



BUNKERDRY

Installation Manual

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INSTALLATION INSTRUCTIONS FOR BUNKER DRY

PLANNING THE INSTALLATION IS VITALLY IMPORTANT, GENERALLY THE MAIN CONSIDERATIONS ARE AS FOLLOWS:

- a) IF THE BUNKER OR TURFED DEPRESSION IS NEW, ENSURE THE SUB-STRATA BASE CAN DRAIN TO A STORMWATER PIPE, CREEK, DAM OR ANY FREE OUTLET. REFER EXAMPLES ON PAGES 15 & 16.
- b) IF THE BUNKER OR TURFED DEPRESSION IS EXISTING, SURVEY THE WORK AREA AND DETERMINE THE DEPTH OF A NEW OR EXISTING DRAIN PIPE. REPLACE A 1 METRE (3"6") DIAMETER OF SAND WITH NEW, AROUND THE BUNKER DRY. IT IS RECOMMENDED, SAND BE OF GOOD QUALITY AND AT LEAST DOUBLE WASHED.
- c) IF THE DRAIN IS EXISTING;
 - (i) CHECK THE SIZE OF THE DRAIN PIPE. THE *BUNKER DRY* ATTACHES TO A STANDARD Ø100mm (4") PVC OR SIMILARLY SIZED AGG PIPE. CHECK THE DRAIN IS CLEAR AND FALLS AWAY FROM THE BUNKER/DEPRESSION.
 - (ii) DETERMINE THE DEPTH OF THE DRAIN PIPE. ENSURE THE DRAIN PIPE DISCHARGES FREELY TO AN OUTLET BELOW THE SURFACE OF THE BUNKER OR TURFED DEPRESSION AT ITS LOWEST POINT.
 - (iii) IDENTIFY THE ABSOLUTE LOW SPOT/S IN THE BUNKER/DEPRESSION. THINK OF A WATER WELL WHERE THE WATER WILL FLOW TO.
 - (iv) CHECK THE DEPTH OF THE DRAIN PIPE TO THE SURFACE LEVEL OF THE BUNKER/DEPRESSION. THE DIFFERENCE BETWEEN THE INVERT OF THE PIPE AND THE BUNKER/DEPRESSION SURFACE MUST BE A MINIMUM OF 350mm (14").
 - (v) MEASURE THE AREA OF THE BUNKER/DEPRESSION AND CHECK AGAINST *BUNKER DRY'S* SIZING TABLE FOR CORRECT NUMBER OF DEVICES. SIZING TABLE IS THE BACK PAGE OF THIS MANUAL
 - (vi) FOLLOW THE INSTALLATION STEPS FOR INSTALLING *BUNKER DRY* DEVICES.
- d) IF THE DRAIN IS NEW;
 - (i) INSTALL NEW Ø100mm (4") DRAIN PIPE AND ENSURE THE PIPE IS LAID AT A MINIMUM GRADE OF 1% OR 1 IN A 100.
 - (ii) DETERMINE THE DEPTH OF THE DRAIN PIPE. ENSURE THE DRAIN PIPE DISCHARGES FREELY TO AN OUTLET BELOW THE SURFACE OF THE BUNKER OR TURFED DEPRESSION AT ITS LOWEST POINT.
 - (iii) IDENTIFY THE ABSOLUTE LOW SPOT/S IN THE BUNKER/DEPRESSION. THINK OF A WATER WELL WHERE THE WATER WILL FLOW TO.
 - (iv) CHECK THE DEPTH OF THE DRAIN PIPE TO THE SURFACE LEVEL OF THE BUNKER/DEPRESSION. THE DIFFERENCE BETWEEN THE INVERT OF THE PIPE AND THE BUNKER/DEPRESSION SURFACE MUST BE A MINIMUM OF 350mm (14").
 - (v) MEASURE THE AREA OF THE BUNKER/DEPRESSION AND CHECK AGAINST *BUNKER DRY'S* SIZING TABLE FOR CORRECT NUMBER OF DEVICES. SIZING TABLE IS ON PAGE 17 OF THIS MANUAL.
 - (vi) FOLLOW THE INSTALLATION STEPS FOR INSTALLING *BUNKER DRY* DEVICES.

IMPORTANT

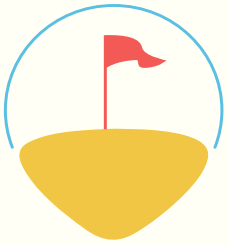
BUNKER DRY IS A GRAVITY DRAINAGE SYSTEM. *BUNKER DRY* IS RELIANT ON AN EFFECTIVE DRAINAGE PIPE WHICH DISCHARGES AT LEAST 350mm (14") BELOW THE LOWEST POINT IN THE BUNKER/DEPRESSION. THE DIFFERENCE IN DEPTH ALLOWS FOR A FREE DISCHARGE WHICH IS VITAL TO ENSURE THE BEST PERFORMANCE. GOOD QUALITY SAND WHICH IS FREE OF CLAY PARTICLES IS ESSENTIAL TO MAINTAIN GOOD FLOW RATES, THUS EVACUATING WATER FROM BUNKERS/DEPRESSIONS FAST.

