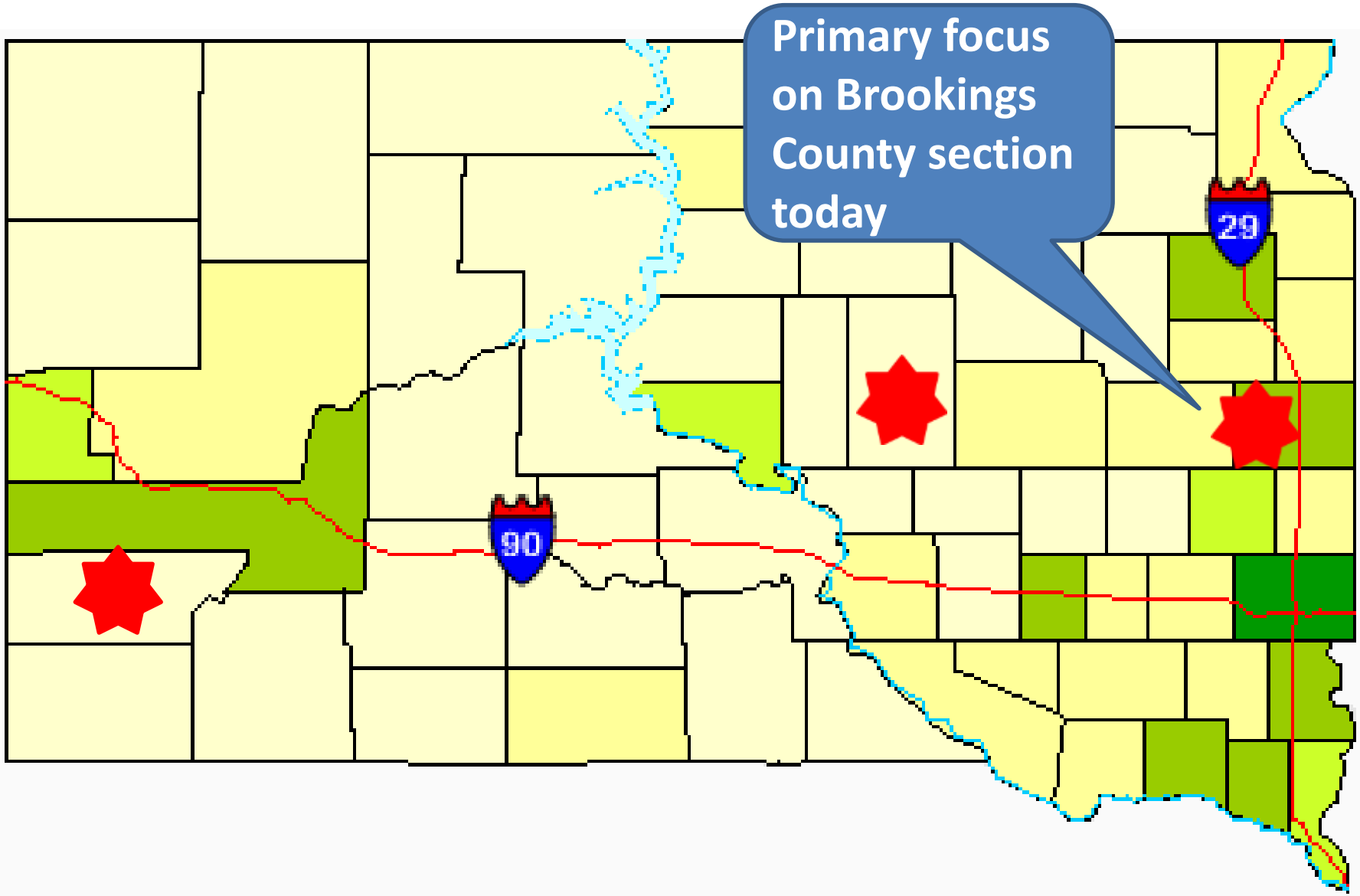
SDDOT/SDLTAP Surface Gravel Study Project Update

