequent question or category for that station is no longer relevant. The questions addressed are:

- Does the station have the physical space needed for a compactor?
- Do site constraints allow trailer maneuvering?
- Is the loss of station capacity at direct load transfer stations acceptable?
- Are the construction costs of compactor retrofits acceptable?

Transfer Station Compactor Retrofit Feasibility					
	Algona	**Factoria**	**Renton**	**Houghton**	**Bow Lake**
Stations have the physical space to install waste compactors	Yes	Yes	Yes	Yes	Yes
Site constraints allow for trailer maneuvering	No	No	No	Yes	Yes
Loss of capacity at direct load facilities is acceptable	No longer applicable	No longer applicable	No longer applicable	No	Capacity increases
Construction costs of compactor retrofits are acceptable	No longer applicable	No longer applicable	No longer applicable	No longer applicable	Rebuilding is more cost-effective

Physical space

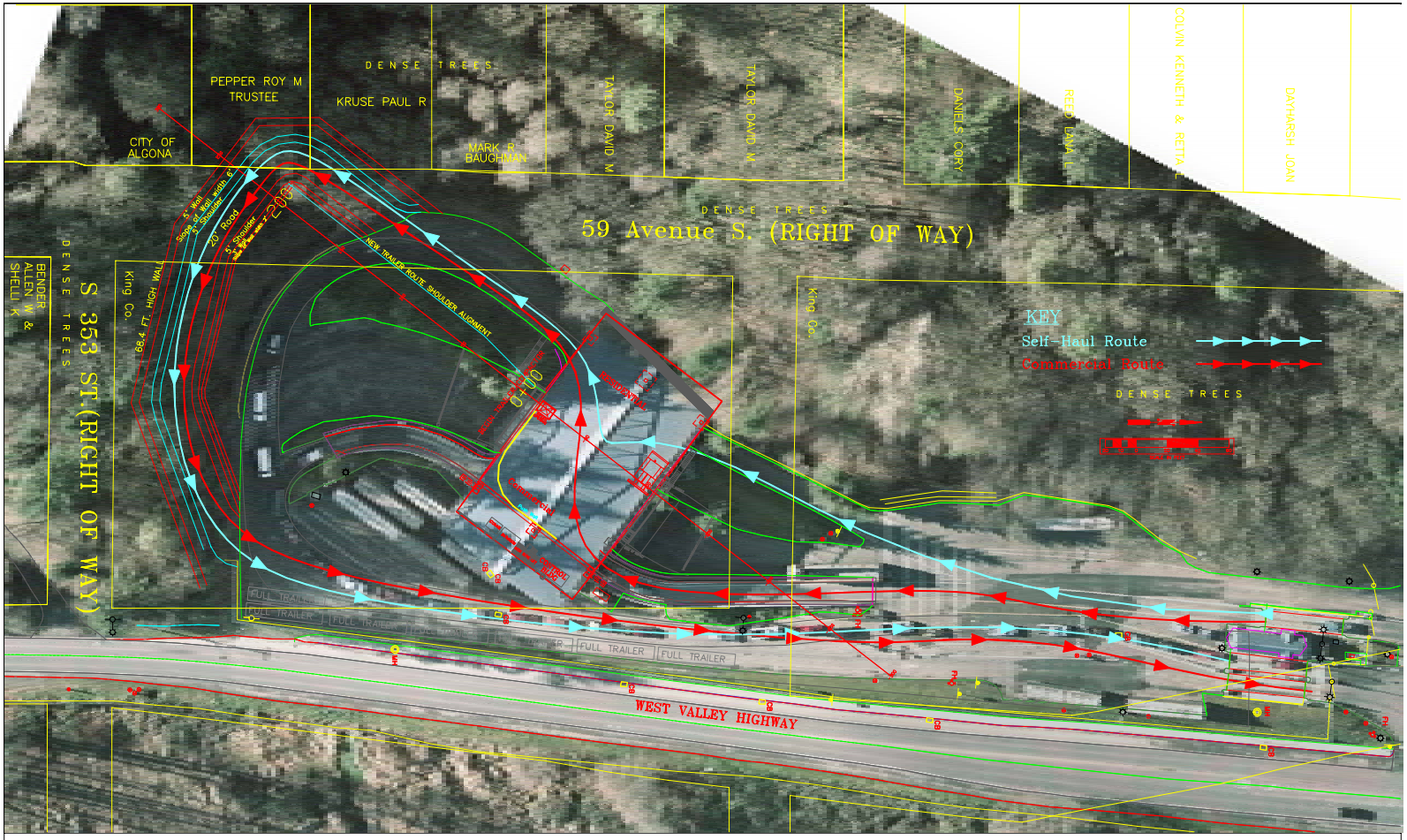
The analysis confirmed that all five transfer stations have the physical space required to install compactors. However, at the direct load facilities, station operators would operate in a constrained area and would need to exercise more control of traffic on the floor. Traffic flow would be adversely affected, including significant increases in vehicle queuing. Trailer parking at Bow Lake would be reduced. None of these impacts, however, would constitute an insurmountable obstacle to installing compactors at the stations.