GOLF COURSES WHICH HAVE A GENTLE SLOPE OR ARE UNDULATING. USUALLY HAVE NO DIFFICULTY IN LAYING DRAINAGE LINES TO A FREE OUTLET, WHETHER THAT BE A STORMWATER DRAIN, CREEK, DAM, LAKE OR SEA. SOMETIMES A PURPOSE MADE DEPRESSION CAN BE UTILISED AS A TEMPORARY BASIN WHICH FILLS WHEN BUNKER/DEPRESSION DRAINAGE IS FLOWING.

WHEN INSTALLING DRAINAGE ON FLATE COURSES, OR WHERE THE WATER TABLE IS HIGH, CONSIDERATION COULD BE GIVEN TO RAISE THE SURFACE OF THE BUNKERS/DEPRESSIONS, OR INSTALL A BELOW GROUND STORAGE SYSTEM SIMILAR TO AN ABSORPTION TRENCH ARRAY OR A TRANSPIRATION BED. ANOTHER SOLUTION IS TO EXTEND THE LENGTH OF THE DISCHARGE DRAIN INTO THE FAIRWAY OR ROUGH, THUS INCREASING THE STORAGE CAPACITY OF THE PIPE.

IF IN DOUBT ABOUT WHERE TO DRAIN THE WATER, WE AT *BUNKER DRY* CAN ASSIST AND ADVISE A SOLUTION BASED ON SOUND ENGINEERING PRINCIPLES. WE HAVE OVER 40 YEARS EXPERIENCE IN HYDRAULIC ENGINEERING AND CAN DESIGN ANY SYSTEM TO IMPROVE DRAINAGE ON AND AROUND THE COURSE AS WELL AS BUNKERS/DEPRESSIONS.

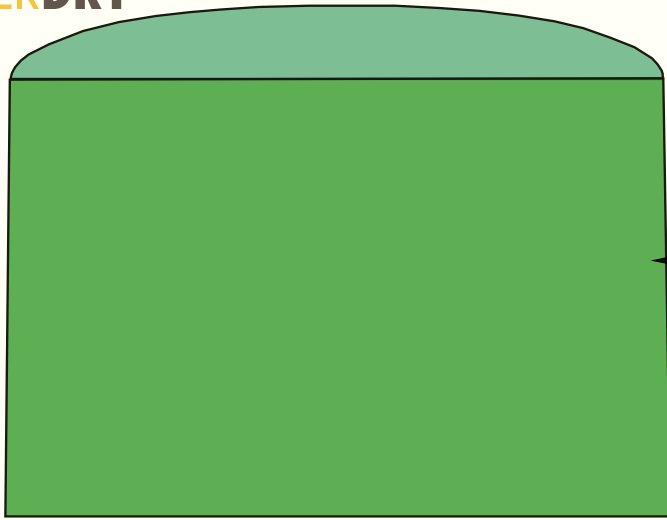
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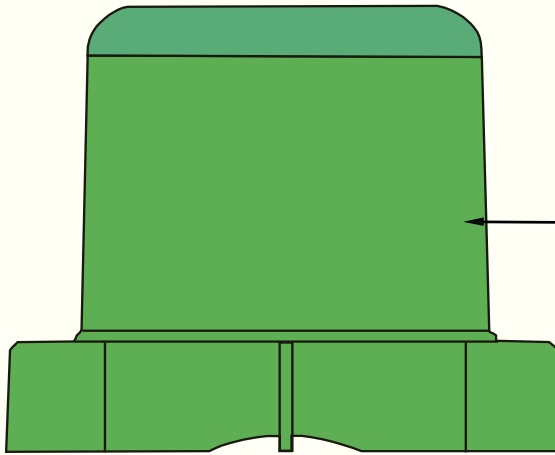
BUNKER DRY

Ø18mm BULLSEYE LEVEL TO ASSIST INSTALLER.

