An article in today's Washington Post has some useful background on oil-well blowouts:

> Blowouts are infrequent, because well holes are blocked by piping and pumped-in materials like synthetic mud, cement and even sea water. The pipes are plugged with cement, so fluid and gas can't typically push up inside the pipes.
>
> Instead, a typical blowout surges up a channel around the piping. The narrow space between the well walls and the piping is usually filled with cement, so there is no pathway for a blowout. But if the cement or broken piping leaves enough space, a surge can rise to the surface.

You may recall from an earlier post that the day before the explosion, a Halliburton team finishing pumping slurry into the hole to seal it. Based on interviews from BP's internal investigation that he obtained copies of, my Berkeley engineering colleague Bob Bea thinks that the cementing is related to the explosion:

> Based on the interviews, Bea believes that the workers set and then tested a cement seal at the bottom of the well. Then they reduced the pressure in the drill column and attempted to set a second seal below the sea floor. A chemical reaction caused by the setting cement created heat and a gas bubble which destroyed the seal.
>
> Deep beneath the seafloor, methane is in a slushy, crystalline form. Deep sea oil drillers often encounter pockets of methane crystals as they dig into the earth.
>
> As the bubble rose up the drill column from the high-pressure environs of the deep to the less pressurized shallows, it intensified and grew, breaking through various safety barriers, Bea said.

Bob led an NSF-funded team that investigated the collapse of the levees in New Orleans. The team's report found strong evidence of design and construction failures by the Army Corps.

UPDATE Another AP story says that the blowout preventers are not as foolproof as we've been led to believe:

> After the accident, BP CEO Tony Hayward said of blowout preventers in general: "It's unprecedented for it to fail."
>
> Yet the AP review turned up instances where preventer seals have failed outright, obstructions have blocked them, or valves simply weren't designed for the task. Sometimes there were blowouts.
>
> The control systems also have proved goof-prone. When a worker accidentally disconnected a blowout preventer at one rig in 2000, federal regulators recommended changes in the control panels. Later that year, a worker at a rig off the Louisiana coast was making those very changes when he accidentally pushed the wrong button – and unlatched the valves; the ensuing blowout released 8,400 gallons of crude.

Another update: the approval letter for BP's exploration plan directs it to "Exercise caution while drilling due to indications of shallow gas and possible water flow." I don't know whether this is an unusual warning in the Gulf, or whether these factors could be related to the accident.