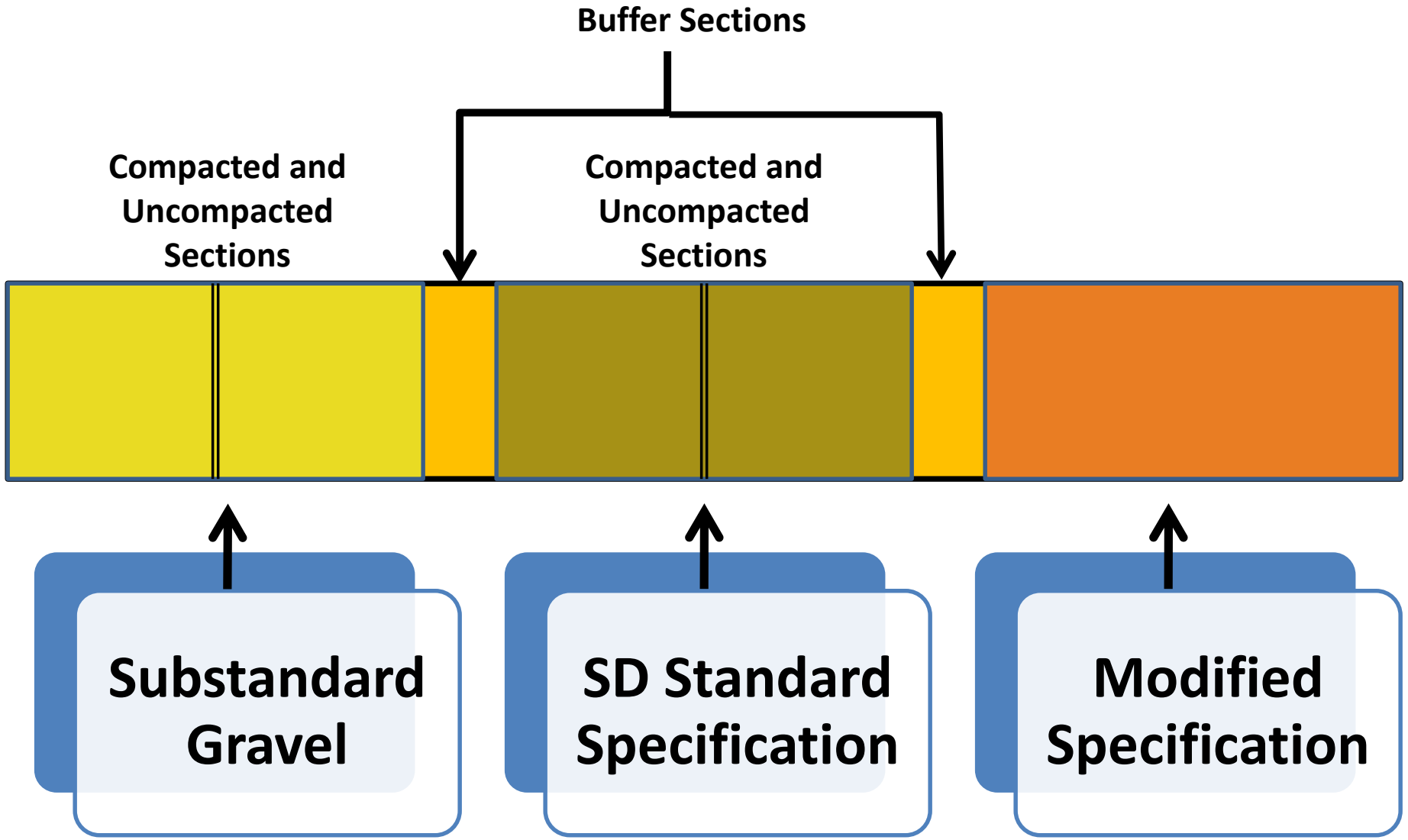
Lessons Learned Thus Far

Focus of Test Project

- **Primary focus is on effect of gravel quality on life-cycle cost of gravel road maintenance**
- **Three types of gravel used in study:**
  1. **Substandard but commonly used – meets no spec except top size control – one inch minus.**
  2. **Barely meets SDDOT Gravel Surfacing Spec – percent passing #200 sieve is low and/or plasticity index (PI) at bottom of range at 4**
  3. **Modified SDDOT Spec – higher minimums of 10% passing #200 sieve and PI at 7.**

Three test sections were built:




Buffer Sections
Compacted and Uncompacted Sections
Compacted and Uncompacted Sections
Substandard Gravel
SD Standard Specification
Modified Specification

Each section was built with three to four inches of new gravel after existing surface was prepared and shaped.