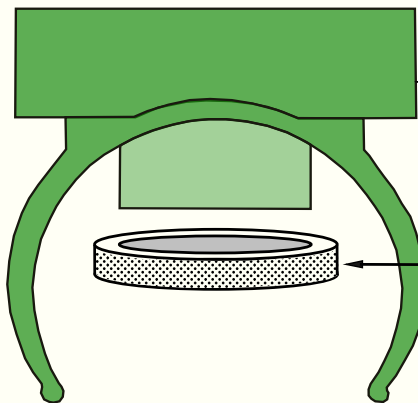
Ø18mm STAINLESS STEEL FERRULE FOR RADIO DETECTION/METAL DETECTOR



Ø160mm PE DOME AND VELOCITY CHAMBER



PRIMARY WEIR AND SECOND COMPONENT FOR VELOCITY CHAMBER



SECONDARY WEIR, NOZZLE AND PIPE SADDLE

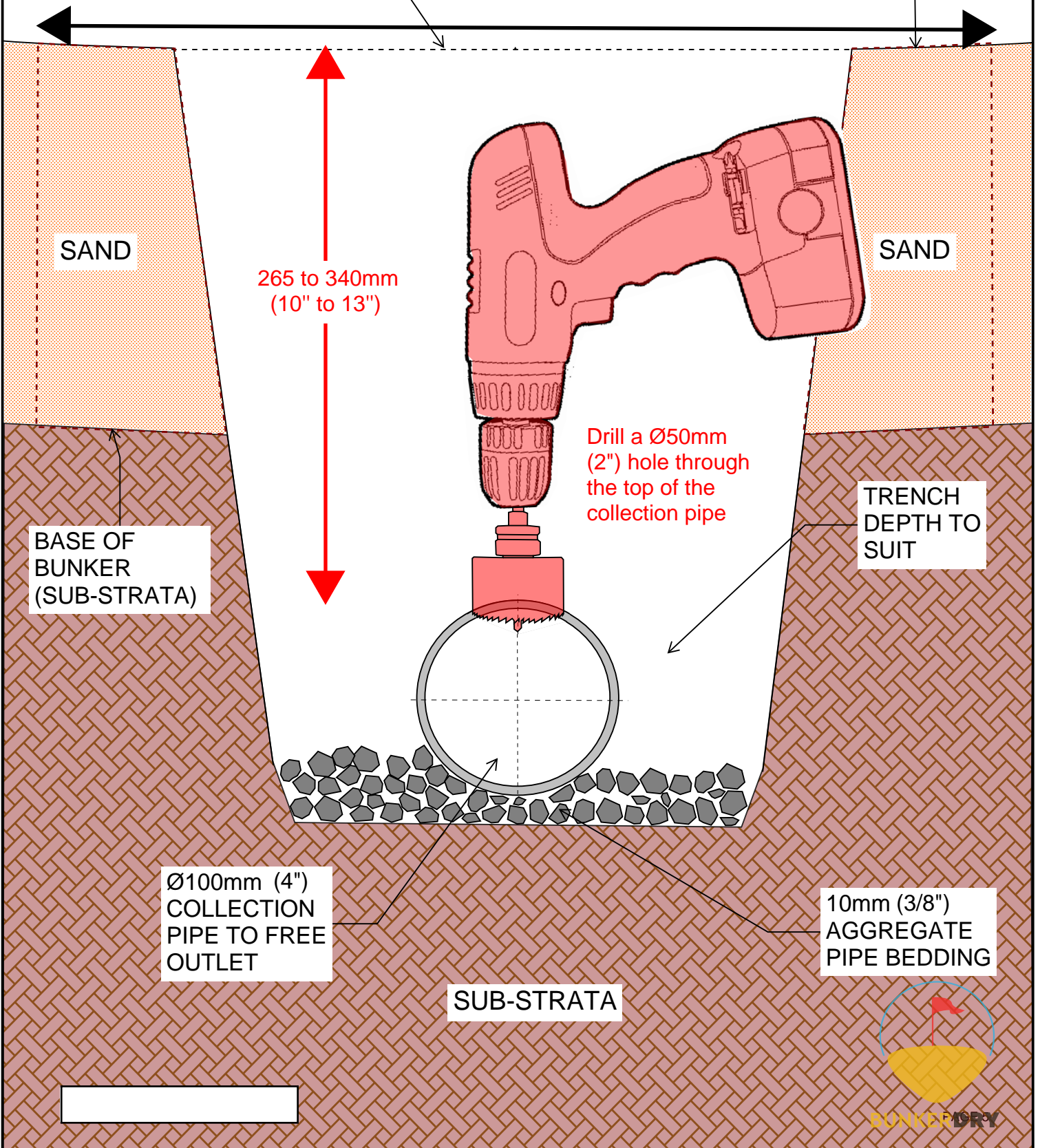
SEALING GROMMET

INSTALLATION: STEP 1

TRENCH THROUGH BUNKER. LOCATE IN THE DEEPEST PART OF THE BUNKER

FOR BEST RESULTS, REPLACE WITH DOUBLE WASHED SAND A METRE IN DIAMETER (3'6") SURROUNDING BUNKER DRY.

