

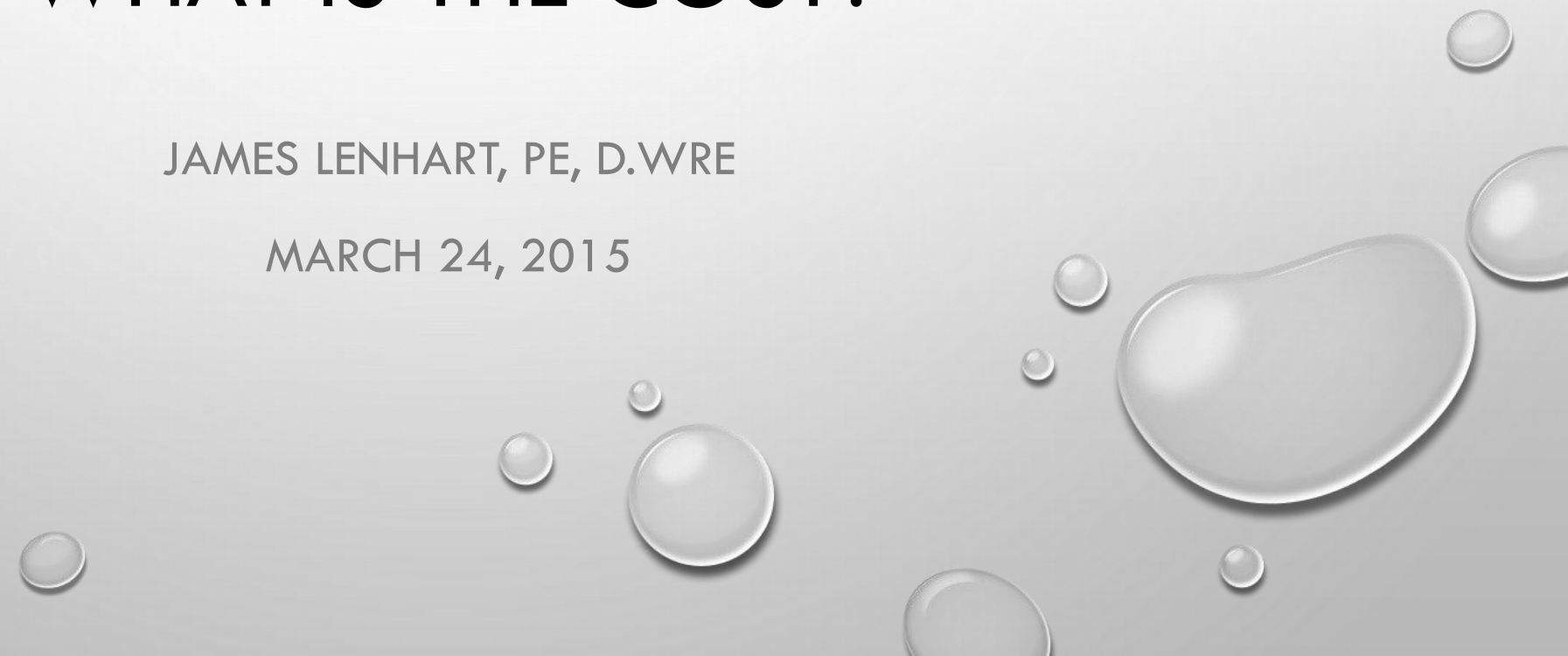


VERIFICATION PROGRAMS
SETTING THE BAR AND LEVELING THE PLAYING FIELD

WHAT IS THE COST?

