

# EVIL RETURNS

*Building a 339-cube Coyote that cranks out 744 all-natural horsepower at the wheels*

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PHOTOGRAPHY BY RICH GROH RACING AND THE FSC STAFF

**A**s self-proclaimed, knuckle-dragging hot-rodders we prescribe to the usual theories when it comes to all things drag racing, like if a little is good then more is always better. It is that sort of thinking that has taken Project Pure Evil, one of our resident project cars, from ridiculous to outrageous in 2019.

Last year it dropped into the 8-second zone when we stuffed a naturally aspirated Coyote 5.0 between the frame rails of Mike Washington's 2,700-pound 1989 Mustang LX coupe. We tagged the project Pure Evil because the engine combination, known as PE-1, was the most sinister of its kind.

Our primary goal was to crack into the 8-second zone – sans boost or nitrous – and it was accomplished rather quickly. Pure Evil ended 2018 with a best of 8.95 at 150 mph in mineshaft conditions at Atco Raceway. The car spun the JPC Racing chassis dyno to an impressive 640 rear-wheel horsepower after stepping up to VP Racing Fuels C85. With the mission accomplished, it left us looking for more, especially with NMRA Advanced Fuel Dynamics Limited Street class running a few tenths quicker. The answer to the problem would come in the form of PE-2, which is phase two of the engine program.







Mike Washington drove Pure Evil to a new best time of 8.77 at 153 mph during the NMRA Ford Motorsport Nationals at Maple Grove Raceway. Backing the new PE-2 powerplant is a Black Magic long-style clutch, G-Force Racing Transmissions G101A four-speed, and a new Team Z Motorsports rear suspension setup.



Remember when we said 'If a little is good, then more is better?' We sketched PE-2 on a bar napkin, complete with buffalo wing sauce stains, and focused on more of everything. The main ingredient – increased displacement – would raise the average power higher through the entire curve. Also on the to-do list was more compression, revised camshaft profiles, and better-flowing cylinder heads.

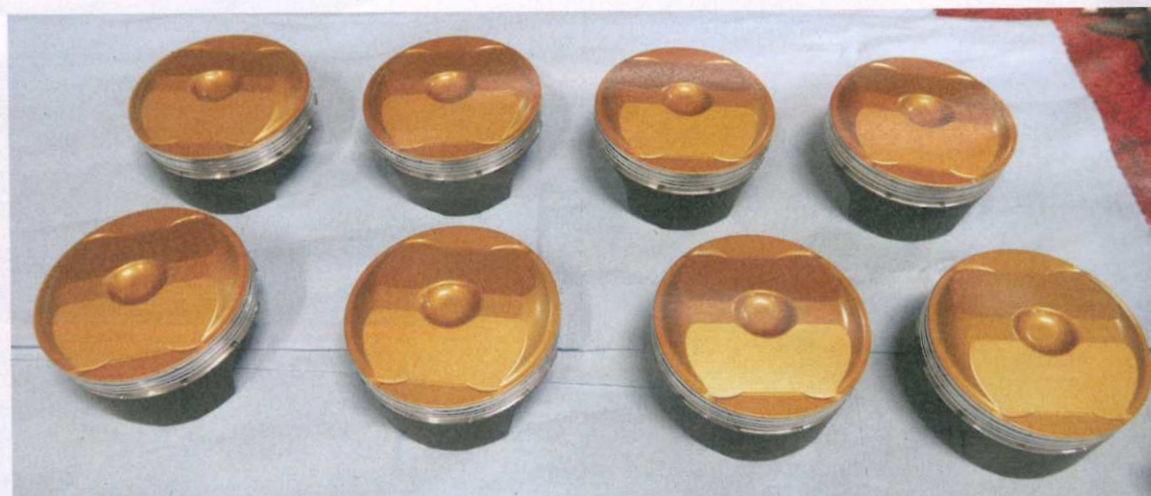
After our late-night bench racing session, we called Rich Groh Racing, otherwise known as RGR Engines, to talk about more specific plans for PE-2. First order of business was the engine block, rather than re-use the 52-liter Voodoo block from PE-1; we snatched up a new Coyote stock block from the JPC Racing parts locker. Groh then added a set of aftermarket sleeves and enlarged the bore to 3.720 inches. The big bore was step one to achieving our final displacement goal of 339 cubes. As a side note, we settled on that number because Limited Street reins in a naturally aspirated Coyote engine to 340 cubic inches before a weight penalty is added.