SURFACE OF BUNKER SAND

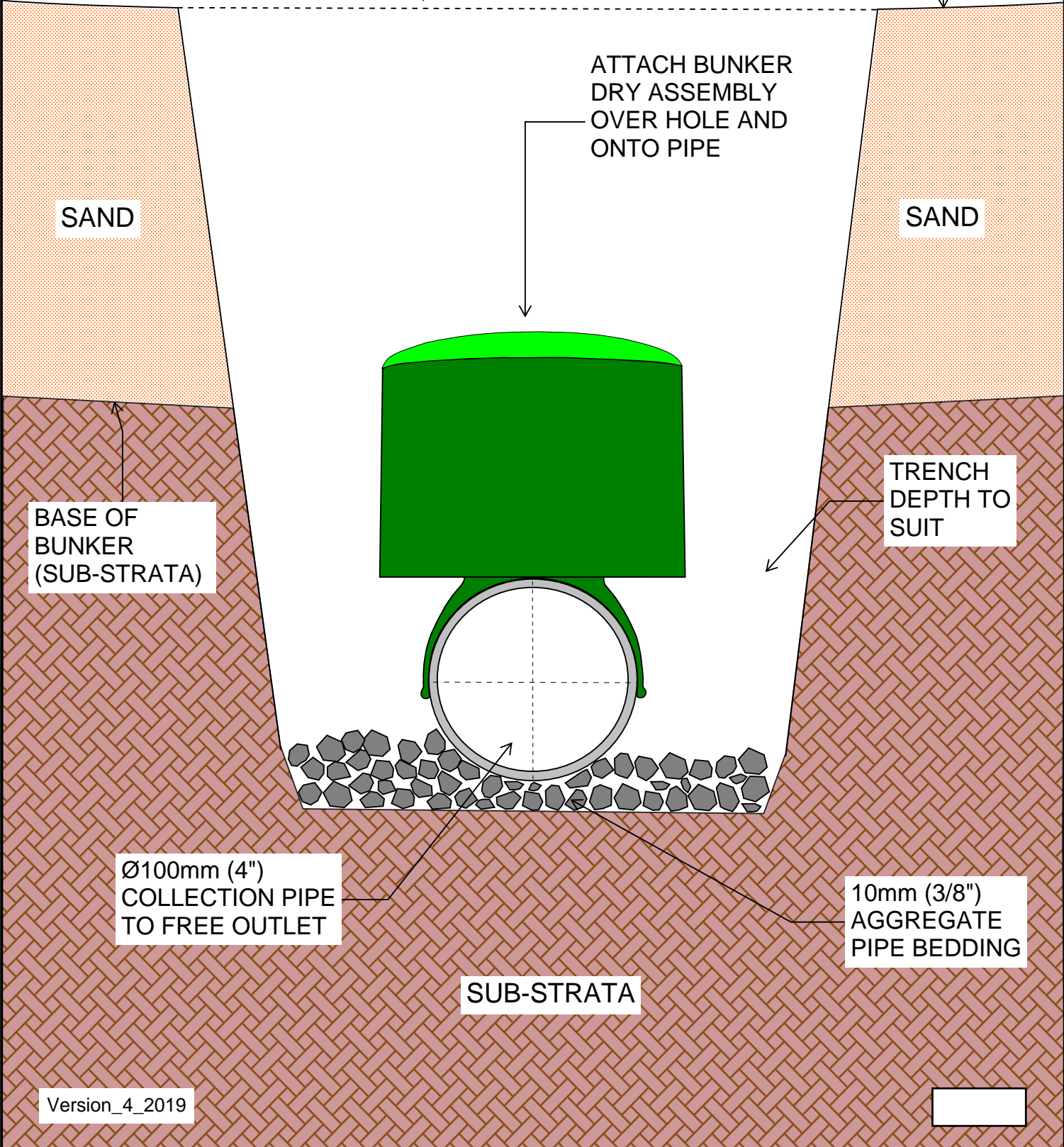


INSTALLATION STEP 2



TRENCH THROUGH BUNKER. LOCATE IN THE DEEPEST PART OF THE BUNKER

SURFACE OF BUNKER SAND



BASE OF BUNKER (SUB-STRATA)