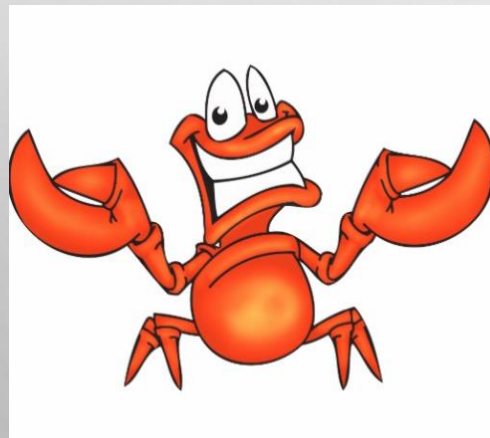
JAMES LENHART, PE, D.WRE

MARCH 24, 2015



COSTS OVERVIEW

- THE COST OF MONITORING
 - TIME
 - CAPITAL EXPENSE
- THE COST OF NOT HAVING A PROGRAM



TIME ELEMENT

- ESTABLISH AN APPROVED QAPP AND PROJECT PLAN 3 TO 6 MONTHS
- IDENTIFY A SITE
 - ENGINEERING DESIGN 3 MONTHS
 - BIDDING AND CONSTRUCTION 6 MONTHS
 - SITE STABILIZATION AND POLLUTANT GENERATION 1 YEAR
 - MONITORING 2 YEARS
 - REPORTING 3 TO 6 MONTHS
- TOTAL 4 TO 5 YEARS
- SHORTCUTS ARE POSSIBLE
 - ALREADY HAVE SITES IN THE GROUND
 - RETROFITS CAN SAVE 2 YEARS
 - MULTIPLE SITES INCREASE SAMPLING SUCCESS



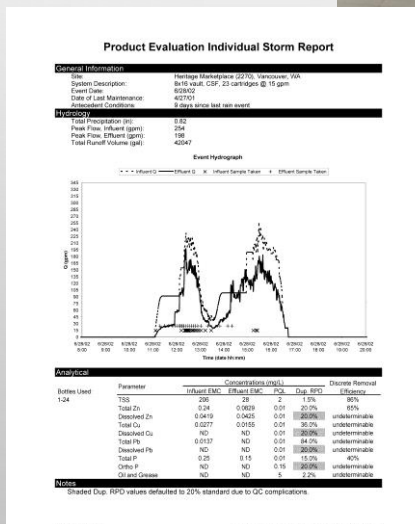
HOW IS THIS ACCOMPLISHED?

- CONSULTANTS
 - PROJECT MANAGEMENT COSTS
 - CONSULTANTS COSTS
- DO IT IN HOUSE
 - HAVE YOUR OWN IN-HOUSE EXPERTISE
 - USE YOUR OWN EQUIPMENT
 - DEVELOP YOUR OWN QAPP AND REPORTS
 - THIRD PARTY TO HANDLE SAMPLES
 - OUTSIDE ANALYTICAL EXPENSES



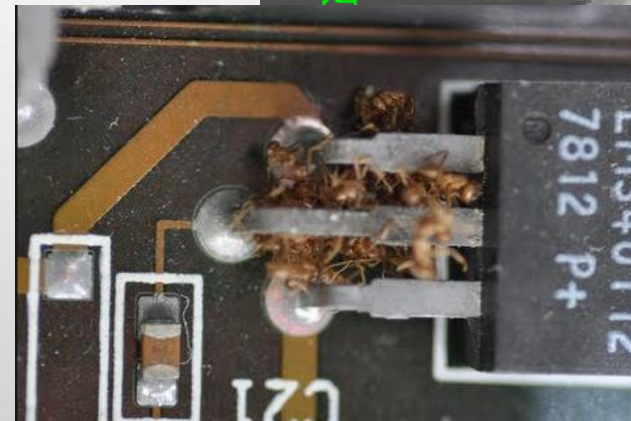
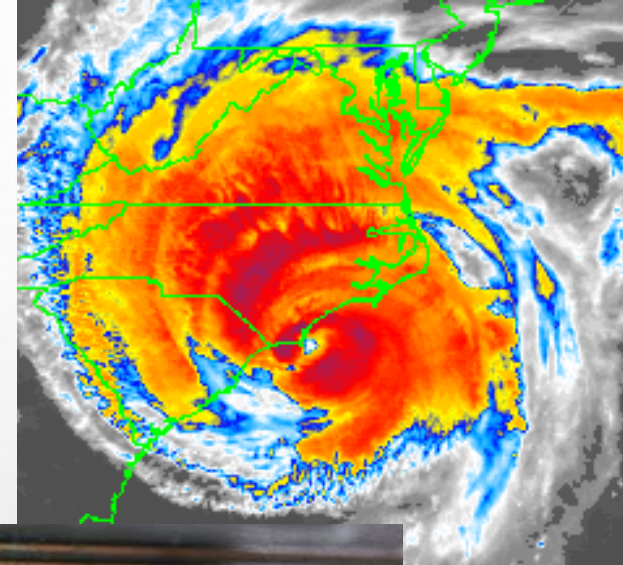
CAPITAL COSTS