Filling those big bores are custom Diamond pistons and this time the compression ratio was raised to the limit with a crackling 17:1 ratio. Running that type of compression takes great planning from an efficient combustion chamber to the right fuel. This year Washington switched to VP Racing Fuels Q16 gasoline instead of the C85 ethanol-based fuel he used in 2018. Total Seal was once again tapped to provide exceptional ring seal to make the most of the high compression ratio, anticipated high rpm, and oil control on the cylinder walls. According to Groh the Total Seal ring package is a critical component in the engine's final output. The Indiana-based engine builder worked with Diamond so the pistons had the correct ring grooves cut to match the rings.

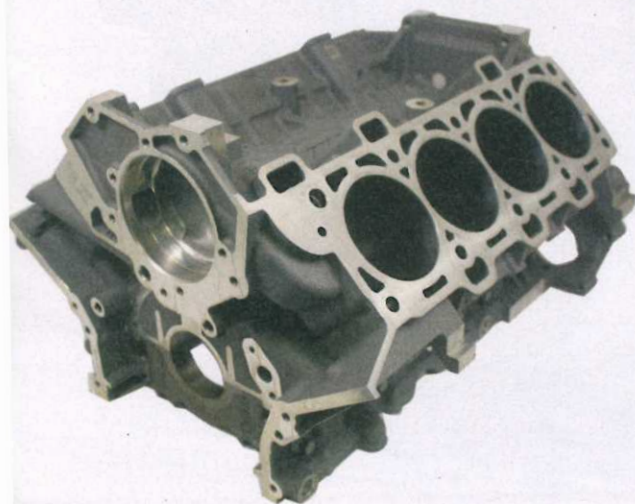
Helping the engine realize 339 cubic inches is a custom steel crankshaft with a 3.900-inch stroke. It has all of the tricks one would want in a naturally aspirated combination, like knife-edged throws, polished journals, and a light overall weight to help engine acceleration. Connecting the custom pistons to a new custom stroker



PE-2 produced a stellar 744 rear-wheel horsepower on JPC Racing's chassis dyno, a 104-horsepower gain over last year's combination. It is the most powerful Coyote-based combination, sans power adders.



Custom Diamond Pistons are forged slugs that are covered in a proprietary coating. Rich Groh of RGR Engines targeted 17:1 compression for PE-2, a far jump from the 14.7:1 compression in the previous engine package.



A factory Coyote engine block was used and RGR Engines installed a set of sleeves for added strength and larger 3.720-inch bore.



The Diamond pistons are mated to Oliver billet connecting rods.



crankshaft is the job of Oliver billet rods. The crank and rods rotate on a complete set of Clevite bearings.

Since this is a Coyote engine that is being used in a high-performance application, there was no choice but to step up to a set of Triangle Speed Shop billet oil pump gears. We selected a Moroso aluminum oil pan, known in the catalog as part number 20574 and officially nicknamed "5.0 Coyote Drag Race Baffled, Rear T-Sump." Groh also used the Moroso oil pump pickup listed under part number 24574.

The Moroso pan has unique features like a thick aluminum rail with a fabricated aluminum sump. The baffling inside the pan uses a trapdoor assembly that keeps oil contained in the pick-up during launches and deceleration. If you are using this setup with a supercharger or turbo there is a 1/2-inch NPT drain-back fitting along with provisions for an oil temperature sensor (1/2-inch NPT fitting) and a 20mm fitting for the factory oil level sensor. The catalog shows it works with 1994 and up Mustang, however the pan fits perfectly in Pure Evil, which is a Fox equipped with a Team Z Motorsports Outlaw K-member.

The short-block was stronger, larger, and features a lot of little tricks to help engine acceleration and produce more horsepower. Moving topside, Groh was tasked with making the engine breath easier using a set of GT350 cylinder heads, a blank cam card from COMP Cams, and a Cobra Jet intake manifold.