TRENCH DEPTH TO SUIT

Ø100mm (4'')
COLLECTION PIPE
TO FREE OUTLET

10mm (3/8'')
AGGREGATE
PIPE BEDDING

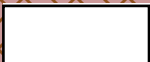
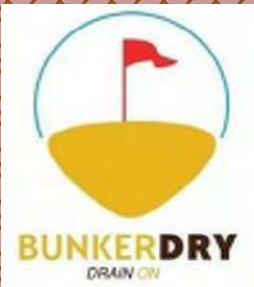
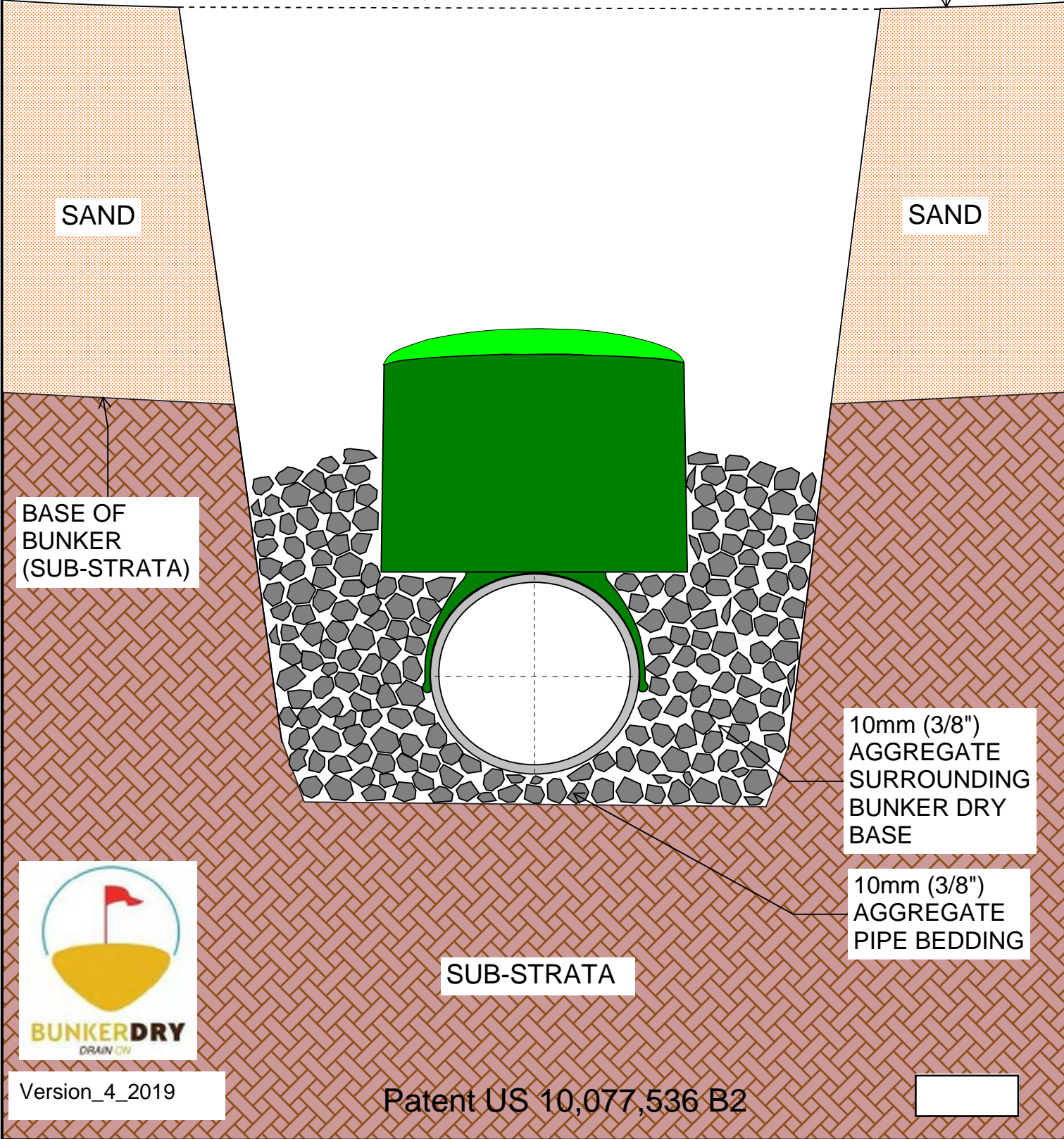
SUB-STRATA