- LABOR
 - SKILLED AND EXPERIENCED FIELD STAFF (2X 0.25 FTE) 4 YRS ~ 140K
 - EXPERIENCED TECHNICAL WRITERS AND PROJECT MANAGERS ~ 0.05 FTE ~ 30K
- EXPENSES
 - TRAVEL SET UP, STORMS RETRIEVAL, FALSE STARTS, MAINT ~ 5K
 - SUPPLIES BOTTLES TUBING, ETC ~ 3K
- EQUIPMENT
 - SAMPLERS(2) 5 YEAR LIFE ~ 20K
 - TELECOMMUNICATIONS ~ 1K
- ANALYTICAL
 - LABORATORY FEES (20 STORMS) ~ 40K
- TOTAL ESTIMATED COSTS ~ 239K
- CONSULTANT: ~ 320 K PLUS OR MINUS



SOME PITFALLS

- IT HAPPENS
 - CLEAN WATER IN, CLEAN WATER OUT
 - HYDRAULICS
 - SAFETY
 - POLLUTANTS OUT OF CHARACTER
 - EROSION
 - WEIRD WEATHER
 - WILDLIFE
- MINIMIZE RISK
 - STRONG PROJECT PLAN AND COMMUNICATION
 - HAVE AN OUT TO ABANDON SITE
 - PRE MONITORING/SITE CHARACTERIZATION



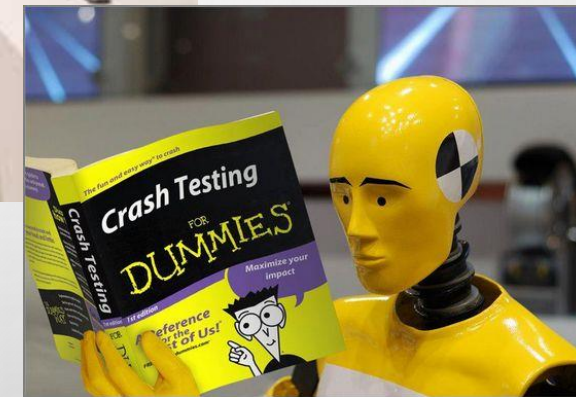
ARE THESE PROGRAMS COST PROHIBITIVE?

- DOES THE COST AND TIME EXCLUDE START UPS?
 - WE OPERATE IN A FAIRLY MATURE REGULATED INDUSTRY (20 YRS)
 - HISTORICALLY MANY OF THE COMPANIES WITH VERIFIED PRODUCTS WERE/ARE START UPS, NOT BIG COMPANIES
 - INDEPENDENTLY FINANCED
 - CAPITALIZATION WITH INVESTORS
- SOME COMPANIES HAVE SPENT MILLIONS OF DOLLARS TO DO VERIFICATION STUDIES
 - TO DEGRADE OR ELIMINATE THESE PROGRAMS DOES A DISSERVICE TO THOSE WHO CHOOSE TO PARTICIPATE AND VERIFY THE TECHNOLOGY
- LAB STUDIES ARE CHEAPER
 - MAY NOT REFLECT REALITY
 - TESTING SOMETHING IN AN UNREPRESENTATIVE SITUATION CAN BE A DISASTER



