JUST DRILL IT

Objective:

Generate a map, using the graphical depiction of different data sets ("exploration reports"), which will act as a predictive model for testing ("drilling").

Applicable Nevada State Science Standards (2005):

Nature of Science

N.8 A.1: Students know how to identify and critically evaluate information in data, tables and graphs.

N.8 A.3: Students know how different explanations can be given for the same evidence.

N.12 A.1: Students know tables, charts, illustrations and graphs can be used in making arguments and claims in oral and written presentations.

N.12 A.2: Students know scientists maintain a permanent record of procedures, data, analyses, decisions, and understandings of scientific investigations.

N.12 A.5: Students know models and modeling can be used to identify and predict cause-effect relationships.

N.12 B.1: Students know science, technology and society influenced one another in both positive and negative ways.

N.12 B.2: Students know consumption patterns, conservation efforts and cultural or social practices in countries have varying environmental impacts.

N.12 B.4: Students know scientific knowledge builds on previous information.

Physical Science

P.12 A.3: Students know identifiable properties can be used to separate mixtures.

Earth Science

E.8 C.6: Students know minerals have different properties and different distributions according to how they form.

E.8 C.7: Students know the characteristics, abundances, and location of renewable and nonrenewable resources found in Nevada.

E.12 C.3: Students know elements exist in fixed amounts and move through solid earth, oceans, atmosphere and living things as part of biogeochemical cycles.

E.12 C.4: Students know processes of obtaining, using, and recycling of renewable and non-renewable resources.

JUST DRILL IT

You are an exploration geologist assigned to find the big gold orebody on the company's mining claim block. Your boss says the budget will only allow six drill holes in the claim block. If you are successful in hitting ore, you will be paid according to how much ore you hit in each drill hole. You gather the exploration reports from the claim block and decide to assemble the "clues" on a map of the claim block. The map of the claim block is set up so north is at the top, and the area of the claim block has been subdivided into a grid of rows and columns. The rows and columns identify specific "blocks" just like a city map. Here is what you know:

1) A geophysical survey using magnetic and electromagnetic detectors over the mining claim block indicates rocks which might host an orebody are not present south of Row 7 and west of Column E. You mark off this area by drawing diagonal lines from NE to SW in the "blocks".

2) Aerial photographs show an east-west fault that would cut off any possible mineralization at the south boundary of Row 4. You mark the boundary with a heavy solid line.

3) A geochemical survey testing for minute quantities of metal found high values of gold in soils in the contiguous area west of Column F, south of Row 3 and north of Row 9. You mark this area by drawing a heavy dashed line around its boundary.

4) Old drilling records indicate drill holes found no gold in blocks G6, D3, C9, F8, A6, B2, and D1. You mark these blocks with the letter "B" with a circle around it for barren drill hole.

5) You remember talking to Prospector Pete and he showed you a couple of gold nuggets he said that he found in a southwest to northeast flowing stream on blocks E5 and D6. You mark these blocks with "NUG" for nugget.

6) Your friend at Geostakers, a claim staking service, reports there is a BIG claim staking rush going on just to the northwest of your mining claim block.

7) A competitor company has sent you a letter offering a deal for blocks F1, G1, F2, and G2. You mark these blocks by drawing diagonal lines from northwest to southeast within this area.

8) Your field crew found old abandoned prospects in B6, D7, and G10 and samples from the waste rock dumps contain gold. You mark these blocks with an "X", that looks like a hammer and pick.

9) You identified a northwest-southeast trending geologic structure from the northwest corner of B5 to the southeast corner of G10. You mark the structure on your map as a dot-dash line.

10) A creek runs through block F2 and G2 and has a high concentration of prince plume plants growing nearby. Prince plume grows well in soils high in selenium, and selenium can occur in association with gold deposits. You mark these blocks with "PP" for prince plume.

Now you must decide which six "blocks" you think might contain ore. Mark six blocks by placing a dot with a circle around it in the middle of each block. It is time to **"Just Drill It"**.

