

Answers to Questions from Government Operations Division

1. UGPTI's Federal and State Funding

- a. How much federal funding does UGPTI receive directly from federal agencies?
- b. How much funding does UGPTI receive from NDDOT?
- c. How much of the funding that UGPTI receives from NDDOT consists of federal source funds?

The analysis includes all Federal and North Dakota DOT grants on an annualized basis. Many of UGPTI's federal grants (such as the University Transportation Center grants) are multiyear awards. Similarly, some North Dakota DOT grants are multiyear contracts. The total amounts of these awards are divided by the number of years to yield an average annual value—e.g., only one year of UGPTI's five-year University Transportation Center grant is reflected in the federal funds number. The numbers are summarized in the table below.

Federal and NDDOT Funds Provided to UGPTI Annually (Preliminary)

Federal funds awarded directly to UGPTI	\$11,901,893
Total NDDOT funds provided to UGPTI	\$3,682,145
NDDOT funding from federal funds	\$2,746,861

As these numbers suggest, roughly 75% of NDDOT's grants to UGPTI are federal source funds. However, NDDOT must match these funds with non-federal source dollars. The match requirement is usually 20%. A few North Dakota DOT grants (such as the Western North Dakota Program and the annual North Dakota Transportation Conference) consist of state funds only, which is why the percentage is 75% instead of 80%. The preliminary estimates are being reviewed by NDDOT and UGPTI. Any appreciable adjustments to the percentages will be reported back to the committee.

2. In UGPTI's biennial road and bridge funding needs study, do we assume that all trucks are legally loaded? What percentages of trucks are assumed to be overloaded and by how much?

In the studies, equivalent single axle loads (ESALs) are used to measure the road impacts due to truck traffic. ESALS are computed for each axle group and summed to obtain an EASL factor for the truck. An ESAL factor for a specific axle represents the impact of that axle in comparison to an 18,000-pound single axle (which has an ESAL factor of 1.0). The ESAL or impact factor depends on the type of axle (e.g., single, tandem, or tridem) and the weight on the axle. The pavement impacts are nonlinear. For example, a 16,000-pound single axle followed by a 20,000-pound single axle on a good flexible (asphalt) pavement generates a total of 2.12 ESALs, as compared to 2.0 ESALs for the passage of two

18,000-pound single axles (Figure 1).¹ An increase in a single-axle load from 18,000 to 22,000 pounds more than doubles the pavement impact, increasing the ESAL factor from 1.00 to 2.09. In comparison, a 34,000-pound tandem axle has an ESAL factor of 1.11 (Figure 2).

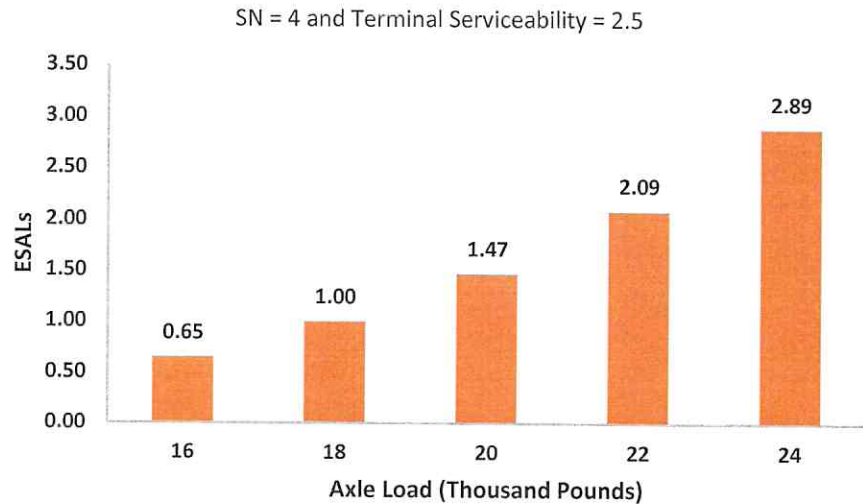


Figure 1 Pavement Impact Factors for Single Axle

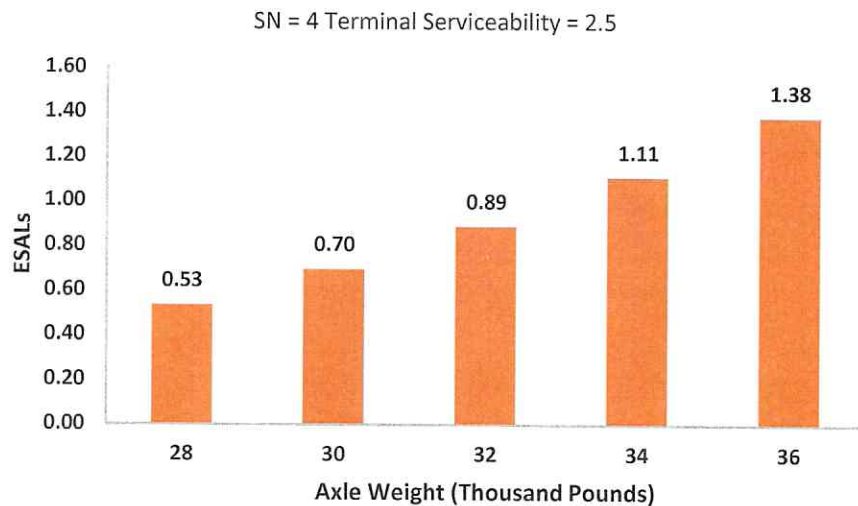


Figure 2 Pavement Impact Factors for Tandem Axle

It is likely that a portion of the truck movements analyzed in the study are overloaded. Based on enforcement data from the North Dakota Highway Patrol and special studies conducted at truck weigh stations, it is estimated that 25% of divisible oil-related truck movements are overloaded. The typical overloaded

¹ The differences in impacts can be more pronounced on roads with lower structural numbers.

vehicle weighs 90,000 pounds, which increases the truck EASL factor by 69% as compared to a legally loaded truck. For farm-to-market movements, most movements are assumed to be overloaded by 10%. Secondary movements between elevators and between elevators and processors are assumed to be legally loaded.

3. What confidence do we place in weigh-in-motion data? How has WIM technology improved over time?

The North Dakota DOT calibrates its WIM sites each year with a 5-axle semi loaded to 80,000 pounds. Generally, the WIM estimates of gross vehicle weights are within $\pm 6\%$ of the actual weights. However, the accuracy may vary from site to site and with conditions, particularly with the wander of the truck's wheels, the temperature of the pavement materials, and the vehicle's speed.

UGPTI has been researching ways to improve the accuracy, reliability, and cost-effectiveness of WIM systems for several years now, considering factors such as tire pressure (which affects the contact area between the wheel and pavement), pavement temperatures, vehicle speeds, and wander and using combinations of embedded sensors, high resolution cameras, and advanced signal processing. The initial results from tests at the MnRoad facility have been encouraging. However, prototype low-cost WIM stations are still a few years away.