- Brookings County Section being built in October, 2011.

- One of the biggest challenges was finding gravel that meets the modified SDDOT Specification: “Shall have minimum plasticity index (PI) of seven”. (Even higher minimum was considered in project planning)

Road mixing natural clay to get the modified surface gravel was done on the Brookings County Section – raised PI from 3 to 7

Final finish on the Brookings Modified Gravel Section

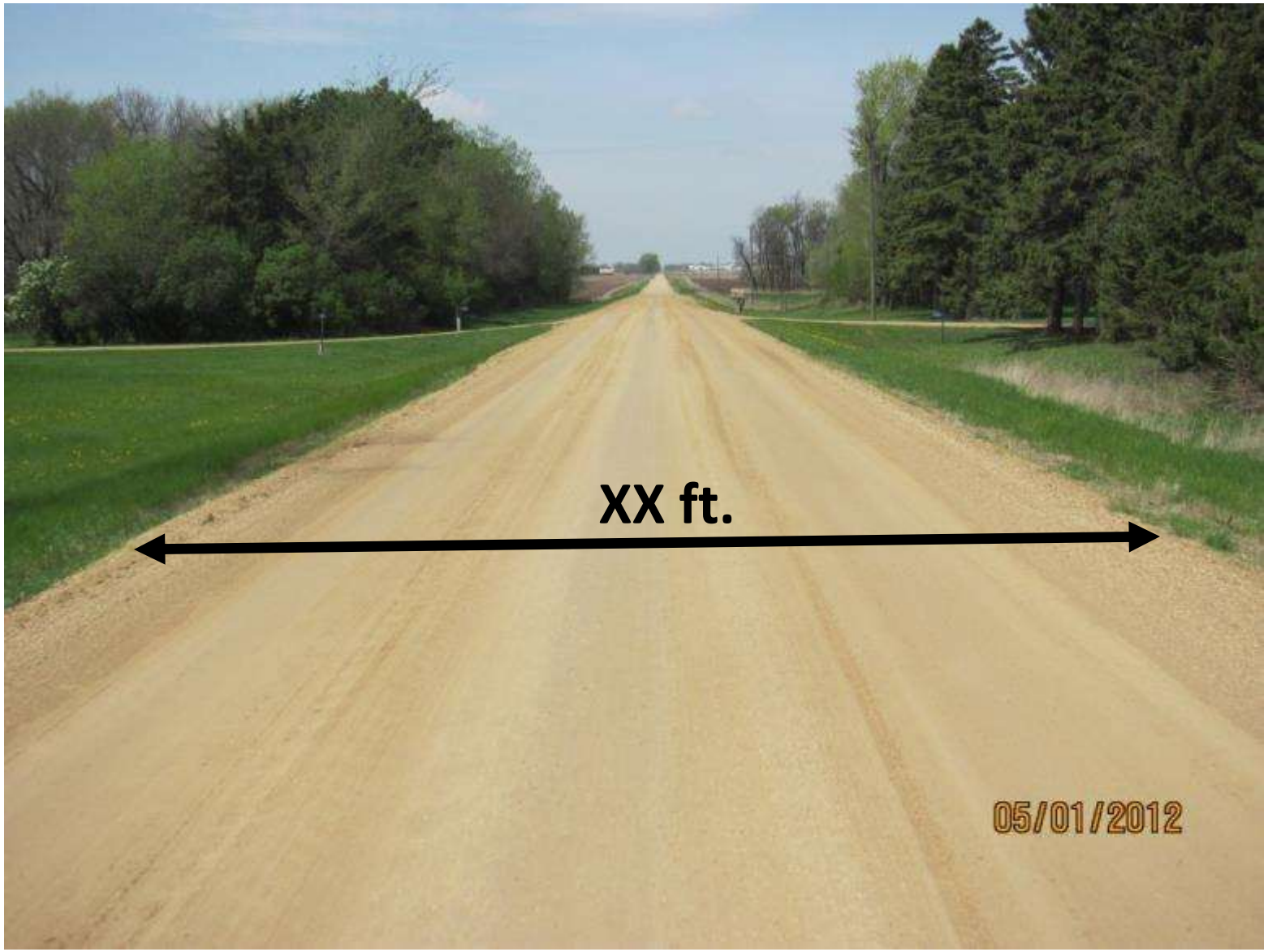
Current Status of Project

- SDLTAP has accumulated photo documentation on all sections over the past three years.
- Measurement and documentation was done on these distress types in 2012 & 2013:
  1. Accumulation of loose aggregate (float)
  2. Changes in top width from time of construction
  3. Presence of corrugation (washboard) on surface
  4. Change in roadway crown

