



### 3.4.2 Tractive Shear

Included in Figure 3.4.1 is a bar chart depicting the calculated value of average applied tractive shear for each hydraulic segment. Values of shear are in pounds per square foot plotted against a secondary vertical axis. Geomorphic processes define the reaches and are indicated by the horizontal bars. Values for applied shear are assigned for each geomorphically defined reach from the values of the included hydraulic segments. Values of assigned applied shear are an index and are used to compare reaches. Actual value of applied shear will vary over the reach and may vary from the calculated values.

The calculated values correlate well with the observed processes and with the values of resistive shear reported in the literature. Transport reaches occur where the applied shear is equal to the resistive shear. A minor increase in tractive shear could trigger either incision or, if woody debris is available, widening. Widening is occurring between Baytree Road and Hightower Creek in the area of the highest calculated applied shear. Values through bridges and culverts are not included. These structures are armored to limit scour. The high sediment load from Hightower Creek is deposited as point bars and in the shadow of debris focusing flow against the banks. The debris jams are sufficiently strong to limit incision by protecting the bed, however, the banks are exposed between jams and are slowly scouring. Jams are naturally occurring and may direct flow into the bank, trap sediment and trash and cause scour immediately downstream of a jam. If jams are removed to increase hydraulic efficiency the bed and banks may rapidly erode.

Incision occurs between Hightower Creek and Lankford Road and between Browns Canal and River Street. These are reaches with calculated shears greater than the resisting shear and with little washload. Meandering occurs downstream of the railroad bridge and for a short reach downstream of Browns Canal confluence. The calculated applied shear values are greater than the value for resisting shear but are less than the value observed for incision. Meandering only occurs in reaches with sufficient or excess sediment to form bars. The majority of sediment is transient washload that does not consolidate as point bars. Meandering appears to be progressing at a slow rate with episodic advances only during higher flows. In general, the banks are sufficiently strong to resist rapid meander advance. If sediment is removed to limit meandering or to increase hydraulic efficiency, it will re-deposit as it is eroded from upstream reaches and tributaries.

**Table 3.4.1** presents the calculated ranges of applied tractive shear for observed geomorphic processes.