INSTALLATION STEP 3

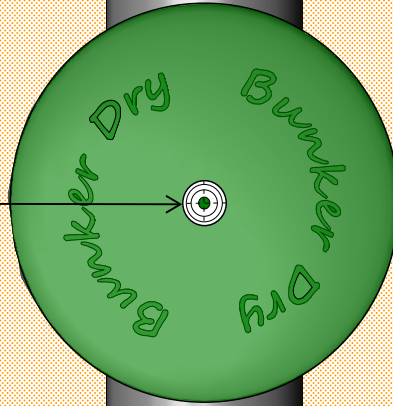
TRENCH THROUGH BUNKER. LOCATE IN THE DEEPEST PART OF THE BUNKER

SURFACE OF BUNKER SAND



TOP VIEW

ENSURE SPIRIT
LEVEL IS CENTRED
WHEN BUNKER
SAND IS PACKED
AROUND BUNKER
DRY



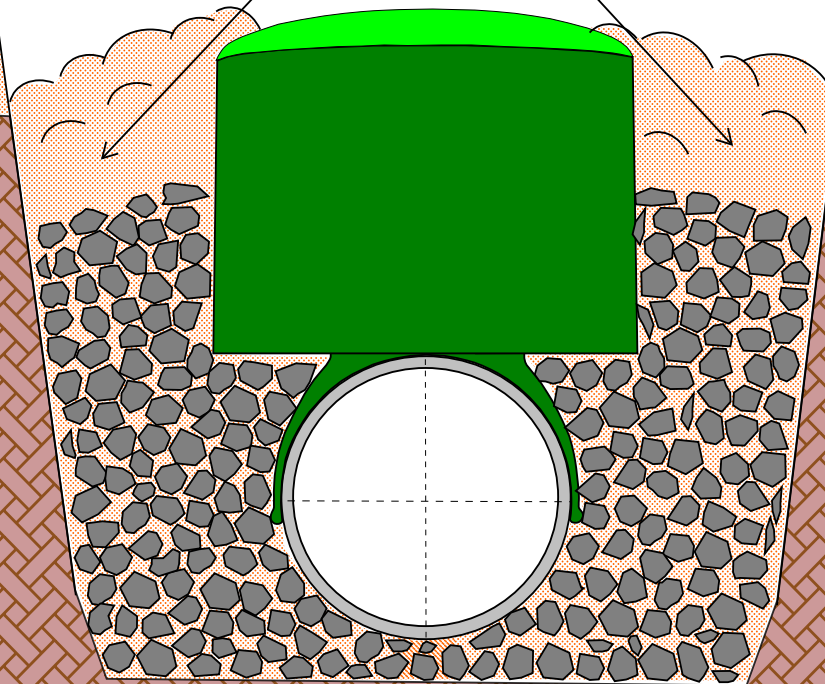
PACK BUNKER SAND
AROUND BUNKER DRY
AND ENSURE DOME IS
LEVEL

SAND

SAND

REFER TOP
VIEW ABOVE

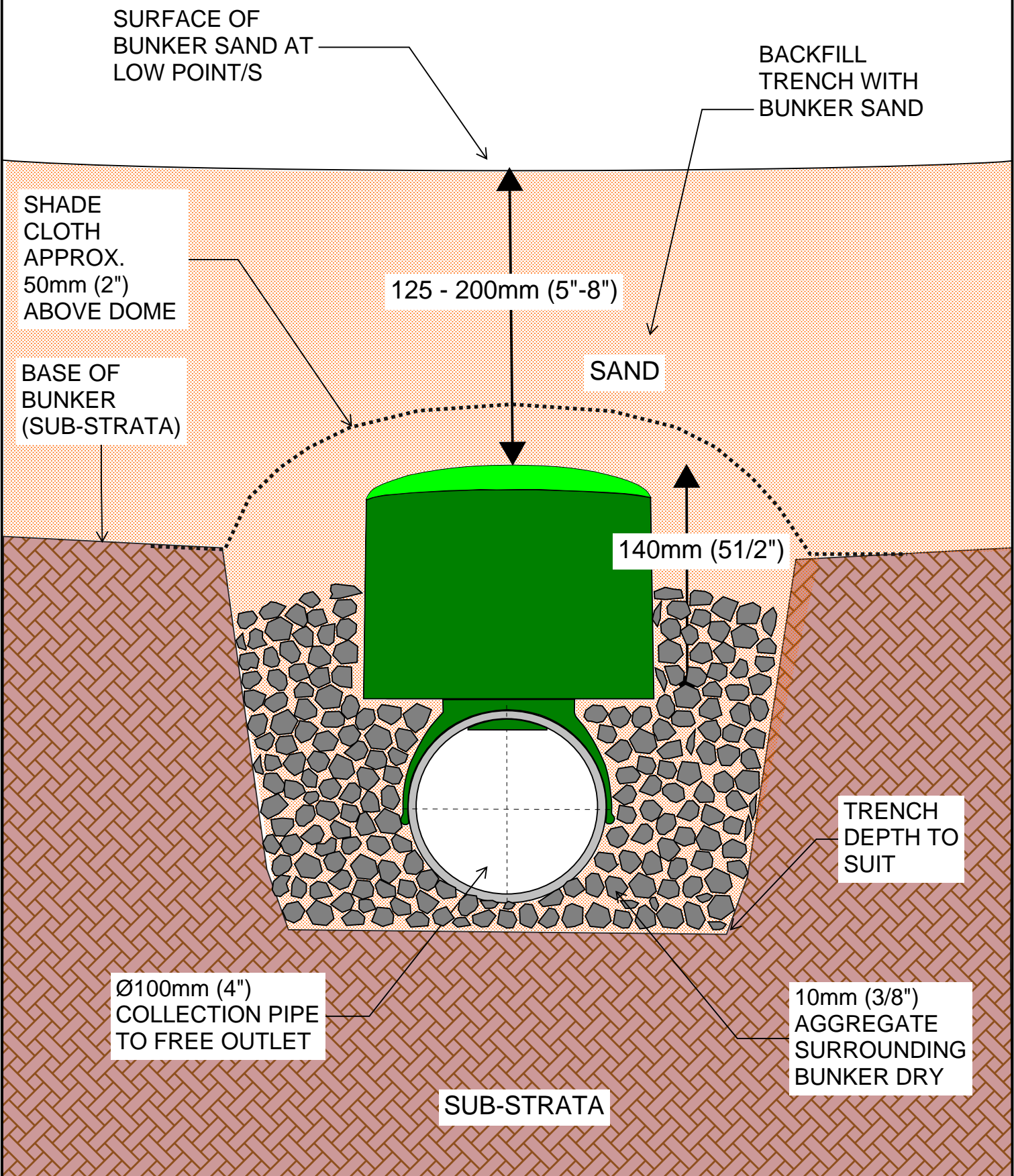
BASE OF
BUNKER
(SUB-STRATA)



