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Michael Miguel
Manager, Public Support Section
Air Resources Board
P.O. Box 2815
Sacramento, CA 95812

RE: Comments on *Evaluation of Port Trucks and Possible Mitigation Strategies*

Dear Mr. Miguel:

We appreciate this opportunity to submit our comments on ARB's draft port truck report. By way of introduction, The Tioga Group (Tioga) is a freight transportation consulting firm with over 150 years of combined staff experience serving carriers, shippers, and public agencies. It has been our privilege to lead many of the goods movement studies, port forecasts, and related projects in California, and to serve as part of the project team for many others. Our recent clients have included SCAG, SANBAG, MTC, SJCOG, STANCOG, the Gateway Cities COG, and the Ports of Long Beach, Los Angeles, and Oakland.

It is clear to us, and to every participant in the freight industry, that diesel emissions from Southern California drayage tractors (port trucks) constitute the single most pressing emissions and freight transportation problem facing the State, and perhaps the nation. ARB's concerns are on target, and fully justified. ARB has clearly worked long and hard to analyze the situation and potential mitigation strategies.

Tioga's unique strength as a consulting firm is our understanding of the freight industry and its workings. We offer the comments below from that perspective.

Port drayage emissions may be worse than estimated.

Our understanding is that ARB estimated the port drayage emissions by first estimating the total port drayage activity, then applying standard diesel engine emissions factors. We believe this method may not account for the dramatic differences between the duty cycle of drayage tractors and the duty cycle of highway operations.

The CARB Highway Heavy Duty Diesel Truck (HHDDT) Test cycle consists of 17% idle, 26% creep and transient, and 58% cruise. A UC Riverside series of tests using a Freightliner tractor with a 2000 Caterpillar C-15 engine yielded the following emissions averages for the CARB HHDDT cycle.

UC Riverside HHDDT Road Test Results

Measure	Idle	Creep	Transient	Cruise
EC mg/min	1.88	15.35	75.81	50.56
OC mg/min	40.98	12.39	44.76	26.97
EC+OC mg/min	42.86	27.74	120.57	77.53
Avg MPH	0	1.8	15.4	39.9

In contrast to the HHDDT cycle, however, a survey of drayage drivers reported 50 – 60% waiting time, much of which is typically spent idling. Depending on the length of their trip and traffic conditions, drayage drivers may spend very little of their time cruising at freeway speeds. The table below presents weighted average EC+OC carbon emissions for the HHDDT cycle based on the UC Riverside results and three conceptual drayage cycles. The implications are striking.

Emissions Implications of Conceptual Drayage Activity Cycles

Cycle	Time Shares				Weighted Averages			
	Idle	Creep	Transient	Cruise	EC+OC mg/min	MPH	EC+OC mg/mi	Excess over HHDDT
CARB HHDDT	17%	7%	19%	58%	77.1	26	176.6	
Conceptual Drayage 1	25%	25%	25%	25%	67.2	14	282.3	60%
Conceptual Drayage 2	50%	20%	10%	20%	54.5	10	331.2	88%
Conceptual Drayage 3	50%	15%	25%	10%	63.5	8	469.7	166%

If, for example, the drayage cycle were evenly split between idling, creeping, transient, and cruise phases the emissions per minute would be less than the HHDDT cycle, but the emissions per mile would be 60% greater because of the reduced average speed. The situation worsens as the percentage of time spent in the cruise mode declines because less and less work is being achieved as average speed falls. In the worst case shown, emissions would be 166% of the HHDDT cycle estimate.

The unfortunate truth is that the 8 mph average shown as the worst case above is not implausible. A driver shuttling between Los Angeles or Long Beach marine terminals and the Union Pacific Intermodal Container Transfer Facility (ICTF) just four miles away will commonly take almost two hours for an 8-mile round trip: 1 hour at the marine terminal to drop an empty and pick up a load: 12 minutes driving at a 20 mph average on port access roads, I-710, and surface streets; 30 minutes to drop the load and pick up an empty at the ICTF; and 12 minutes to drive back to the marine terminal for another cycle.

These observations imply that the emissions from diesel tractors engaged in port drayage may be much worse than emissions from similar vehicles in other applications. ARB may want to commission field emissions tests on working drayage tractors to refine or verify the emissions estimates.

DPF strategies may not be effective.

We are not aware of any research or field work that verifies the efficacy of DPF and ADPF systems in port drayage operations. As the draft report points out, DPF systems rely on exhaust heat to burn off accumulated carbon. The apparent percentage of idle time in the actual drayage duty cycle raises a serious concern that the available exhaust heat may be insufficient for full DPF benefits. Active DPF (ADPF) systems are not only more expensive, but depend on a degree of diligent operation and maintenance that cannot be assumed in low-margin, owner-operator firms.

ARB may wish to consider verifying DPF/ADPF efficacy in actual drayage operations before adopting a final strategy.

Drayage fleet fluidity may present implementation problems.

Our informal analysis suggest that ARB's estimate of 12,000 for the dedicated port truck fleet is about right. We would, however, add the following observations.