The float test (loose aggregate)

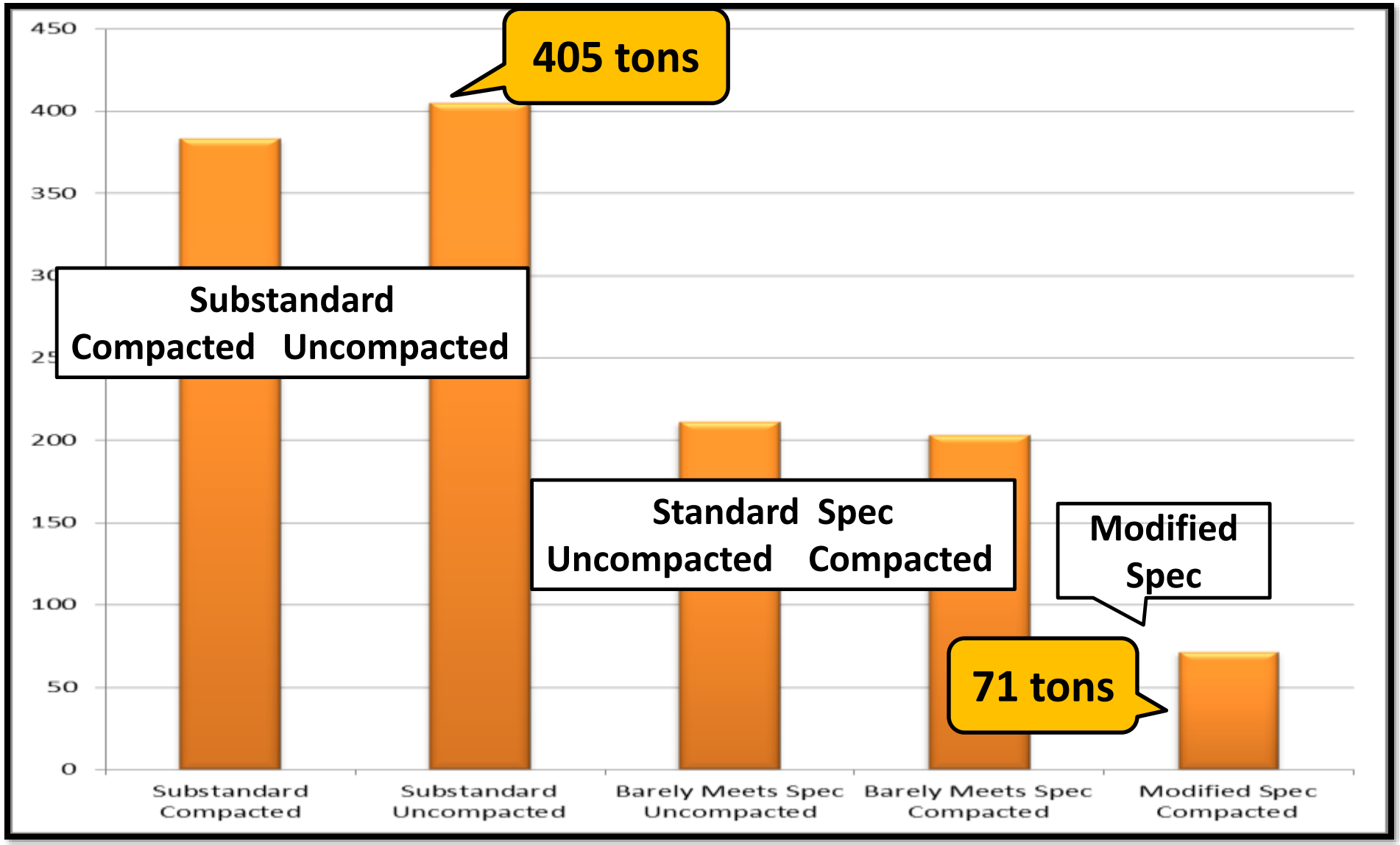
Simply remove loose aggregate from a 10 inch cross section, weigh it and convert that to a one-mile section