Site constraints

There are no apparent site constraints at the Houghton and Bow Lake transfer stations. The other three stations, however, could not be retrofitted with compactors because the required 200 feet of trailer maneuvering room could not be provided at a reasonable cost.

Providing space at Algona would require a massive vertical cut into the surrounding hillside. The cost would be considerable and eliminates Algona as a compactor candidate. Schematic A shows the changes required at Algona.

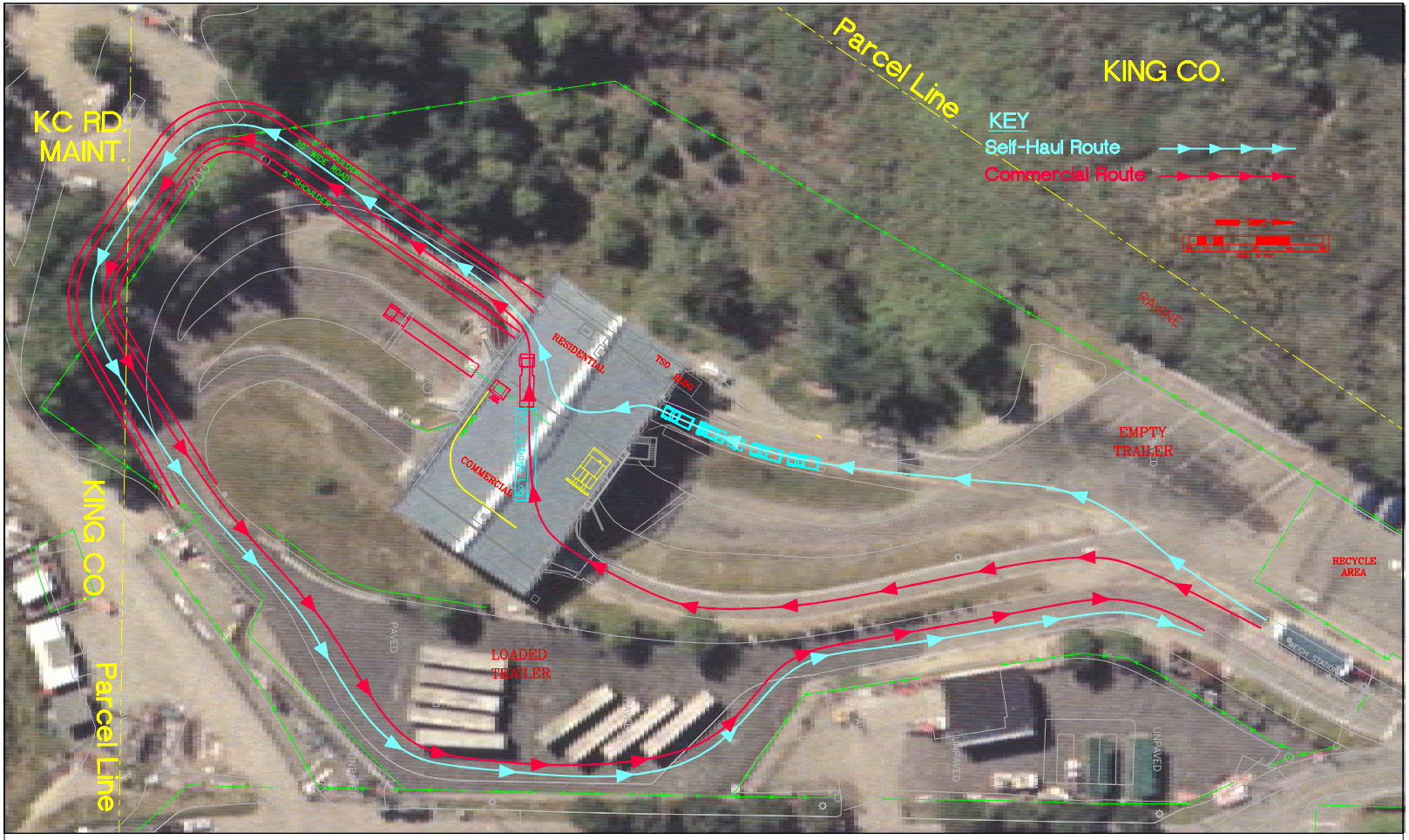
Schematic A



Algona Transfer Station

At Renton, providing sufficient space would require use of adjacent King County road maintenance land and extensive filling of an embankment. The analysis concluded that compactor installation at Renton would not be feasible. Schematic B shows the changes required at Renton.