JUST DRILL IT

DRILLING RESULTS TABLE

Determine the drilling results from your six drill holes in the table below. **The instructor will use the key to tell you whether you hit ore or came up blank!** The drill hole location is the block in which you chose to drill. The grade is the amount of gold you found in the rock in ounces per ton. The thickness is the length in feet of the drill hole that intercepted ore. Exploration geologists multiply the grade times the thickness to determine where the "high grade" ore is located within the orebody. For this activity, we'll assume that the samples used to determine our grade came from "HQ" sized core (2.5" in diameter) and that the rock cored has an average density of 12 ft^3/tn. Using πr^2 divided by this density give us a density factor of 0.00284 tons per linear foot of drilled HQ core. The grade thickness can then be multiplied by this factor and then by the price of gold (we are using **$500** per ounce, but you may substitute the current price) to get a value for the drill hole.
This is your pay!

Drill Hole Location	Grade (in ounces per ton)		Intercept Thickness (in feet)		Density Factor (in tons per linear foot of HQ core)		Price of Gold (in dollars per ounce)		YOUR PAY!
	oz/tn	x	ft	x	0.00284 tn/ft	x	$/oz	equals	$
	oz/tn	x	ft	x	0.00284 tn/ft	x	$/oz	equals	$
	oz/tn	x	ft	x	0.00284 tn/ft	x	$/oz	equals	$
	oz/tn	x	ft	x	0.00284 tn/ft	x	$/oz	equals	$
	oz/tn	x	ft	x	0.00284 tn/ft	x	$/oz	equals	$
	oz/tn	x	ft	x	0.00284 tn/ft	x	$/oz	equals	$
TOTAL									$

1.   How did you do relative to the other members of your class? (How much gold, in ounces, did you discover?)

        _____

2.   What clues did you use to help you find gold (or what should you have used)?

        _____

        _____

        _____

3.   If you were to drill a second round of <u>three</u> holes, which blocks (indicate row and column) would you drill in?

        _____

        _____

        _____

4.   If the gold grade was uniformly distributed throughout each square you successfully drill tested and each square was 100 feet by 100 feet, what would be your new total pay?

        _____

        _____

        _____

Just Drill It Base Map

COLUMNS

NORTH

	A	B	C	D	E	F	G
ROWS							
1							
2							
3							
4							
5							
WEST							**EAST**
6							
7							
8							
9							
10							

SOUTH

Just Drill It Base Map Answer Sheet

COLUMNS

NORTH

ROWS

	A	B	C	D	E	F	G
1	CLAIM STAKE RUSH			Ⓑ		COMPETITOR OFFER	
2		Ⓑ				PP	PP
3				Ⓑ			
4	HIGH GEOCHEMICAL VALUES INSIDE DASHED-LINE BOX					FAULT	
5					NUG		
6	Ⓑ			NUG			Ⓑ
7							
8						Ⓑ	
9			Ⓑ				
10	GEOPHYSICAL RESULTS NEGATIVE						