Change in top-width is measured on traveled way – hinge point to hinge point



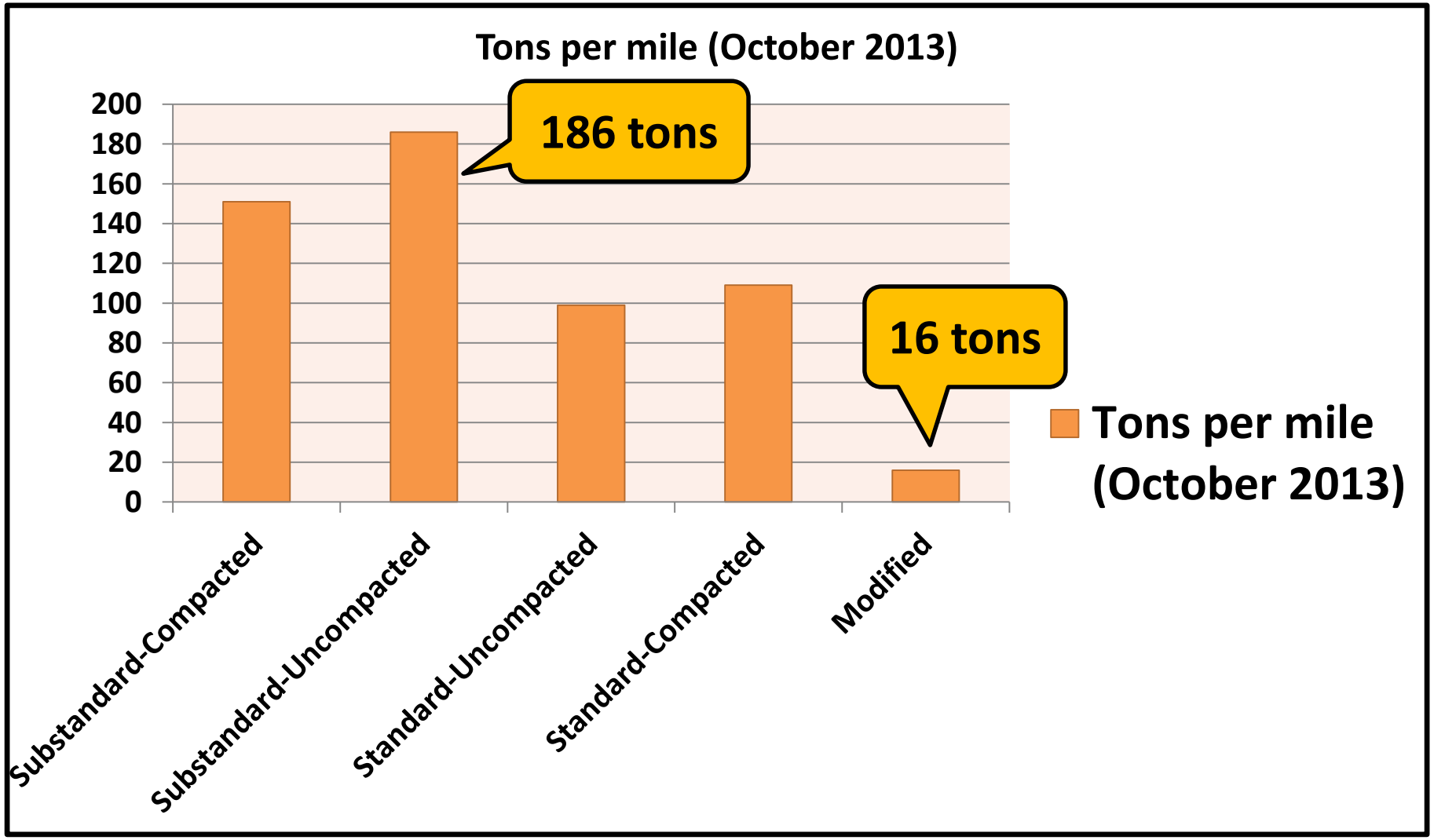
Corrugation (washboard): Hard to quantify in extent, fairly easy to measure severity