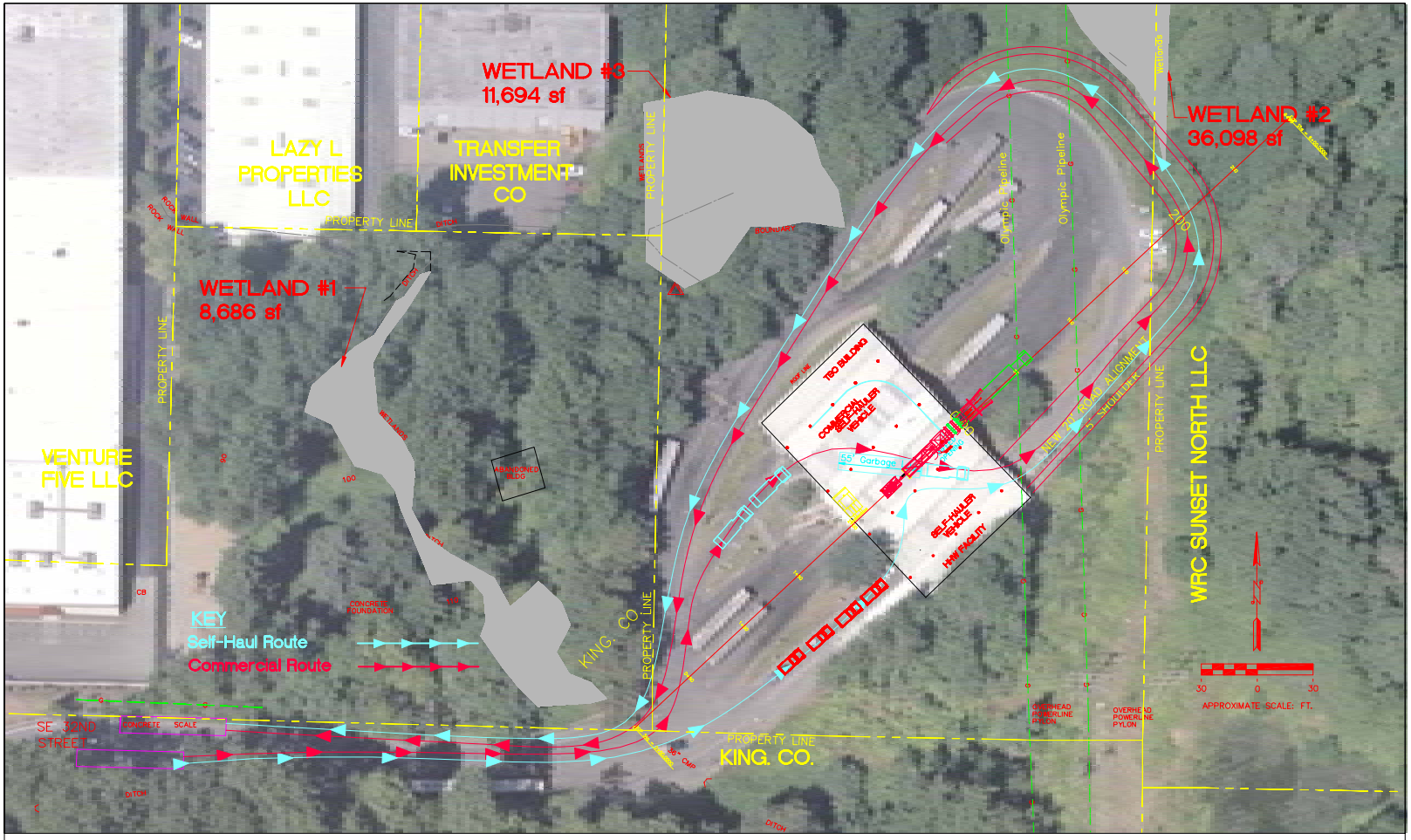
Schematic B



Renton Transfer Station

Achieving the clearance at Factoria would require relocating or realigning the Olympic natural gas pipeline. Such a project would be extremely difficult. Expanding roads into wetland areas and private property would also be required. Installing a compactor at Factoria would not be feasible. Schematic C shows the changes required at Factoria.