WEST

EAST

SOUTH
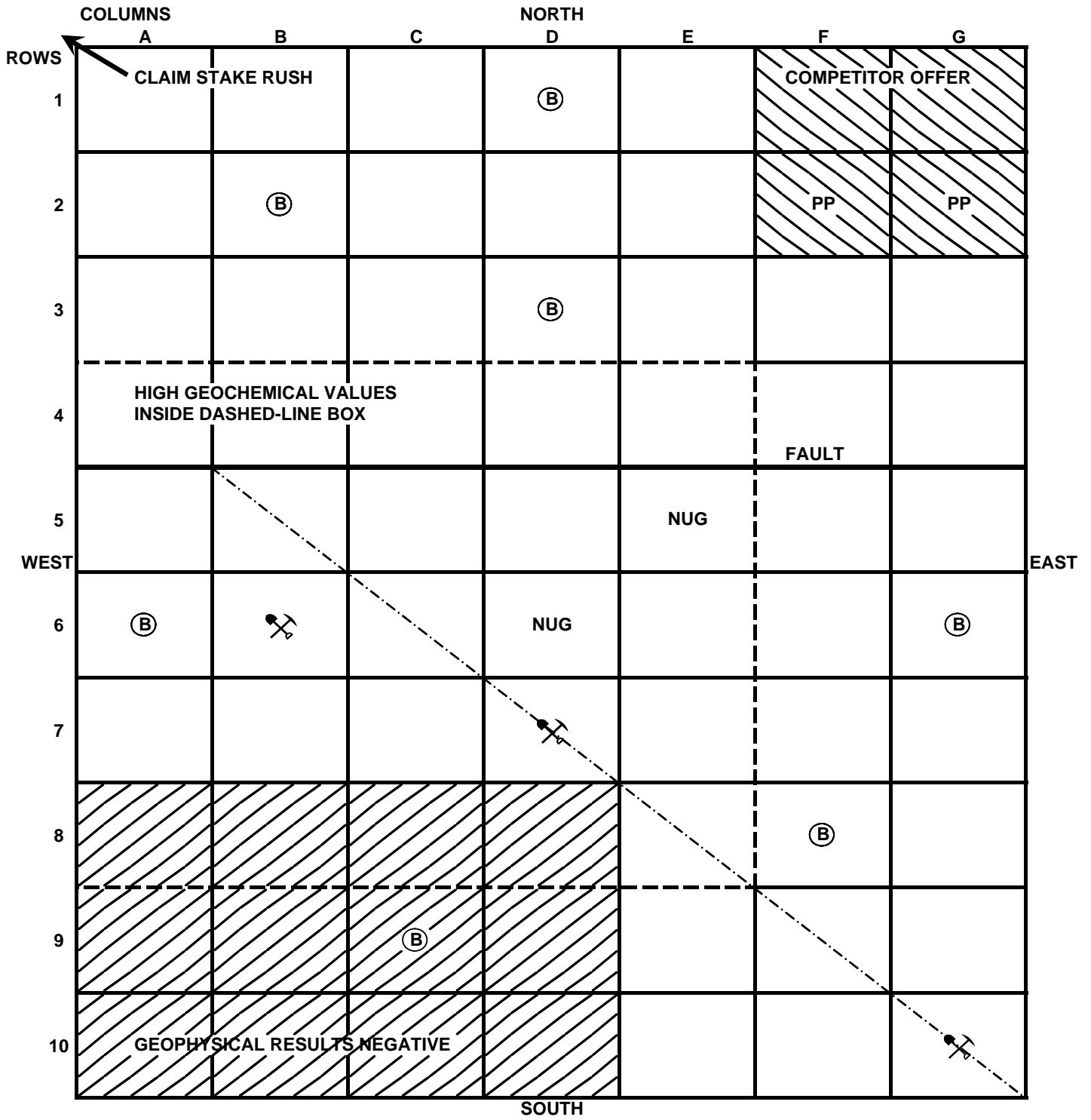
Just Drill It Base Map Answer Sheet w/Gold Ore Intercepts

COLUMNS   NORTH

	A	B	C	D	E	F	G
1	CLAIM STAKE RUSH 50' @ .5			Ⓑ		COMPETITOR OFFER	
2		Ⓑ				PP 20' @ .3	PP 40' @ .2
3				Ⓑ			
4	HIGH GEOCHEMICAL VALUES INSIDE DASHED-LINE BOX					FAULT	
5		60' @ .4	100' @ .4	80' @ .4	NUG		
6	Ⓑ	40' @ .4	50' @ .7	NUG 40' @ .5			Ⓑ
7		20' @ .4	20' @ .2	20' @ .4			
8					20' @ .3	Ⓑ	
9			Ⓑ			30' @ .3	
10	GEOPHYSICAL RESULTS NEGATIVE						20' @ .2