Brookings Section – Loose Aggregate 2012

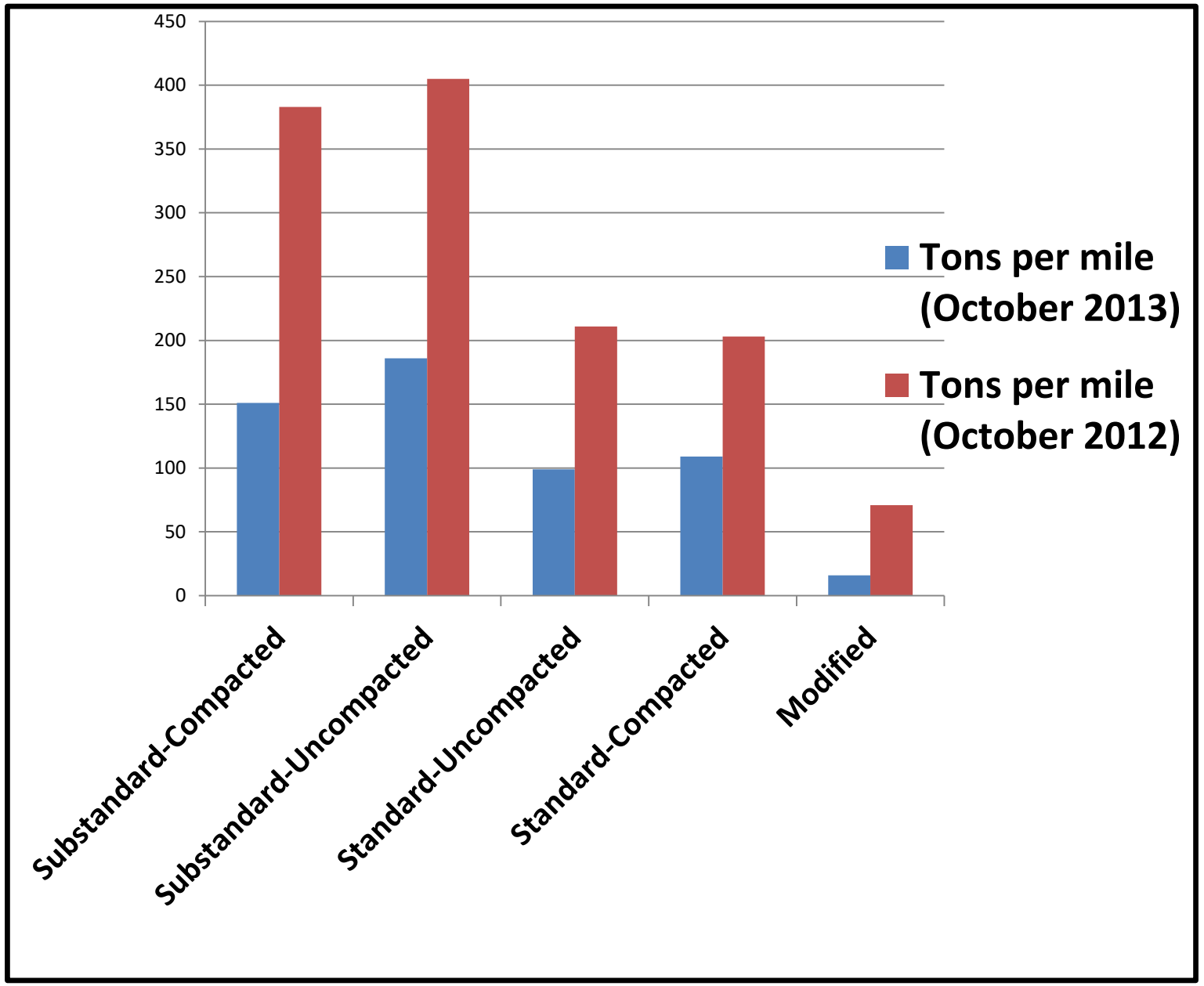


Brooking Section – Loose aggregate 2013

Note: trends are the same, but much more moisture was received during the 2013 maintenance season compared to 2012.