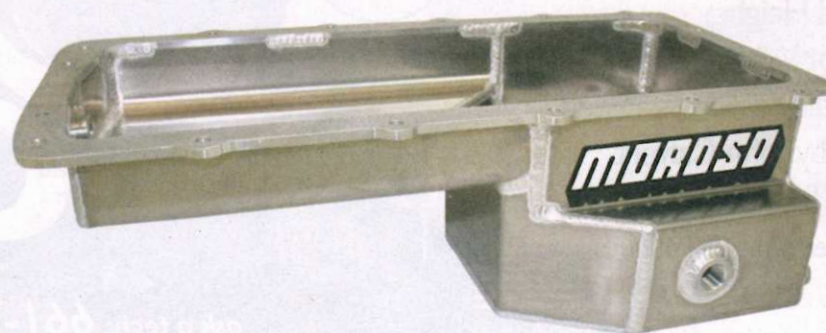
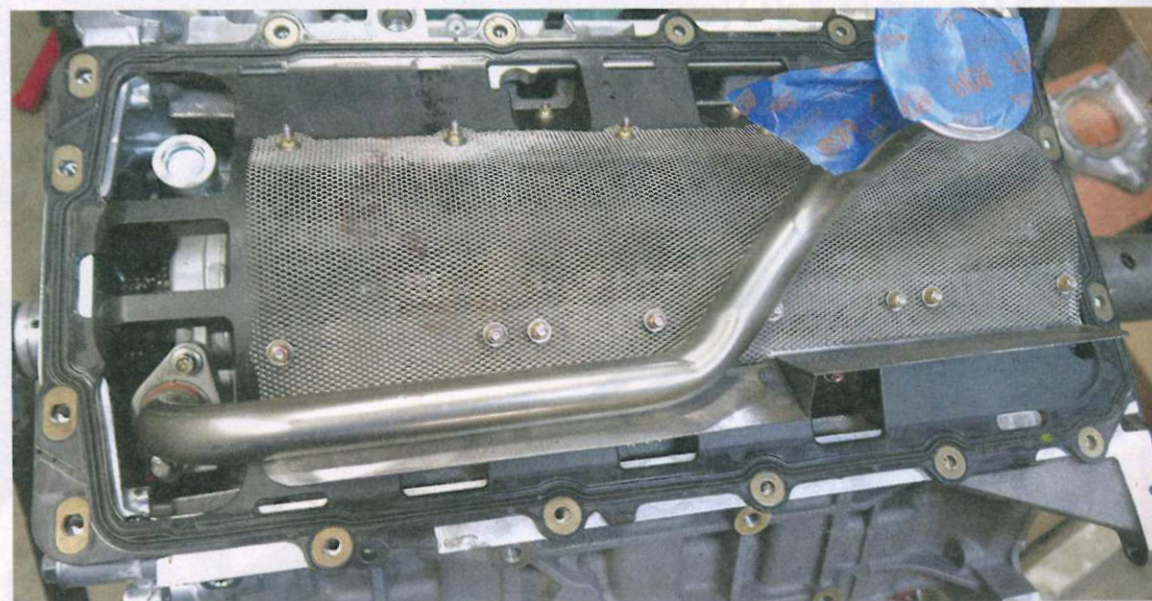
Last year PE-1 used a set of stock heads that only benefited from a valve job. This year, Groh broke out the



Total Seal piston rings are a key element to creating big power in naturally aspirated trim and we tapped into NHRA Pro Stock technology for PE-2. Diamond Pistons designed the ring grooves specifically for these rings to ensure maximum power.