Peak shipping season (formerly July-October, but now starting earlier) draws in many truckers who split their time between drayage and other lines of business, such as local cartage or agricultural movements in season. In the Central Valley there are a number of trucking firms who serve both the ports and local trucking needs. Some “long-haul” firms also engage in occasional port drayage on behalf of specific customers, especially when local drayage drivers are in short supply.

Banning non-compliant trucks from serving port terminals might unfairly penalize such “part-time” participants whose trucks are normally used in other services. Taking “part-time” truckers out of the port drayage business would almost certainly result in serious port congestion on peak shipping season.

Accordingly, ARB might wish to consider fee-based penalties for non-complying trucks rather than an outright ban.

There are opportunities for performance-based regulation.

A key element in encouraging drayage drivers and firms to acquire and operate low-emissions drayage tractors would be an emissions classification and certification program tied to financial incentives. The voluntary federal Clean Fuel Fleet emissions standards for 1998 – 2003 engines, shown below, could be a starting point. Such a classification could become the basis for tax incentives, low-interest loans, purchase subsidies, or surcharges on non-compliant tractors.

Clean Fuel Fleet Program (g/bhp-hr)

Category	CO	$NMHC+NO_X$	PM	HCHO
LEV - California (Low Emission Vehicle)		3.5		
ILEV (Inherently Low Emission Vehicle)	14.4	2.5		0.050
ULEV (Ultra Low Emission Vehicle)	7.2	2.5	0.05	0.025

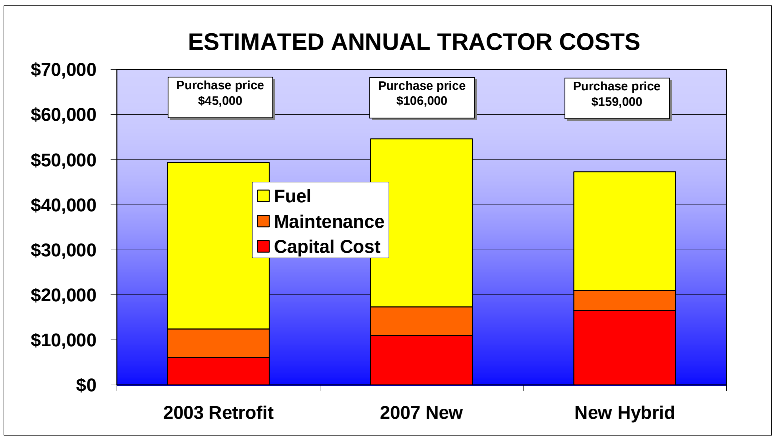
The introduction of PierPass in Southern California gives policy makers an additional opportunity to manage and encourage the introduction of low-emissions drayage tractors. PierPass was introduced to encourage nighttime pick up and delivery of marine containers at the port terminals by surcharging daytime operations and using the revenue to subsidize extended terminal gate hours. The identification, accounting, and invoicing mechanism of PierPass would likely be adaptable to distinguishing between LEV, ILEV, and ULEV drayage tractors, and surcharging higher-emissions vehicles. A surcharge would permit the utilization of “part-time” fleets in peak periods to avoid port congestion, but would penalize such operations and create an incentive to either comply or surrender the business to complying operators.

ARB strategies should allow for development of alternative technologies.

We are concerned that a strategy based on retrofitting diesel tractors or replacing them with newer diesel tractors will perpetuate the use of a technology that is basically ill-suited to port drayage operations. Port drayage is characterized by low speeds over congested urban streets and highways, and lots of idling and queuing. The second-hand diesel tractors used in drayage were designed for over-the-road trucking, with long periods of steady-speed operation. Continued reliance on this equipment for port drayage operations is at the root of the emissions problem.

As documented in the enclosed paper (originally prepared for the Nation Urban Freight Conference), we believe that series-hybrid drayage tractors could out-perform conventional diesel drayage tractors with dramatically lower emissions and lower life-cycle costs. Development of gas-hybrid drayage tractors comparable to gas-hybrid transit buses now operating could completely eliminate diesel fuel and diesel emissions. We are currently seeking funding for critical data collection and performance modeling to verify our initial analysis.

Conceptual Conventional vs. Hybrid Cost Structure



Whether hybrid drayage tractors or some other technology eventually replaces conventional diesel equipment in drayage service, the ARB strategy should allow for the emergence of other means to the same end.

Concluding Comments.

We believe that ARB's analysis is a significant step forward in the drive to understand the port trucking industry and mitigate its impacts. As noted above, we think the problem might even be worse than indicated by ARB's estimates.

The fluidity of the port drayage fleet presents an inherent implementation problem that might be addressed through a performance-based incentive/surcharge plan tied to PierPass or another mechanism.

There are additional tools that can be brought to bear on the problem without retreating from ARB's emissions target. We think that hybrid drayage tractors are a promising technology, and would like to see an ARB strategy that allows for the successful development of approaches outside the conventional diesel tractor. We would welcome an opportunity to discuss this technology further with ARB.

We would be pleased to discuss any of these comments at your convenience.

Sincerely,

Daniel S. Smith
Principal

enclosure