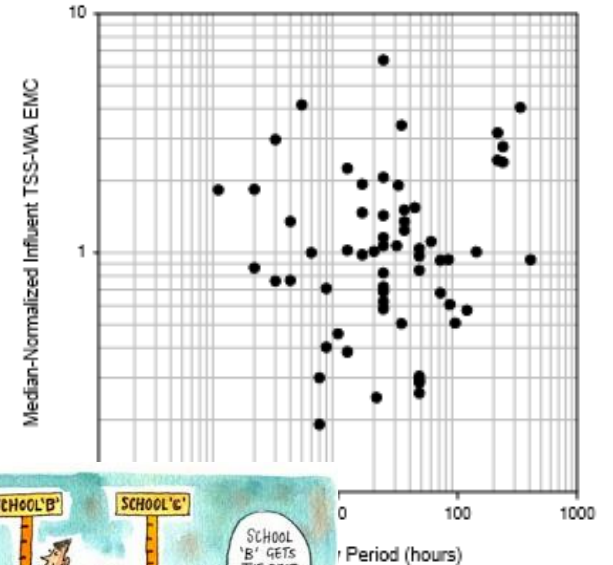
ARE THESE COSTS A BARRIER TO ENTRY OR DO THEY STIFLE INNOVATION?

- TESTING AND VERIFICATION IS NOT NEW TO INDUSTRY
 - RF TESTING AND BATTERY TESTING FOR TELECOMMUNICATIONS
 - CRASH TESTING FOR CARS – NOT IN THE EARLY DAYS
 - GUARD RAIL TESTING
- NEW PRODUCTS ARE EMERGING ALL OF THE TIME
 - SOME ARE GOOD.....SOME ARE NOT!
 - GREEN ROOFS, PERMEABLE PAVEMENTS, FILTERS, HIGH RATE BIOFILTERS, RWH, ETC
- THE MAJORITY OF THE BUSINESS IS IN AREAS WITH A PROGRAM
 - YES IT IS TRUE – THE MORE STRINGENT THE REGS – THE BETTER FOR OUR BUSINESSES!



WAYS TO REDUCE COSTS

- WE CAN REDUCE COSTS AND TIME TO ENTRY
 - ALLOW PROGRAMS FOR PILOTS AND DEMONSTRATION
 - MAKE THE PROCESSES MORE EFFICIENT TO REDUCE COSTS
 - CRITERIA VS. GUIDELINES
 - STANDARDIZE EVALUATION PROCEDURES
 - KNOW THE DIFFERENCE BETWEEN VERIFICATION AND CERTIFICATION
 - ESTABLISH CLIMATIC REGIONS TO AVOID EXCESSIVE VERIFICATIONS
 - REVERSE DATA COMPATIBILITY
 - EXPERIENCED SAMPLING PROCEDURES
- AGENCIES HAVE COSTS TOO
 - THESE PROGRAMS SET THE BAR AND LEVEL THE PLAYING FIELD
 - TO DO OTHERWISE LEADS TO ENTROPY
 - THIS IS THE BEST PROTECTION REGULATORY BODIES HAVE TO MAINTAIN A LEVEL PLAYING FIELD



THE COST OF NOT DOING IT

- NO BAR AND LEVEL PLAYING FIELD LEADS TO A DOWNWARD SPIRAL OF TECHNOLOGY AND KILLS INNOVATION
 - EITHER ALL COMERS WHATEVER, OR NOTHING AT ALL
 - CONFUSING AND UNFOUNDED CLAIMS
 - REDUCED SIZING AND PERFORMANCE
- LOWER PERFORMING AND SMALLER SYSTEMS DRIVEN BY INTENSE PRICE COMPETITION
 - LESS WATER TREATED TO A LOWER STANDARD
- RUINS THE INDUSTRY REPUTATION
 - REGULATORS CHOOSE TO AVOID MTDS ALTOGETHER
 - THIS IS A LOSE/LOSE/LOSE SITUATION
 - THERE IS A DEMAND FOR THESE PRODUCTS FOR A GOOD REASON



CONCLUSION

- ESTABLISH A ROBUST PROGRAM
 - SET THE BAR AND LEVEL THE PLAYING FIELD
 - SEEK TO STREAM LINE PROCESS AND MINIMIZE CRITERIA
- THE COST IS NOT SMALL
 - THE REWARD IS WORTH THE COST
- HOLD US ACCOUNTABLE
 - THESE SYSTEM ARE NOT “ONESY, TWOSEYS” ANYMORE
- LET US BE USED WHERE IT MAKES SENSE
 - SUBSTANTIAL ECONOMIC DRIVERS IN THE URBANIZED ENVIRONMENT
 - LIKE ANY SCM, PROPERLY DESIGNED AND MAINTAINED, THESE SYSTEMS WORK WELL