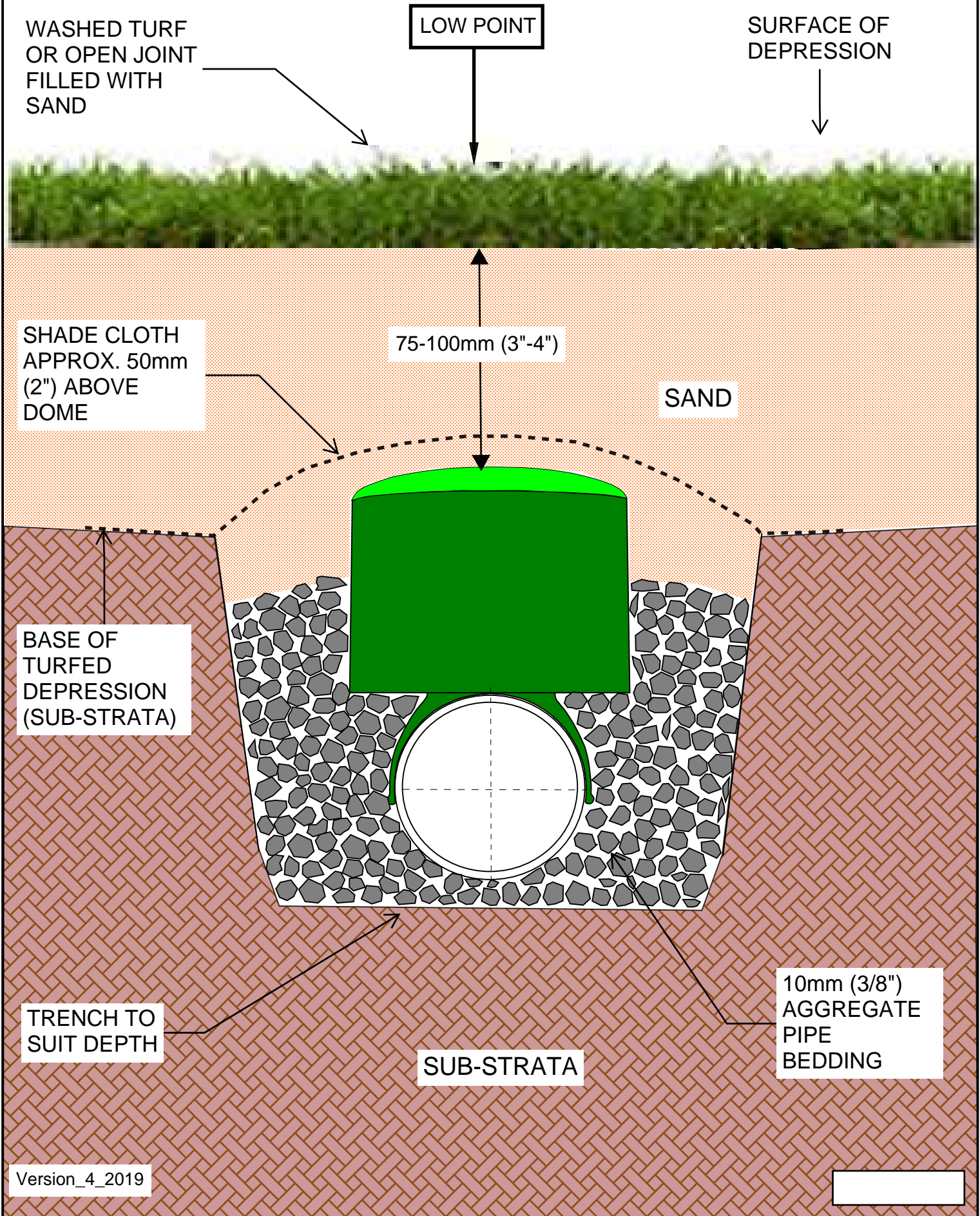
SUB-STRATA

INSTALLATION STEP 4

COMPLETED INSTALLATION



INSTALLATION IN TURFED DEPRESSION



Bunker Types					
Category	Area of bunker [m ²]	Size	Depth	Shape	Variable Depth
1	2-59 m ²	Minor	Shallow	Circular	Depth up to 0.4m*
2	2-59 m ²	Minor	Deep	Circular	Depth greater than 0.4m*
3	2-59 m ²	Minor	Shallow	Elliptical/irregular	Depth up to 0.4m*
4	2-59 m ²	Minor	Deep	Elliptical/irregular	Depth greater than 0.4m*
5	60-119 m ²	Small	Shallow	Circular	Depth up to 0.6m*
6	60-119 m ²	Small	Deep	Circular	Depth greater than 0.6m*
7	60-119 m ²	Small	Shallow	Elliptical/Irregular	Depth up to 0.6m*
8	60-119 m ²	Small	Deep	Elliptical/Irregular	Depth greater than 0.6m*
9	120-179 m ²	Medium	Shallow	Elliptical/Irregular	Depth up to 0.8m*
10	120-179 m ²	Medium	Deep	Elliptical/Irregular	Depth greater than 0.8m*
11	120-179 m ²	Medium	Shallow	Elliptical/Irregular	Depth up to 0.8m*
12	120-179 m ²	Medium	Deep	Elliptical/Irregular	Depth greater than 0.8m*
13	180-239 m ²	Large	Shallow	Elliptical/Irregular	Depth up to 1.0m*
14	180-239 m ²	Large	Deep	Elliptical/Irregular	Depth greater than 1.0m*
15	180-239 m ²	Large	Shallow	Elliptical/Irregular	Depth up to 1.0m*
16	180-239 m ²	Large	Deep	Elliptical/Irregular	Depth greater than 1.0m*
17	240-299 m ²	Extra Large	Shallow	Elliptical/Irregular	Depth up to 1.2m*
18	240-299 m ²	Extra Large	Deep	Elliptical/Irregular	Depth greater than 1.2m*
19	240-299 m ²	Extra Large	Shallow	Elliptical/Irregular	Depth up to 1.2m*
20	>300 m ²	Extra Large	Deep	Elliptical/Irregular	Depth greater than 1.2m*