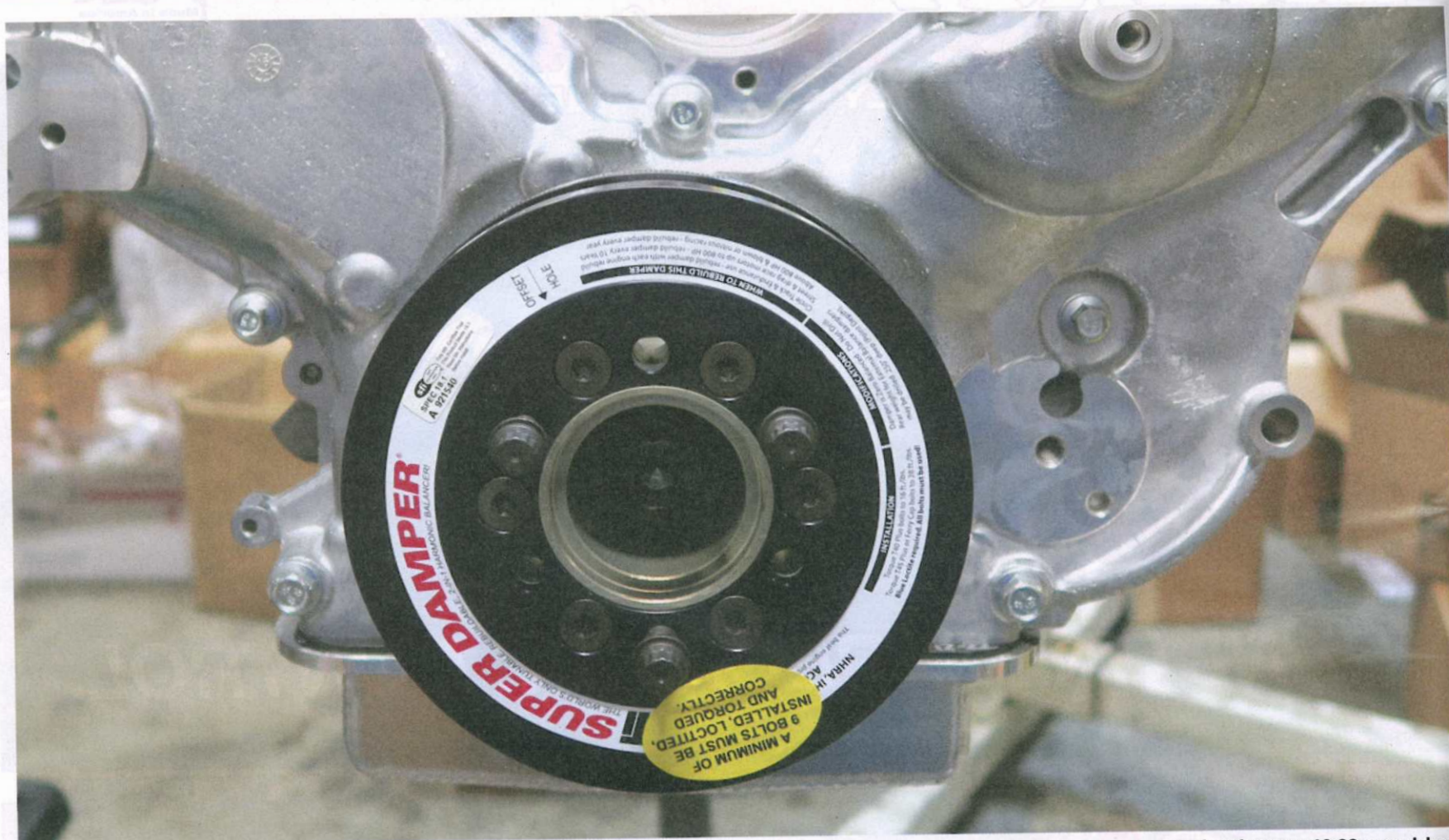


Groh worked with an undisclosed crankshaft manufacturer to produce the billet crank in PE-2. It features a 3.900-inch stroke, knife-edged throws, and polished surfaces. It is lighter than a stock crank but significantly stronger thanks to the material and design.



Moroso supplied the oil pickup and oil pan for PE-2. The oil pan is designed for drag racing and features a unique trap door to keep the pickup tube submerged in oil during hard launches and deceleration.





An ATI Performance Products Super Damper is used to keep the engine properly balanced and it conforms to SFI spec 18.1. All vehicles that run 10.99 or quicker are required to have an SFI balancer for safety reasons. We opted for the aluminum shell version.

grinders and got to work on the GT350 castings. The intake and exhaust ports were run through and the heads now flow 349.7 cfm on the intake and 250.1 cfm on the exhaust, both at .600-inch lift. Those flow numbers were accomplished with the factory valves, making it even more impressive. A set of PAC springs and titanium locks and retainers are used to control the valves. After studying the data from PE-1 there were changes made to the camshaft profiles. The sticks continue to carry a .580-inch lift on both intake and exhaust cams, but Groh was hesitant to reveal more than those specs.

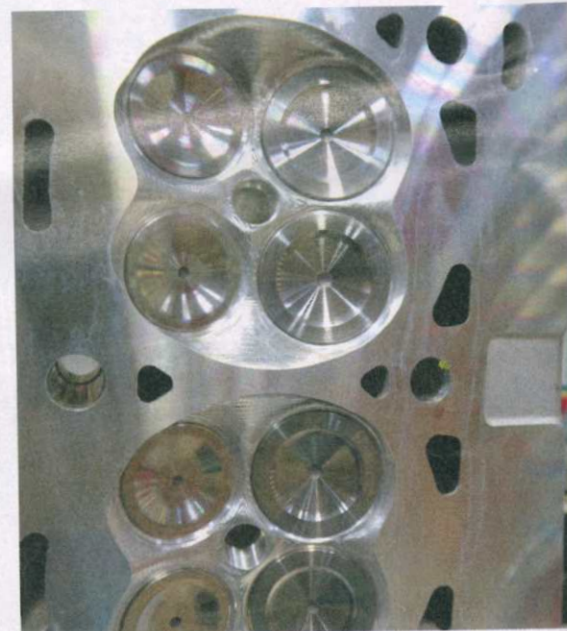
Topping the engine is a Brett Barber-ported Ford Performance Cobra Jet intake manifold with a mechanical throttle body. EB Custom Works built a custom air intake system that uses a massive scoop connected to the opening in the lower valance. The K&N Filters intake setup that's required on NHRA Pro Stock vehicles inspired the custom inlet. DeatchWerks 80 lb/hr fuel injectors are by fed VP Racing Fuels Q16 from a giant Weldon fuel pump.