WEST   EAST

SOUTH
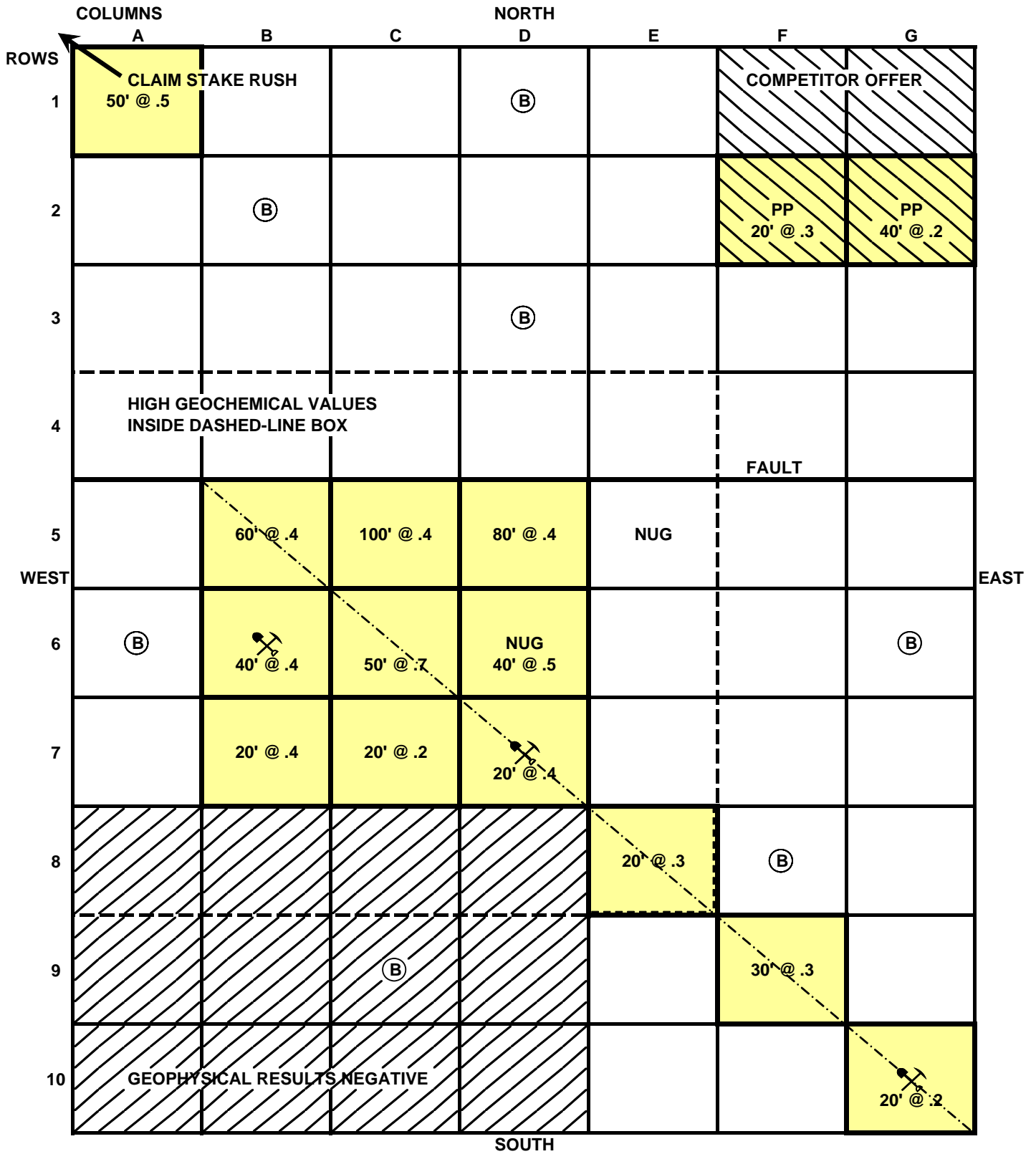
Just Drill It Base Map w/Gold Ore Intercepts

	COLUMNS A	B	C	D	E	F	G
ROWS **1**	50' @ .5			Ⓑ			
2		Ⓑ				PP 20' @ .3	PP 40' @ .2
3				Ⓑ			
4							
5		60' @ .4	100' @ .4	80' @ .4	NUG		
6	Ⓑ	40' @ .4	50' @ .7	NUG 40' @ .5			Ⓑ
7		20' @ .4	20' @ .2	20' @ .4			
8					20' @ .3	Ⓑ	
9			Ⓑ			30' @ .3	
10							20' @ .2

WEST   EAST

SOUTH