Schematic C



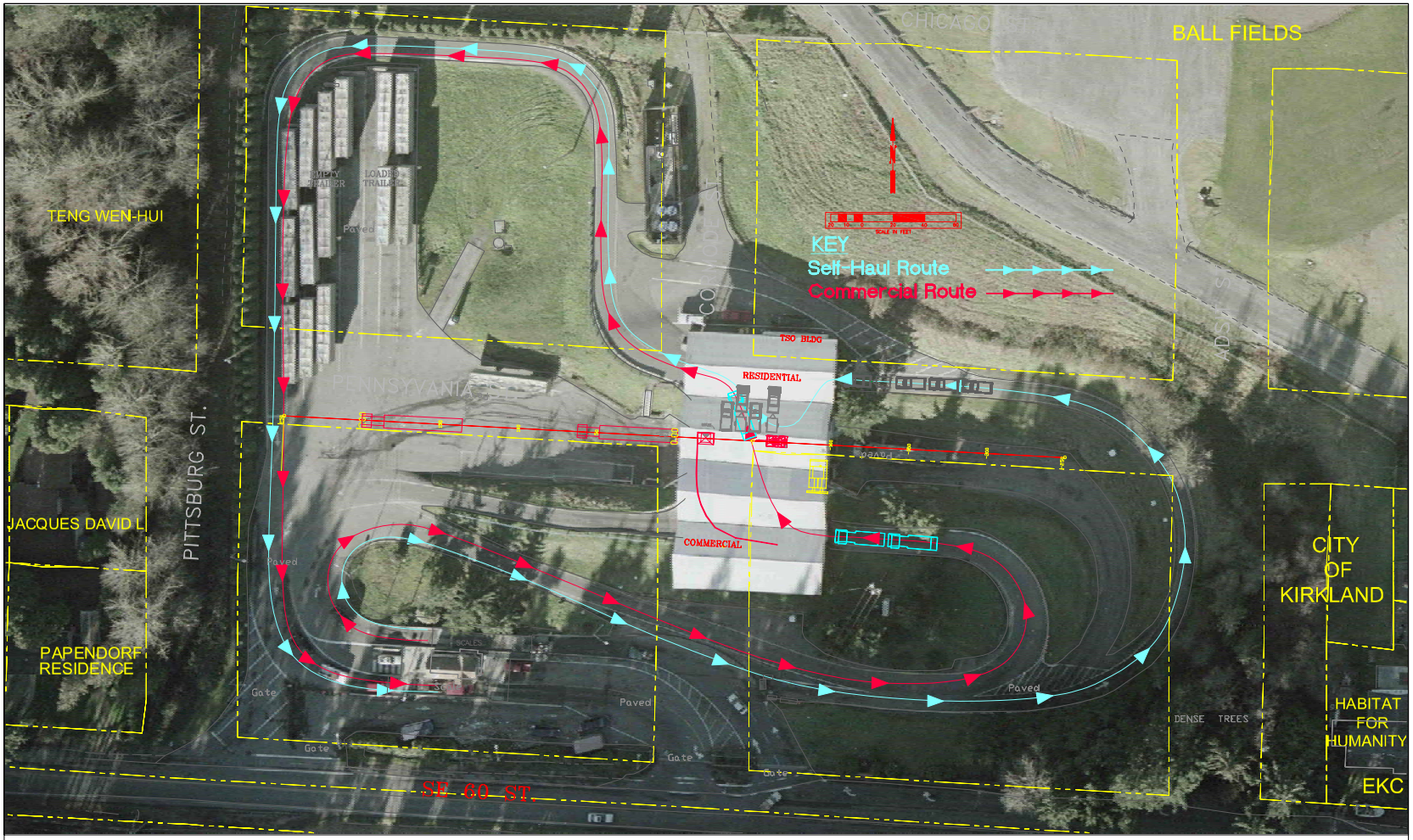
Factoria Transfer Station

Loss of capacity

All direct load transfer stations would suffer significant capacity losses as a result of installing compactors. For Algona, Renton and Factoria, site constraints also preclude compactor installation.

Installing a compactor at Houghton as at the other three direct load stations, would result in a 60% capacity loss. Self-haul activity at Houghton accounts for 84% of the traffic. The remaining capacity would not be sufficient for self-haul service especially on weekends. Schematic D shows the changes required at Houghton.