Washington continues to employ the American Racing Headers custom stepped headers, complete with 3-inch collectors, H-pipe, and muffler setup from PE-1. An AEM Infinity engine management system controls the potent Coyote and Eric Holliday handles the tuning chores.

We expected big things from PE-2 when it came time to strap it down on the chassis dyno at JPC Racing and it



Triangle Speed Shop billet oil pump gears are installed in a factory oil pump housing. These gears ensure durability as PE-2 is routinely spun to nearly 10,000 rpm on the drag strip.



The GT350 cylinder heads feature Ford Performance valves, which are the same ones as the stock cylinder heads. RGR Engines did a considerable amount of work on the ports and he massaged the combustion chambers for a more efficient burn.



certainly didn't disappoint us. Within three pulls the RGR engine cranked out 744 rear-wheel horsepower, for those keeping score at home that is a 104-horsepower gain over PE-1's rear-wheel output. Peak power came at just 7900 rpm despite spinning it to 10,000 rpm on some pulls.

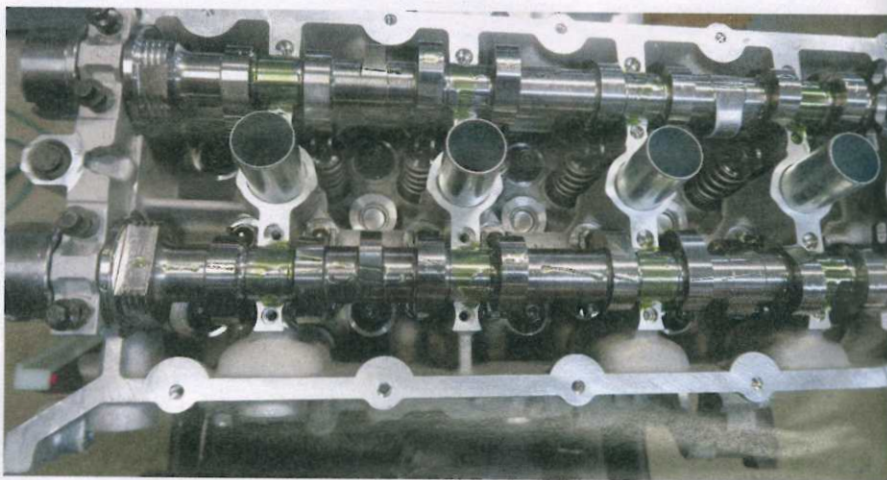
The big power was immediately seen on track as Washington drove Pure Evil to a best of 8.85 at 152 mph on just the third hit down the racetrack. A month later he lowered that mark down to 8.77 at 153 mph during the NMRA Ford Motorsport Nationals at Maple Grove Raceway. Reviewing the datalogs from the AEM Infinity and consulting with Holliday, Cale Aronson of Black Magic Clutches, and Eric Bardekoff of EB Custom Works, all parties agree there is more ET left in the combination. But we will have to wait until after the summer heat to see those gains.

We have several tests slated for Pure Evil as a collection of intake manifolds are on the shop bench. We also plan to show the benefits and dyno results of an Aerospace Components vacuum pump.

If you thought cracking into the eights was fun, just hold on tightly because there is a lot more coming from Pure Evil in the coming months. **FSC**



We tapped COMP Cams for the custom camshafts and each stick features .580-inch lift, but Groh preferred to keep the other specs on the down low. A set of PAC valvesprings keeps the valves under control.



Data from PE-1 revealed that the out-of-the-box Cobra Jet intake was nearing its limit so for PE-2 we turned to Air Flow Solutions for some help. Brett Barber opened up the throttle body area and touched up the runners for more volume to feed the hungry Coyote engine.

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