Supersolid vs. phase separation in 2D PINAKI SENGUPTA, LEONID P. PRYADKO, UC Riverside, FABIEN ALET, CEA Saclay, MATTHIAS TROYER, ETH Zürich, GUIDO SCHMID, ETH Zürich — We study the nature of the ground state of the strongly-coupled two dimensional extended Bose Hubbard model on a square lattice. Strong coupling expansion and quantum Monte Carlo simulation of finite systems were used to analyse the stability of the $(\pi, \pi)$ crystalline order at half-filling and the effects of doping away from it. We find that strong but finite on-site interaction along with a comparable nearest-neighbor repulsion results in a thermodynamically stable supersolid ground state just above half-filling, while the system phase separates just below half-filling. The interplay between these two interaction energies results in a rich phase diagram which is studied in detail.