Schematic D



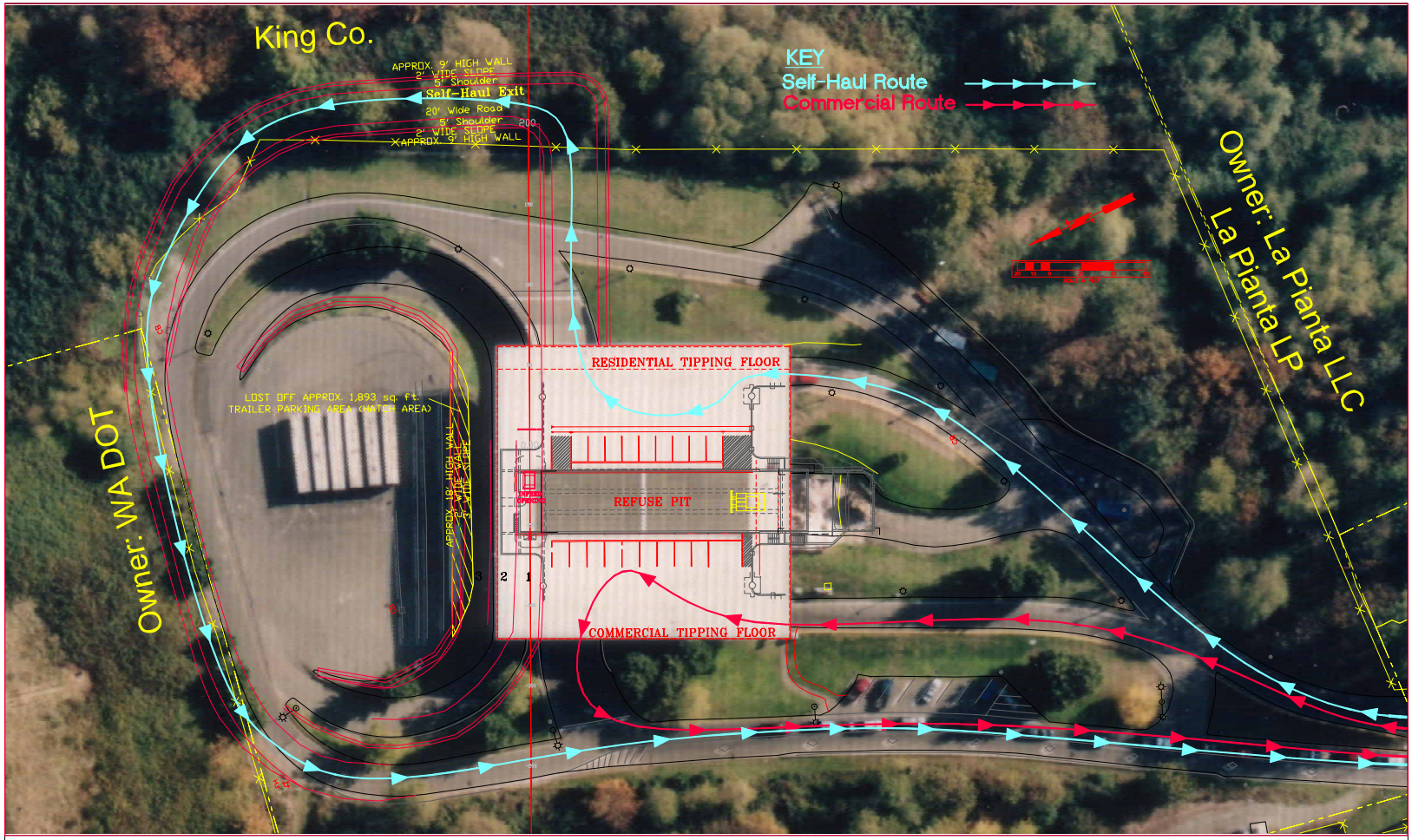
Houghton Transfer Station

Capacity at Bow Lake would actually increase from the current 74 tons-per-hour (tph) to 100 tph with one compactor or 200 tph with two compactors.

Construction costs for the direct load stations are not discussed because compactor installation at these stations is not feasible due to site constraints and capacity loss.

Due to its design, Bow Lake could accommodate installation of one or two compactors. Construction required for this installation would be subject to current code requirements of the City of Tukwila, Bow Lake's permitting jurisdiction. Construction costs to bring the facility up to current code are comparable to costs for building a new facility designed for use with a compactor. Schematic E shows the changes at Bow Lake.

Schematic E



Bowlake Transfer Station

Summary

The division's feasibility analysis demonstrates that installing compactors at the existing transfer stations would not be a viable approach because of one or more of the following obstacles:

- site constraints
- loss of waste handling capacity
- high costs

Site constraints and loss of capacity are significant at Algona, Factoria, Renton and Houghton. One or two compactors could be installed at Bow Lake; however, the cost of retrofitting the existing facility would likely exceed that of replacing it with a new structure.