*Denotes average depths associated with typical bunker types. Bunkers which fall outside this range should be sized by Bunker Dry.

Depending on the size of the bunker, it may also be of value to create some additional low points to encourage higher flowrates which will keep the sand area drier.

Bunker Dry Sizing Chart			
Area of bunker [m ²]	Category	Number of Bunker Dry units	Comments
2-59 m ²	1, 2, 3 & 4	1	Locate close to centre at lowest point.
60-119 m ²	5 & 7	2	Locate close to centre at lowest point @ approximately 1.0 m apart. *
	6 & 8	2	Locate close to centre at lowest point @ approximately 0.5 m apart. *
120-179 m ²	9 & 11	2~3	Locate close to centre at lowest point @ approximately 1.5 m apart from central unit. *
	10 & 12	2~3	Locate close to centre at lowest point @ approximately 1.0 m apart from central unit. *
180-239 m ²	13 & 15	3~4	Locate close to centre at lowest point @ approximately 2.0 m apart from central unit. *
	14 & 16	3~4	Locate close to centre at lowest point @ approximately 1.5 m apart from central unit. *
240-299 m ²	17 & 19	4~5	Locate close to centre at lowest point @ approximately 2.5 m apart from central unit. *
	18 & 20	4~5	Locate close to centre at lowest point @ approximately 2.0 m apart from central unit. *
>300 m ²	Not defined	To be Advised	Requires design by Bunker Dry

*Denotes separation dimensions are not necessarily linear. Depending on the type, shape and sand base, it may be more efficient to group the Bunker Dry units in a circular or square arrangement.