Loose aggregate comparison 2012 & 2013



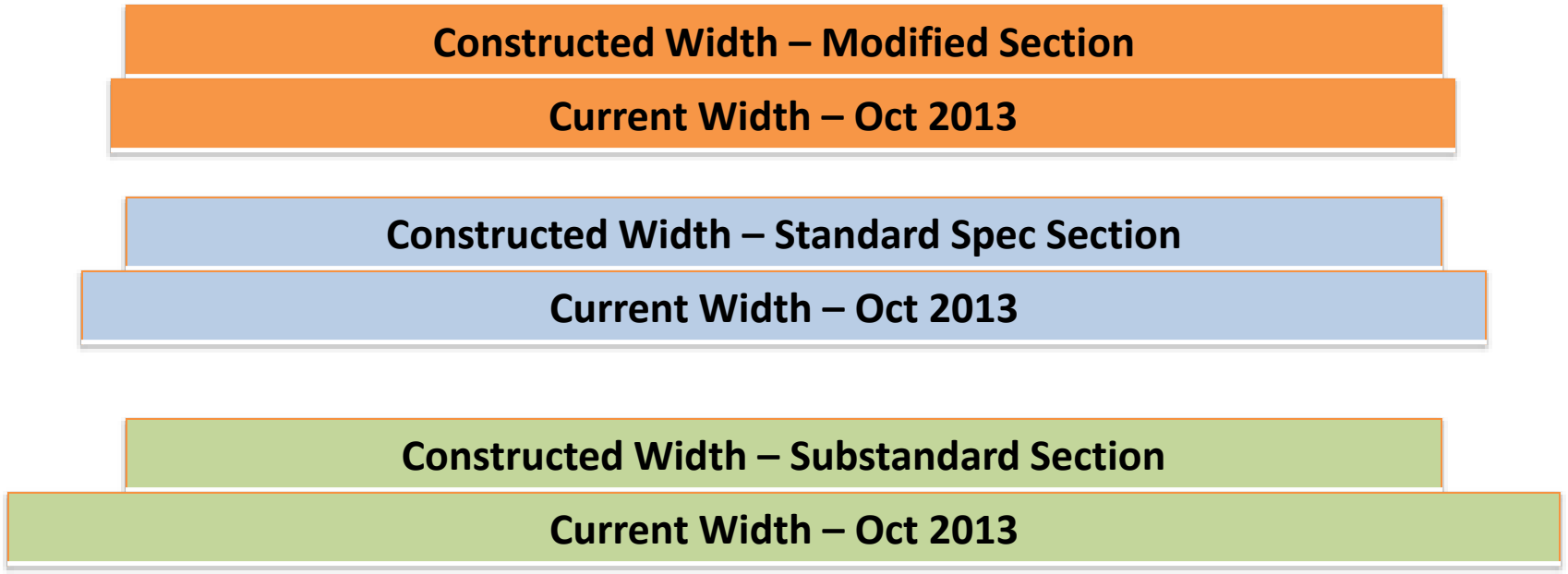
Corrugation (Washboard)

No corrugation observed on any sections meeting at least minimum standard specification.

However, substandard section had the beginning of light corrugation only two days after blade maintenance in Oct 2013.

Change in Roadway Surface Width

Constructed Width – 21.5 ft on all sections



Width ranged from 22 ft on modified section (top bar) to 25.25 ft on substandard section (bottom bar) after two years

Crown: consistently measured less on substandard section

- Issues with crown appeared to be influenced by the motor grader operator and not just the material.

- Crown was never measured greater than 3%. Construction requirement was 4%. The substandard section always has .5 to 1% less crown indicating greater problems holding crown in the loose material.

Substandard section – aggregate has moved outward nearly 4 ft since construction

Modified section has moved outward only six inches since construction

View of Substandard section – 10-18-13

View of Modified section – 10-18-13

Does the modified section rut in wet weather? Virtually no rutting ever observed.

Typical harvest traffic on this road

Concluding Points

- Meeting basic SDDOT standard surface gravel specification reduces loose aggregate by 1/3 to 1/2.
- Widest differential was in Brookings County near end of corn harvest in 2012 with 405 tons of loose aggregate on substandard section to only 71 tons on modified section.
- No corrugation ever observed on standard or modified material.

Concluding Points (Con't)

- Most interesting fact thus far: Brookings Co. has **done blade maintenance up to four times on substandard section to only once on modified**!
- A negative aspect: some push-back from aggregate producers who would prefer to produce as they always have – no close control of % passing the #200 sieve and plasticity index.